U.S. Department of the Interior
National Park Service

Sequoia and Kings Canyon National Parks
California

Wilderness Stewardship Plan and Final Environmental Impact Statement

Volume 1 • Chapters 1-5, Glossary, References

April 2015

FRONT COVER
Fin Dome in the Rae Lakes area
Photo Courtesy of Rick Cain

United States Department of the Interior

NATIONAL PARK SERVICE
Sequoia and Kings Canyon National Parks
47050 Generals Highway
Three Rivers, California 93271-9651

IN REPLY REFER TO:
1.A.1.

Dear Friends of Sequoia and Kings Canyon National Parks:

I am pleased to announce the release of the Wilderness Stewardship Plan and Final Environmental Impact Statement (WSP/FEIS) for Sequoia and Kings Canyon National Parks. This plan provides direction to the National Park Service (NPS) for the next 15 to 20 years as it makes decisions regarding the use and protection of the wilderness encompassed by these parks. The NPS will use the management framework established by the WSP to preserve wilderness character, to encourage and provide opportunities for public use and enjoyment of wilderness, and to improve conditions in areas where there may be unacceptable levels of impact.

Input from the public and agencies helped to shape this plan since its initiation in 2010. The parks received 255 public comments during the 60-day public review of the draft plan, released in June 2014. Key issues brought forward during the public review included visitor access, trail management, stock use, research and the use of the Redwood Canyon Cabin, and commercial services in wilderness. Revisions to the preferred alternative (alternative 2) between the draft and final plan include:

- Adding the most recent available data to the visitor capacity framework and the extent necessary determination for commercial services in wilderness;
- Clarifying the trails classification system and slightly modifying the trails open and closed to stock access;
- Allowing for the continued use of the Redwood Canyon Cabin for the administration of wilderness, but with a smaller footprint and fewer appurtenances;
- Providing for short-term use of the Wolverton corral by private parties and commercial service providers, but not reestablishing permanent occupation of this facility by a commercial pack station for wilderness access;
- Adding information related to climate change;
- Refining the climbing management strategy to clarify the definition of fixed anchors.

The final WSP/FEIS is available on the NPS Planning, Environment, and Public Comment (PEPC) website at http://parkplanning.nps.gov/sekiwild. A limited number of printed documents are available. To request printed documents or CDs, call (559) 565-3102, or write to me at the below address. A 30-day “no-action” period will begin on the date the Environmental Protection Agency publishes the notice of availability of the final plan in the *Federal Register*, after which the NPS will prepare a record of decision (ROD). After approval of the ROD by the Pacific West Regional Director, we will announce the selected plan through local and regional press, and on the PEPC website.

Your contributions to this planning effort make a difference in protecting the wilderness of Sequoia and Kings Canyon National Parks. Thank you for your involvement in this important plan.

Woody Smeck, Superintendent
Sequoia and Kings Canyon National Parks
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Three Rivers, CA 93271-9700

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National Park Service
U.S. Department of the Interior

Sequoia and Kings Canyon National Parks

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EXECUTIVE SUMMARY

The wilderness areas of Sequoia and Kings Canyon National Parks (the parks) are visited by tens of thousands of people each year. Visitors to the parks' wilderness can enjoy a diverse array of opportunities while experiencing one of America's most superlative landscapes. Those who have yet to visit the wilderness are invited to consider their connection to wildlands, plan a trip, or enjoy it from afar.

This *Wilderness Stewardship Plan / Final Environmental Impact Statement* (WSP/FEIS) provides direction for the National Park Service (NPS) to make decisions regarding the future use and protection of the parks' wilderness. The WSP/FEIS analyzes the consequences of creating a plan that would provide management direction for the many outstanding resource values present in the parks' wilderness, including natural and cultural resources, as well as diverse recreational and educational opportunities for visitors. It analyzes these elements in accordance with the National Environmental Policy Act (NEPA), the National Historic Preservation Act (NHPA), the Wilderness Act, and other legal mandates governing decision making by the NPS.

Readers may gain a quick summary of the proposed action by reviewing, at a minimum, the following parts of the document:

- this Executive Summary
- the Table of Contents (for specific sections of interest)
- "Alternative 2 (Preferred Alternative): Protect Wilderness Character by Implementing Site-specific Actions" section in chapter 2
- Appendices that provide specific management strategies.

In addition, the glossary may help with unfamiliar terms, and the appendices also offer in-depth and background information on many topics.

PURPOSE OF ACTION

This WSP/FEIS (or plan) will provide management direction for two designated wilderness areas, several potential wilderness additions, and an area of proposed wilderness. The California Wilderness Act of 1984 (Public Law [PL] 98-425) designated the Sierra Crest portion of both parks as the Sequoia-Kings Canyon Wilderness. The Omnibus Public Land Management Act of 2009 (PL 111-11) designated the John Krebs Wilderness in Sequoia National Park; it also expanded the Sequoia-Kings Canyon Wilderness to include the North Fork Kaweah area and Redwood Canyon area. The parks' total designated wilderness is now 808,078 acres — approximately 93.3% of the total park acreage of 865,964. In addition, because the southern end of the Hockett Plateau (approximately 29,500 acres) remains proposed wilderness, it is managed as wilderness, according to law (PL 111-11) and NPS policy. The parks also contain several designated potential wilderness additions (DPWA), including the area around the Pear Lake Ski Hut and Bearpaw Meadow High Sierra Camp. These would become wilderness when and if the non-conforming activities (e.g., commercial enterprise) and/or facilities are removed. Altogether, designated and proposed wilderness areas comprise nearly 97% of the total acreage of Sequoia and Kings Canyon National Parks (figure ES-1 on the following page).

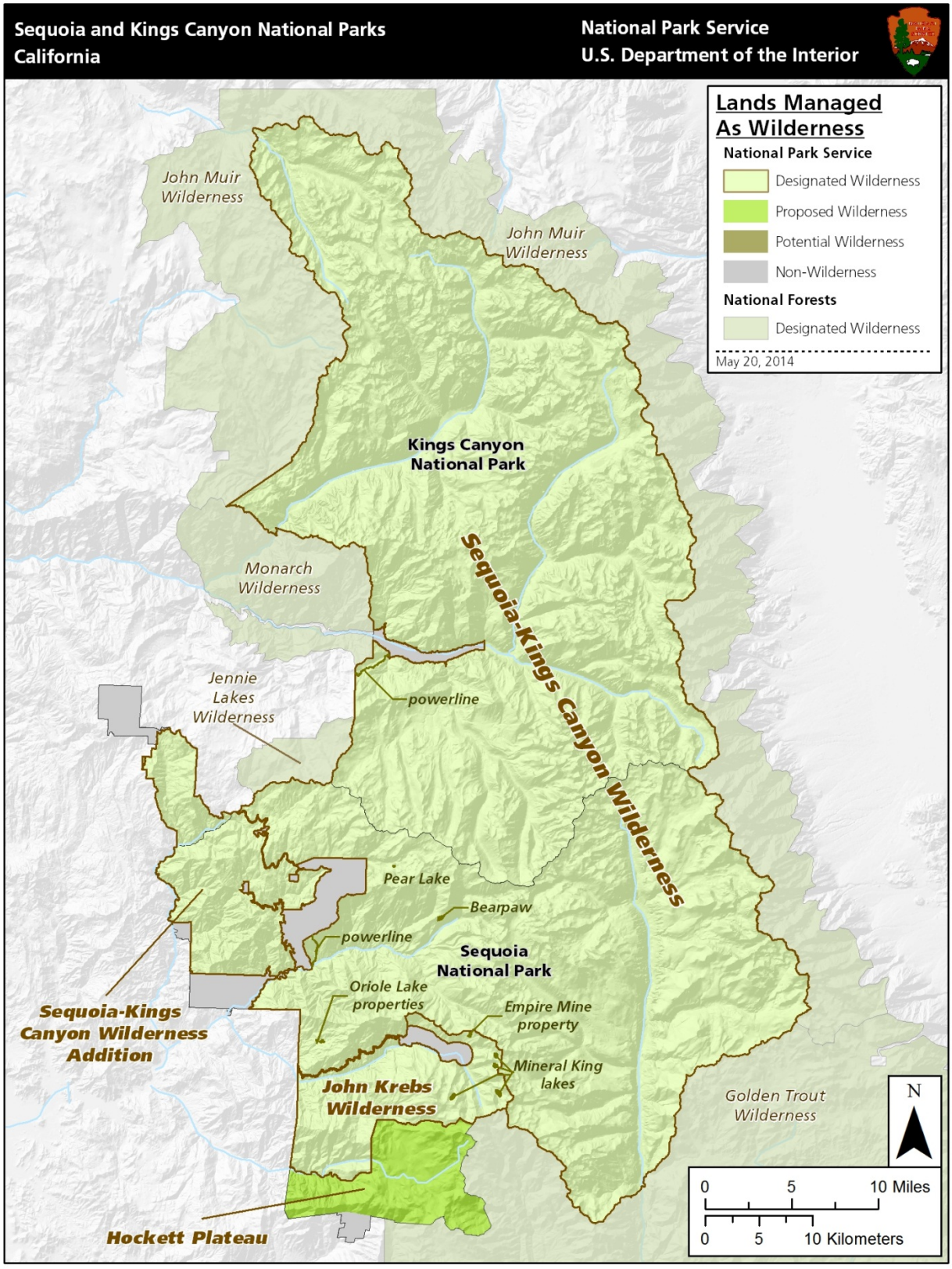

Figure ES-1: Wilderness Areas In and Around Sequoia and Kings Canyon National Parks

The WSP/FEIS addresses recent servicewide guidance (NPS *Management Policies 2006*), reflects provisions of the California Wilderness Act of 1984 and the Omnibus Public Land Management Act of 2009, incorporates new research findings, and uses a new interagency planning framework for the preservation of wilderness character. The purposes of the WSP include implementing the long-term vision for protecting wilderness character that is contained in the parks' Final General Management Plan (GMP) / Final Environmental Impact Statement, as well as enhancing established programs and actions for managing these areas as wilderness. (Note: In an order dated May 29, 2012, the U.S. District Court for the Northern District California issued an opinion in a lawsuit that challenged the parks' GMP [High Sierra Hikers Association v. U.S. Department of the Interior].) The Court order "vacate[d] all portions of the GMP and Record of Decision (ROD) which provide programmatic guidance regarding the type or level of stock services necessary in the Sequoia and Kings Canyon National Parks wilderness or direction as to need, appropriateness, or size of developments, structures, or facilities used completely or partially for commercial stock services." Where the GMP is referred to in this document, only those sections not vacated by the court order apply.) The WSP also replaces the current plans of record, the 1986 *Backcountry Management Plan* (BMP) and its accompanying 1986 *Stock Use and Meadow Management Plan* (SUMMP).

This WSP establishes a framework for managing wilderness and areas managed as wilderness within Sequoia and Kings Canyon National Parks to meet these critical objectives:

- preserve wilderness character
- provide opportunities for and encourage public use and enjoyment of wilderness in accordance with the Wilderness Act and other laws and policies
- improve conditions in areas where there may be unacceptable levels of impacts on wilderness character
- protect the natural and cultural resources within wilderness

NEED FOR ACTION

The WSP is needed to establish more specific goals and objectives for the management of visitors and certain administrative activities within the parks' wilderness. A variety of controversial or long-standing issues are addressed in the WSP, including visitor capacity, wilderness permitting, party (group) size limits for people and stock, campfire regulations, camping locations and regulations, food-storage requirements, human-waste management, stock access, stock grazing, maintenance of facilities and trails, and management of frontcountry facilities that support wilderness use. The WSP also analyzes and determines the types and levels of commercial services that may be performed for activities that are proper for realizing the recreational or other wilderness purposes of the areas, as required by §4(d)(5) of the Wilderness Act.

The framework of this WSP/FEIS is founded on describing the wilderness character of the parks, defining the goals and objectives for managing wilderness visitor use and impacts, describing desired conditions for the visitor experience and wilderness character, developing visitor-use capacities, and determining the types and levels of commercial services necessary to support wilderness purposes.

In accordance with §102(2)(C) of the National Environmental Policy Act of 1969 (NEPA; PL 91-190), the parks have prepared this WSP/FEIS to consider alternative strategies for future management of the parks' wilderness. Five alternatives for achieving wilderness-stewardship objectives, including the no-action alternative, are identified and analyzed. They describe five different ways to provide appropriate

types and levels of access for visitors and authorized users, preserve wilderness character, protect cultural and natural resources, and adhere to legally required management and preservation objectives.

Mehrten Creek along the High Sierra Trail

GOALS AND OBJECTIVES

Goals and objectives are key elements of a wilderness stewardship plan, as they establish and provide the direction for the parks' wilderness management program and reflect the purpose and need for planning. Wilderness goals and objectives flow from law, policies, park and wilderness enabling legislation, the parks' *General Management Plan* (GMP) objectives, public input, and more. The following identify what the WSP needs to address to achieve long-term successful management and protection of wilderness:

- Preserve ecological, geological, scientific, educational, scenic, and historical values of wilderness, including culturally significant resources and paleontological resources within wilderness, as important and prominent values, consistent with the Wilderness Act, California Wilderness Act, and applicable planning guidance from the GMP
- Manage archeological, historical, and ethnographic sites in a manner that is compatible with wilderness and historic-preservation laws
- Preserve dark night skies
- Preserve natural soundscapes
- Work to reduce conflicts between user groups as well as between users and sensitive resources

- Determine the types and levels of commercial services that will be allowed in wilderness and manage these services subject to applicable laws and policies
- Foster an inspired and informed public and park staff who value preservation of the parks' wilderness
- Promote Leave No Trace© minimum-impact practices
- Promote safety within the context of wilderness where users are expected to be self-reliant

Desired conditions are the natural and cultural resource conditions that the NPS aspires to achieve and maintain over time, and the conditions necessary for visitors to understand, enjoy, and appreciate those resources (NPS 2009a). In the context of a wilderness stewardship plan, *desired conditions* qualitatively describe an ideal condition of wilderness character. Some desired conditions may not be fully attainable due to factors unrelated to visitor use or park management activities (e.g., due to external factors such as climate change and air pollution). The Wilderness Act requires that, as a minimum, wilderness character be preserved from the time of designation. NPS *Management Policies 2006* also allows the NPS to take action to restore wilderness character when past actions have impacted wilderness character.

In this WSP, desired conditions are defined for the four primary qualities of wilderness character. More specific desired conditions are also provided under the qualities that relate specifically to visitor use management.

- The untrammeled quality of wilderness character would be preserved by limiting deliberate manipulation of ecological systems except as necessary to promote another quality of wilderness character.
- The natural quality of wilderness would be preserved by mitigating the impacts of modern civilization on ecosystem structure, function, and processes. The NPS aspires to minimize or localize adverse impacts caused by visitor use and administrative activities. In the wilderness, natural processes would dominate:
    - ecosystem structure and function
    - native biodiversity
    - water quality and quantity
    - decomposition, nutrient cycling and soil forming processes
    - meadow and wetland productivity
    - fire regimes
    - soundscapes, dark skies and viewsheds

  Additionally the NPS seeks to minimize adverse impacts caused by visitor use and administrative activities to cultural, historical and pre-historical resources.

- The undeveloped quality of wilderness character would be preserved through the removal of installations that are unnecessary for the protection of other wilderness character qualities.
- Outstanding opportunities for solitude or primitive and unconfined recreation would be provided to support visitor use and enjoyment of the parks' wilderness areas in balance with the protection of other wilderness character qualities.
    - Visitors with diverse backgrounds and capabilities would have opportunities to use and enjoy wilderness.

- Visitors would have opportunities to experience solitude, a state of being alone or feeling remote from society, although these opportunities could vary by location and time.
- Visitors would have opportunities to participate in a variety of primitive recreation activities, characterized by non-motorized, non-mechanical travel and reliance on personal skill; primitive recreation activities would be managed to preserve other wilderness character qualities.
- Visitors would have opportunities to recreate in an unconfined, self-directed manner, subject only to those regulations that are necessary to preserve wilderness character.

PLANNING ELEMENTS TO BE ADDRESSED

Specific planning elements or topics to be addressed in the plan were developed for discussion and to set the framework for the alternatives. Each of these topics will be addressed under each alternative and a comparison of the environmental consequences of each alternative will be completed. These planning topics were identified based on internal and external scoping; federal laws, regulations, and executive orders; NPS *Management Policies 2006*; site visits; and public comments.

MANAGEMENT ACTIONS APPLICABLE TO ALL ALTERNATIVES

Wilderness Education: Education is a critical component of wilderness stewardship. Programs that help visitors and staff to understand wilderness values and ethics are extremely important across all alternatives. Information explaining proper wilderness behavior and how to access less-visited areas of wilderness could help reduce the impacts of visitors on the environment and one another's experiences, as well as disperse use (Cole et al. 1987). Understanding the qualities and benefits of wilderness also leads to improved stewardship. A wilderness information and education strategy has been developed as part of this plan.

Aviation (Military, Commercial, and Private): Managing military and private aviation above park wilderness is outside the scope of the WSP; however, the plan will determine the future of commercial air tours over wilderness. As an outcome of this WSP/FEIS, air tours over the parks are determined to be counter to the preservation of wilderness character, and the parks will continue to pursue means for their exclusion from the Federal Aviation Administration (FAA) list of NPS units where air tours are allowed. The parks will continue to work cooperatively with regional and national military leadership to ensure that military aviation operations are no more than minimally disruptive to the experience of wilderness visitors. Private aircraft use would continue to be managed by the FAA, and the NPS will continue to work cooperatively with the FAA to resolve problems.

Administrative Communications in Wilderness: Effective radio-communication systems are necessary to support resource protection actions, emergency services, the safety of wilderness staff, and transmittal of information on wilderness conditions to the frontcountry to inform wilderness visitors. Radio repeaters in wilderness exist in strategic and remote locations and require maintenance. Helicopter use may be authorized to maintain radio repeaters if it is determined by the superintendent to be the minimum requirement needed to achieve the purposes of the area as wilderness, including the preservation of wilderness character. As future technologies are developed, the existing structures would be considered for replacement, with replacement outside of wilderness preferred. If structures are able to be removed, the installation sites would be restored to natural conditions.

Administrative Activities (e.g., Ranger Patrols and Operations, Maintenance Activities, Resource Management Activities, Park Aviation, etc.) and Minimum Requirement Standards: Administrative presence may impact opportunities for solitude and unconfined recreation. Rangers, trail crews, and

resource management crews are stationed in the parks' wilderness to educate and assist visitors, enforce regulations and restrictions, carry out projects, and perform maintenance activities to protect and preserve wilderness character. Many of these actions, such as those requiring the use of helicopters, are approved only after a minimum requirement analysis (MRA) determines that the actions are the minimum required to administer the area as wilderness.

Tree Hazard Management: Removing hazard trees in wilderness is not a normal or desirable activity, but may be allowed under certain circumstances after an analysis to determine that the actions are the minimum required to administer the area as wilderness.

Research: The parks are recognized for advancing scientific research and integrating knowledge gained from scientific inquiry into the management of wilderness resources. Researchers from outside entities submit approximately 60 to 80 requests for permits each year to study aspects of the wilderness environment. For some park visitors, interaction with agency personnel and researchers may reduce the unconfined feeling or opportunities for solitude (Fauth and Tarpinian 2011; NPS 2011a). Other research actions may result in a temporary trammeling of wilderness but may improve the natural quality of wilderness over time. Research that has the potential to affect wilderness character, or that proposes a prohibited action, is evaluated separately through a MRA.

Winter Use: A wide range of activities can be experienced in the wilderness during the winter, generally from November through mid-May. Due to the high-elevation, demanding terrain, and potentially extreme weather of the parks' wilderness, winter activities can be challenging and hazardous for the inexperienced user. However, users of the winter environment will find the quiet, solitude, and beauty of the parks' wilderness extraordinary and inspiring. The winter use of the wilderness will be managed consistently across the alternatives.

Climbing Management: Climbing management in National Park wilderness is directly guided by relevant NPS management policies, director's orders, and reference manuals. The U.S. Code of Federal Regulations and the parks' Superintendent's Compendium also provide indirect and direct management control of climbing and related activities. Director's Order #41: Wilderness Stewardship provides specific guidance on the management of climbing in wilderness. A Climbing Management Strategy has been developed as part of this WSP.

KEY ELEMENTS CONSIDERED IN THE ALTERNATIVES

Each alternative emphasizes different approaches to protecting wilderness character. The variations in these elements are what make the alternatives different. The overarching element-specific objectives for this plan are:

- **Visitor-use Levels** – Visitor use and enjoyment of wilderness would be promoted while ensuring the preservation of wilderness character.
- **Trails** – The trail system would facilitate access for visitor use and enjoyment of the wilderness. Trails would be well suited to the types and levels of visitor use.
- **Campfires** – Visitors would have the opportunity to enjoy campfires where campfires are compatible with the protection of vegetation and downed wood resources.
- **Food Storage** – Native wildlife would subsist only on naturally obtained food, uninfluenced by the presence of human food.
- **Human-waste Management** – Human waste would not contaminate water or create unsanitary or unsightly conditions. Management of waste would not unduly impact the undeveloped quality.

- **Party Size** – Party size would be set at levels high enough to allow for a variety of experiences, but low enough to protect wilderness character from impacts associated with large groups.
- **Camping/Campsites** – Visitors would have the opportunity to choose camping locations, except in areas where dispersed camping would result in unacceptable impacts.
- **Stock Use** – Visitors would have opportunities to travel with stock, from day rides to multi-day trips, in a manner that ensures the protection of wilderness character.
- **Administrative Structures and Development** – Installations and developments would be the minimum necessary for the administration of wilderness.
- **Frontcountry Facilities to Support Wilderness** – Frontcountry facilities that support activities in wilderness would encourage and/or facilitate visitor use and enjoyment of wilderness.
- **Commercial Services** – Commercial services may be performed to the extent necessary for activities which are proper for realizing the recreational or other wilderness purposes of the areas. Commercial services (wherein a service is performed for a fee or charge) would support visitor use and enjoyment of wilderness in a variety of appropriate ways.

Because each alternative emphasizes different approaches to protecting wilderness character, alternative-specific objectives for the eleven planning elements were also developed and are included in chapter 2.

ALTERNATIVES CONSIDERED

This WSP/FEIS considers five alternatives that would manage the overall character of the parks' wilderness, including key aspects such as wilderness use levels, access and trails, stock use and grazing, and recreational and administrative infrastructure. Each alternative meets applicable laws, as well as the goals, objectives, and desired conditions described in chapter 1. The high standard for natural resource preservation required by the 1964 Wilderness Act means there is little variation across the alternatives in terms of how natural resources are addressed. The main differences between these alternatives lie in the key elements of wilderness management – use levels, access and trails, stock use and grazing, and infrastructure, both recreational and administrative. These differences are driven by the different approach to management that each alternative offers. Each alternative serves visitor and/or operational needs in different ways.

DESCRIPTION OF THE ALTERNATIVES

A summary of the alternatives is presented in the following paragraphs. The details of the alternatives are presented in table ES-1 (next page).

Alternative 1: No-action / Status Quo. The overarching idea behind alternative 1 is that the current documents and actions used by the parks to oversee wilderness would remain the same. That does not mean that nothing could change, but changes would be driven by the same plans currently in use. Under alternative 1, the management of all wilderness areas would continue to be guided by the Backcountry Management Plan (BMP) and Stock Use and Meadow Management Plan (SUMMP), each approved in 1986.

The BMP allows for recreational use in such a manner that park resources are preserved now and into the future. The BMP establishes trailhead quotas, a wilderness permit system, and management objectives for campfires, campsites, sanitation, food storage, special-use limits, area closures, stock use and grazing, education and interpretation, trails and travel, signs, commercial operations, ranger stations, administrative policies, and monitoring (e.g., meadows monitoring).

TABLE ES-1: SUMMARY OF ALTERNATIVES BY ELEMENT

Topic	Alternative 1 No-action/Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Element 1: Visitor-use Levels Permitting/Quotas	Trailhead quotas exist at most locations.	Trailhead quotas would remain the same or be slightly reduced in high-use areas.	Trailhead quotas would be increased by 10% in some areas.	Daily trailhead quotas would remain the same or be slightly reduced in highest use areas compared to alternative 1. Trailhead quotas in low-use areas would be reduced from those of alternative 1.	Trailhead quotas would be reduced by 30% wilderness-wide.
Element 1: Visitor-use Levels Destination Quotas	Destination quotas apply for Emerald and Pear lakes.	Existing destination quotas would continue to be applied. Additional destination quotas may be added for specific areas (e.g., Bearpaw, Dusy Basin, Guitar Lake, Hamilton Lake, Monarch Lakes, Rae Lakes, and other areas).	Existing destination quotas would continue to be applied. No additional destination quotas would be added.	Existing destination quotas would continue to be applied. Additional destination quotas may be added in the future for specific areas including Bearpaw, Dusy Basin, Guitar Lake, Hamilton Lake, Monarch Lake, Rae Lakes, and potentially others.	Existing destination quotas would be discontinued. New destination quotas may be implemented for specific popular areas.
Element 1: Visitor-use Levels Day-use Permits and Quotas	There are no day-use permits/quotas.	No day-use permits/quotas would be implemented at this time but they may be considered in the future in the most popular areas to meet desired conditions.	No day-use permits/quotas would be implemented.	Same as alternative 2.	Day-use quotas would be applied in specific areas (e.g., Lakes Trail, Mist Falls, Monarch Lake, and potentially other areas).
Element 2: Trails *Appendix K has more details on trail classification and management.*	There is currently no trail classification system. Trails are maintained, relocated, or reconstructed per the NPS Trail Maintenance Handbook standards and the BMP and SUMMP. No new trail construction is authorized.	A trail classification system would be established and trails would be designated Class 1, 2 or 3 and maintained to trail class. Some Class 3 trails would be downgraded to Class 2. Some Class 2 trails would be downgraded to Class 1. New Class 1 trails would be established to protect resources; some Class 1 trails would be abandoned.	A trail classification system would be established and trails would be designated Class 1, 2 or 3 and maintained to trail class. Some Class 2 trails would be upgraded to Class 3. New Class 1 trails would be established or abandoned to protect resources. Some Class 1 trails would be upgraded to Class 2.	A trail classification system would be established and trails would be designated Class 1, 2 or 3 and maintained to trail class. Some Class 3 trails would be downgraded to Class 2. Most Class 2 trails would be maintained to Class 2, but some would be upgraded to Class 3 or downgraded to Class 1. Some Class 1 trails would be abandoned.	A trail classification system would be established and trails would be designated Class 1, 2 or 3 and maintained to trail class. Most trails would be maintained at their "current" class.
Element 2: Trails Signs	Trail signs with directional markers and mileages are present. Interpretive signs are generally not authorized.	Signs would be appropriate to trail class.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.
Element 3: Campfires Restrictions	Recreational campfires would be allowed in the foothill and montane forest areas where adequate wood supplies exist. Recreational campfires would continue to be allowed up to: 10,000 feet in the San Joaquin and Kings river drainages. 9,000 feet in the Kaweah River drainage. 10,400 feet in the Kern River drainage.	Recreational campfires would be allowed in the foothill and montane forest areas where adequate wood supplies exist. Recreational campfires would be allowed up to: 10,000 feet in the San Joaquin, Kern, and Kings river drainages. 9,000 feet in the Kaweah and Tule river drainages.	Recreational campfires would be allowed in the foothill and montane forest areas where adequate wood supplies exist. Recreational campfires would be allowed up to 9,000 feet wilderness-wide.	No campfires in wilderness.	Recreational campfires would be allowed in the foothill and montane forest areas where adequate wood supplies exist. Recreational campfires would be allowed above 10,000 feet wilderness-wide.

TABLE ES-1: SUMMARY OF ALTERNATIVES BY ELEMENT (CONTINUED)

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Element 3: Campfires Site-specific Variations	Additional site-specific prohibitions are in place in the Kings, Kaweah, Kern, and Tule River drainages.	In areas where available wood could be burned without unduly depleting ground fuels or consuming important resources, variances could be established. Site-specific prohibitions would be implemented at: Hamilton Lakes, Mineral King Valley, Pinto Lake, Redwood Canyon, and in selected sequoia groves.	No variances would be established. Site-specific prohibitions would be implemented in the most popular areas (e.g., Pacific Crest Trail (PCT) / John Muir Trail (JMT), Rae Lakes Loop, High Sierra Trail (HST), Mineral King Valley, and Rock Creek drainage) and in selected sequoia groves.	N/A: No campfires in wilderness.	No variances would be established. Site-specific prohibitions would be implemented in selected sequoia groves.
Element 3: Campfires Summary	Allows recreational campfires in 398,829 acres of 837,806 acres of wilderness.	Allows recreational campfires in 395,710 acres of 837,806 acres of wilderness.	Allows recreational campfires in 293,840 acres of 837,806 acres of wilderness.	Allows recreational campfires in 0 acres of wilderness.	Allows recreational campfires in 425,276 acres of 837,806 acres of wilderness.
Element 4: Food-storage Food-storage Boxes	There are 86 food-storage boxes currently in wilderness and these would remain.	Of the existing 86 food-storage boxes, 48 would be retained and 25 would be removed. An additional 13 food-storage boxes would be tested prior to removal. Food-storage boxes would be retained in highest use areas (e.g., Rae Lakes Loop, HST). Some boxes could be relocated.	Existing food-storage boxes would be retained; however, they may be relocated. Up to 35 new food-storage boxes would be added in key areas.	All food-storage boxes would be removed.	Same as alternative 4.
Element 4: Food-storage Portable Container Requirements	Portable food-storage containers are required for overnight use at Rae Lakes Loop and vicinity, Dusy and Palisades basins, and in the Rock Creek area.	Portable containers would be required for overnight use at North Dome, Dusy Basin, Rae Lakes Loop and Rock Creek areas, and may be required in other areas.	Existing portable container requirements would be modified based on the locations of additional food-storage boxes. Additional portable container requirements would be implemented in specific areas as needs arise.	Portable containers would be required for all overnight users wilderness-wide.	The NPS would retain the ability to require portable containers in specific areas.
Element 4: Food-storage Requirements – Commercial Guides	Commercial guides (stock and hiking) are required to use portable containers wilderness-wide (condition of commercial use authorization [CUA]).	Same as alternative 1.	Same as alternative 1.	Same as alternative 1.	Same as alternative 1.
Element 4: Food-storage Other Methods	Counterbalancing and hanging food is allowed. Guarding food items is not allowed.	Counterbalancing and hanging would be allowed in areas where containers are not required. Guarding food items is not allowed.	Same as alternative 2.	Counterbalancing and hanging and guarding food items would not be allowed.	Self-determined food storage methods would be required (counterbalancing and hanging food or portable containers). Guarding food items would not be allowed.
Element 5: Human Waste Cat-holes	Cat-holes are required where there are no privies/restrooms.	Same as alternative 1.	Cat-holes would be required where there are no privies/restrooms except in areas where pack-out waste kits are required.	Cat-holes would be required (except in areas with pack-out waste kit requirements).	Cat-holes would be required in all areas. Visitors may elect to use pack-out waste kits.

TABLE ES-1: SUMMARY OF ALTERNATIVES BY ELEMENT (CONTINUED)

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Element 5: Human Waste Privies and Restrooms	There are two restrooms and 21 privies in wilderness.	Existing privies and restrooms (Emerald and Pear lakes) would be evaluated and those beyond reasonable repair or in unsuitable locations (low-use, close-in areas, where soils allow for cat-holes) would be removed. Nine public-use privies would be retained; seven public-use privies would be removed; one public-use privy would be added at Rock Creek Crossing. New privies would be considered for high day-use areas. Five additional privies/restroom buildings could be removed if maintaining them becomes cost prohibitive or if pack-out waste kit testing is successful.	All existing privies and restrooms would be retained. New privies would be considered for popular day-use areas (e.g., Heather Lake) and popular overnight areas.	All existing privies and restrooms would be removed (including Emerald and Pear Lake restrooms), except those affiliated with administrative structures. No new privies, vault toilets, or restrooms would be constructed.	Same as alternative 4.
Element 5: Human Waste Pack-out Waste Kits	Pack-out waste kits are highly recommended in the Mount Whitney area.	Pack-out waste kits may be required in certain areas to minimize the need for privies and restrooms.	Pack-out waste kits would be required in the Mount Whitney area. Existing privies would remain and be maintained in their current locations.	Pack-out waste kits would be recommended or required in popular areas.	Pack-out waste kits would be recommended in certain areas.
Element 6: Party Size Hikers and Boaters *Note: Off-trail restrictions apply to both day users and overnight users.*	On-trail (day use) party size limit of 25 On-trail (overnight use) party size limit of 15. Off-trail party size limit of 15.	On-trail (day use) party size limit of 25 On-trail (overnight use) party size limit of 15. Off-trail party size limit of 12 except in areas with specific lower limits (see below).	On-trail (day use) party size limit of 25 On-trail (overnight use) party size limit of 15. Off-trail party size limit of 15.	On-trail (day use) party size limit of 25 On-trail (overnight use) party size limit of 12. Off-trail party size limit of 8.	On-trail (day-use) party size limit of 20. On-trail (overnight use) party size limit of 10. Off-trail party size limit of 8.
Element 6: Party Size Recreational Stock Users *Note: Off-trail restrictions apply to both day users and overnight users.*	Maximum party sizes include: On-trail (day-use) – (including day rides, spot and dunnage) – 25 people; 20 stock; combined maximum of 45. On-trail – 15 people; 20 stock; combined maximum of 35 (with some lower exceptions). Off-trail – 15 people; 20 stock; combined maximum of 35.	Maximum party sizes include: Day Rides – 20 people; 20 stock; combined maximum 40. On-trail – 15 people; 20 stock; combined maximum 28. Off-trail – 12 people; 12 stock; combined maximum 14.	Maximum party sizes include: Day Rides – 25 people; 25 stock; combined maximum 50. On-trail –15 people, 25 stock; combined maximum 40. Off-trail – 15 people; 25 stock; combined maximum 40.	Maximum party sizes include: Day Rides – 15 people; 15 stock; combined maximum 30. On-trail – 12 people; 15 stock; combined maximum 20. Off-trail – 8 people; 7 stock; combined maximum 11.	Maximum party sizes include: Day-rides – 13 people; 13 stock; combined maximum 26. On-trail – 10 people; 13 stock; combined maximum 18. Off-trail – No off-trail stock use allowed.

TABLE ES-1: SUMMARY OF ALTERNATIVES BY ELEMENT (CONTINUED)

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Element 6: Party Size Area-specific Restrictions	Temporary party-size limits of 8 (number of people and stock combined) in 5 off-trail areas (Darwin Canyon, Dusy Basin, , Mount Whitney / Mount Langley, Sixty Lake Basin, and Sphinx Lakes).	Existing off-trail temporary party-size limits of 8 would be adopted permanently at Darwin Canyon/Lamarck Col (includes Class 1 trail area), Dusy Basin, Mount Whitney / Mount Langley (includes Class 1 trail area), Sixty Lake Basin, and Sphinx Lakes. Upper Goddard Canyon/Martha Lake would have a party-size limit consistent with the off-trail party size (12 people, 12 stock, combined maximum of 14). Combined party size of 8 (people and stock) for day rides into Sixty Lake Basin. Trail closed to stock beyond a point 1.8 miles from the junction of the JMT and the Sixty Lake Basin Trail. Combined party size of 8 (people and stock) for day rides above Penned Up Meadow on the Class 1 trail into Miter Basin.	Existing temporary party-size limits would be removed (party size of 8). A party-size limit of 4 would be implemented for camping at North Dome.	Existing temporary party-size limits would be removed and replaced with a wilderness-wide off-trail party size of 8.	Existing temporary party-size limits would be removed and replaced with a wilderness-wide off-trail party size of 8. Consider more restrictive party size for day-use in specific highly visited areas (Lakes Trails, Mist Falls, Monarch Lake, and potentially other areas).
Element 6: Party Size – General Area-specific Restrictions – Redwood Canyon	Redwood Canyon: maximum of 10 stock and maximum hiker party size of 10 people.	A party-size limit of 10 people or 10 people with 10 stock (combined maximum of 20) would be retained for Redwood Canyon.	A party-size limit of 10 people or 10 people with 10 stock (combined maximum of 20) would be retained for Redwood Canyon.	A party-size limit of 8 people or 8 people with 8 stock (combined maximum of 16) would be implemented for Redwood Canyon.	A party-size limit of 6 people or 6 people with 6 stock (combined maximum of 12) would be implemented for Redwood Canyon.
Element 6: Party Size – General Area-specific Restrictions – Milestone Basin	Milestone Basin maximum of 8 stock, by special permit only.	N/A: Closed to stock.	Same as alternative 1.	N/A: Closed to stock	N/A: Closed to stock.
Element 7: Camping/Campsites Hikers Allowable camping relative to wilderness boundary or trailhead	Camping would continue to be prohibited within 1 mile of any road and generally within 4 miles of a developed area or trailhead complex.	Camping would be prohibited within specified distances from each trailhead and 1 mile from any frontcountry development.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.
Element 7: Camping/Campsites Close-in Camping Areas	Not applicable	Allow camping in specific close-in areas (e.g., Colony Mill Trail, Don Cecil Trail, and North Dome).	Same as alternative 2.	No camping in specific close-in areas (e.g., within 2 miles of either trailhead on the Colony Mill Trail; on the entire Don Cecil Trail).	Same as alternative 2.
Element 7: Camping/Campsites Existing Designated Campsites Hikers	Designated camp area exists at Bearpaw Meadow and designated campsites exist at Emerald and Pear lakes and Paradise Valley.	Existing designated sites at Emerald and Pear lakes, lower Paradise Valley, and the designated camp area at Bearpaw Meadow would be retained.	Same as alternative 2.	All existing designated sites at Emerald and Pear lakes, Paradise Valley, and the camp area at Bearpaw Meadow would be removed.	Existing designated sites at Emerald and Pear lakes, Paradise Valley, and the camp area at Bearpaw Meadow would be removed.
Element 7: Camping/Campsites New Designated Campsites Hikers	No additional designated campsites would be established.	Additional designated sites or camp areas could be established at selected high-use areas, including but not limited to: Dusy Basin, Guitar Lake, Kearsarge Lakes Basin, Middle and Upper Rae Lakes, and Woods Creek Crossing.	Additional designated sites would be established in selected popular areas, including but not limited to Dusy Basin, Evolution Valley, Guitar Lake, JMT, Kearsarge Lakes Basin, Middle and Upper Rae Lakes, Mineral King Lake Basins, PCT, Redwood Canyon, and Woods Creek Crossing.	No new designated sites would be established at this time.	Same as alternative 4.

TABLE ES-1: SUMMARY OF ALTERNATIVES BY ELEMENT (CONTINUED)

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Element 7: Camping/Campsites Universally Accessible Sites Hikers	None	One or more universally accessible campsites closer to the trailhead would be considered (Potential location to consider – near the confluence of Bubbs Creek and South Fork Kings River).	Same as alternative 2.	None	None
Element 7: Camping/Campsites Stock Users	No camps would be designated for the exclusive use of stock users with the exception of Upper and Lower Funston Meadows. No other camps are designated for the exclusive use of stock users.	In specific high-use locations, stock users may be required to camp in designated stock camps. (e.g., Big Pete Meadow, Rock Creek Crossing, and Woods Creek Crossing). These sites would be stock user only camps. Upper and Lower Funston would no longer be designated stock camps.	In specific, high-use locations, stock users may be required to camp in designated stock camps, These sites would be stock user only camps.	There would be no designated stock camps.	Same as alternative 4.
Element 7: Camping/Campsites Night Limits	Visitors are limited to 14 consecutive nights at a single location, 21 consecutive nights per trip, and 63 total nights per year except for the specific areas below.	Visitors would be limited to 14 consecutive nights at a single location, 25 consecutive nights per trip, and 75 total nights per year except for the specific areas below.	Visitors would be limited to 7 consecutive nights at a single location, 20 consecutive nights per trip, and 60 total nights per year except for the specific areas below.	Visitors would be limited to 10 consecutive nights at a single location, 21 consecutive nights per trip, and 63 total nights per year except for the specific areas below.	Visitors would be limited to 10 consecutive nights at a single location, 21 consecutive nights per trip, and 63 total nights per year except for the specific areas below.
Element 7: Camping/Campsites Area-specific Night Limits	2-night limit at Charlotte Lake, Hamilton Lake, Kearsarge Lakes, Paradise Valley, and Redwood Canyon. 1-night limit at Rae Lakes, per lake.	3-night limit at Emerald and Pear lakes (combined) and at Soldier Lake. 2-night limits at Charlotte Lake, Colony Mill Trail, Crabtree area, Don Cecil Trail, Dusy Basin, Guitar Lake, the JMT from Woods Creek Crossing to Vidette Meadow, Kearsarge Lakes Basin, North Dome, Paradise Valley, and Redwood Canyon. 1-night limit at Hamilton Lake and 1-night limit per lake at Rae Lakes.	2-night limit at Charlotte Lake, Colony Mill Trail, Crabtree area, Don Cecil Trail, Dusy Basin, Emerald and Pear lakes (combined), Guitar Lake, Hamilton Lake, Kearsarge Lakes Basin, North Dome, Paradise Valley, Redwood Canyon, and Soldier Lake. 1-night limit per lake at Rae Lakes, at any one location on the JMT between Vidette Meadow and Woods Creek Crossing.	4-night limit at Crabtree area and Soldier Lake. 3-night limit at Charlotte Lake, Colony Mill Trail, Emerald and Pear lakes (combined), Guitar Lake, the JMT from Woods Creek Crossing to Vidette Meadow (at any one location), North Dome, and Redwood Canyon. 2-night limits at Dusy Basin, Hamilton Lake, Kearsarge Lakes Basin, Paradise Valley, and Rae Lakes (per lake).	4-night limits at Colony Mill Trail, Crabtree area, Guitar Lake, and the JMT from Woods Creek Crossing to Vidette Meadow. 3-night limits at Don Cecil Trail, Dusy Basin, Emerald and Pear lakes (combined), Kearsarge Lakes Basin (combined), Paradise Valley (whole valley), Redwood Canyon, and Rae Lakes (per lake). 2-night limit at Hamilton Lake.
Element 8: Stock Use Access and Travel On-trail	On-trail: Currently nearly all maintained wilderness trails in the parks are open to stock (637 of 653 miles). Stock travel is also permitted on 77 miles of informal and abandoned trails. (Note: Not all trails open to stock are maintained to stock standards)	On-trail: Stock travel would be allowed on 650 of 691 miles of maintained trails.	On-trail: Stock travel would be allowed on 671 of 714 miles of maintained trails.	On-trail: Stock travel would be allowed on 527 of 643 miles of maintained trails.	On-trail: Stock travel would be allowed on 665 of 702 miles of maintained trails.
Element 8: Stock Use Access and Travel On-trail Camping Access	Approximately 598 miles of maintained and unmaintained trails are open to camping with stock.	Approximately 532 miles of maintained trails would be open to camping with stock.	Approximately 565 miles of maintained trails would be open to camping with stock.	Approximately 377 miles of maintained trails would be open to camping with stock.by all user groups (private, commercial, and administrative) with an additional 72 miles of maintained trails open to overnight travel by private stock or administrative stock parties only (closed or day-use only for commercial stock).	Approximately 555 miles of maintained trails would be open to camping with stock.

TABLE ES-1: SUMMARY OF ALTERNATIVES BY ELEMENT (CONTINUED)

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Element 8: Stock Use Access and Travel Off-trail	Off-trail: Travel more than 0.5 mile from trails open to camping with stock is allowed in four areas of the parks: on the Hockett Plateau, along the western side of the Kern River watershed south from the Chagoopa Plateau, on the Monarch Divide including Hotel Creek, and in the Roaring River area. Travel is allowed up to 0.5 mile from trails and routes to reach campsites.	Off-trail: Travel more than 0.5 mile from trails open to camping with stock would be allowed in four areas of the parks: on the Monarch Divide, in the Roaring River area, on the Hockett Plateau, and along the western side of the Kern River watershed south from the Chagoopa Plateau. In other areas open to camping with stock, travel would be allowed up to 0.5 mile from trails and routes in areas where they are allowed to camp and up to 100 yards from day-use trails.	Off-trail: Travel more than 0.5 mile from trails open to camping with stock would be allowed in four areas of the parks: on the Monarch Divide, in the Roaring River area, on the Hockett Plateau, and along the western side of the Kern River watershed south from the Chagoopa Plateau. In other areas open to camping with stock, travel would be allowed up to 0.5 mile from trails and routes in areas where they are allowed to camp and up to 100 yards from day-use trails.	Off-trail: Travel more than 0.5 mile from maintained trails open to camping with stock would be allowed for private stock parties in four areas of the parks: on the Hockett Plateau (except for Tar Gap), on the Monarch Divide (except for Kennedy Canyon), in the Roaring River drainage (except for Elizabeth and Colby passes), and along the western side of the Kern River watershed south from the Chagoopa Plateau (except for Lower Big Arroyo and Willow Meadow Cutoff). In other areas open to camping with stock, travel would be allowed up to 0.5 mile from trails and routes in areas where they are allowed to camp, and up to 100 yards from day-use trails.	Off-trail: Travel more than 0.5 mile from trails open to camping with stock would be prohibited. In areas open to overnight stock use, travel would be allowed up to 0.5 mile from trails and routes in areas where they are allowed to camp. Stock would be allowed to travel up to 100 yards from day-use trails.
Element 8: Stock Use Grazing	Grazing is generally allowed in areas open to camping with stock (within 0.5 mile of maintained trails open to camping with stock, along designated unmaintained routes, or in off-trail travel areas). Grazing is not allowed in those areas open only to stock travel.	Grazing would generally be allowed in areas open to camping with stock (within 0.5 mile of maintained trails open to camping with stock or in off-trail travel areas). Grazing would not be allowed in those areas open only to travel.	Grazing would generally be allowed within 0.5 mile of maintained trails open to camping with stock. Grazing would generally be prohibited in areas open to off-trail travel with the following exceptions: Ansel Lake, Chagoopa Treehouse Meadow, Crytes Lakes, Laurel Creek Basin, Long Meadow (Ferguson Creek), Sugarloaf Creek Confluence, and West Fork Ferguson Creek. Grazing would not be allowed in those areas open only to stock travel.	No administrative, private, or commercial grazing would be allowed. Visitors and park staff traveling with stock would be required to carry feed for their animals and confine them on durable non-vegetated surfaces in camp.	Grazing would generally be allowed within 0.5 mile of maintained trails open to camping with stock. Grazing would not be allowed in those areas open only to travel.
Element 8: Stock Use Stock Use Structures	There are 52 existing hitch rails and 54 existing drift fences, pasture fences, and gates in the parks' wilderness managed under the SUMMP.	23 hitch rails would be removed and 29 hitch rails would be retained. 12 fences/gates would be removed and 42 would be retained.	14 hitch rails would be removed and 38 would be retained. 5 fences/gates would be removed, 49 would be retained, and 1 new fence with a gate would be constructed.	All hitch rails not associated with administrative facilities would be removed. All drift fences and gates would be removed. Groups traveling with stock would be required to hold their stock while camping (e.g., set up high lines) on durable, non-vegetated surfaces.	28 hitch rails would be removed and 24 would be retained. A total of 18 fences and gates would be removed, 36 fences/gates would be retained, and 1 gate would be added.
Element 9: Administrative Structures Ranger Stations	Ranger Stations: 15 Patrol Cabins: 3	Ranger Stations: Retained: 14 Removed: 1 Patrol Cabins: Retained: 3 Removed: 0	Ranger Stations: Retained: 15 Removed: 0 Patrol Cabins: Retained: 3 Removed: 0	Ranger Stations: Retained: 8 Removed: 7 Patrol Cabins: Retained: 1 Removed: 2	Ranger Stations: Retained: 11 Removed: 4 Patrol Cabins: Retained: 3 Removed: 0

TABLE ES-1: SUMMARY OF ALTERNATIVES BY ELEMENT (CONTINUED)

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Element 9: Administrative Structures Administrative Pastures	Stock pastures associated with ranger stations are located at Hockett Meadow, Kern, Redwood Meadow, and Roaring River. Facilities such as hitching rails are associated with structures at Hockett Meadow, Quinn, and Redwood Meadow.	Existing administrative pastures and associated structures would be retained in their current location (Hockett Meadow, Kern, Redwood Meadow, and Roaring River).	Same as alternative 2.	Existing administrative pastures and associated facilities would be removed (Hockett Meadow, Kern, Redwood Meadow, and Roaring River).	The existing administrative pasture (and fence) at Redwood Meadow would be removed. The Hockett Meadow and Kern pastures would be reduced in size. The administrative pasture at Roaring River would be retained.
Element 9: Administrative Structures Crew Camps	There would continue to be 15 established and long-term trail crew camps within Kings Canyon National Park and 10 established and long-term trail crew camps within Sequoia National Park. Other project crew camps (for administration of wilderness) would continue to be established as needed on case-by-case basis.	Existing trail crew camps would be retained, but the number of installations would be reduced to one at each camp. Other project crew camps would be established as needed on case-by-case basis.	The number of trail crew camps in Kings Canyon National Park would be increased to 20. The number of trail crew camps in Sequoia National Park would be increased to 15. Other project crew camps (for administration of wilderness) would be established as needed on case-by-case basis.	Trail crews would conduct trail maintenance through use of mobile operations; there would be no long-term established camps. Short-term project crew camps (for administration of wilderness) would be established as needed on case-by-case basis.	Same as alternative 4.
Element 9: Administrative Structures Other Administrative Facilities	The Redwood Canyon Cabin and associated infrastructure is operated under a Memorandum of Understanding with a non-governmental organization for the purposes of research.	Use of the Redwood Canyon Cabin would be authorized by permit for activities appropriate for the administration of wilderness. The footprint of the facility would be reduced and the external installations (e.g., privy, equipment storage boxes, and woodshed) would be removed.	The Redwood Canyon Cabin would be retained as research support with reduced affiliated infrastructure. Use would include park staff, cooperators, research organizations, and universities (non-park staff would be required to obtain a permit). The supporting infrastructure (e.g., water system, tables, etc.) would be removed, and the area rehabilitated.	Use of the Redwood Canyon Cabin by researchers would be terminated within 1 year of WSP approval. The cabin and all associated installations would be removed over a two-year period after WSP approval. Future research activities in Redwood Canyon could continue, but without the use of the cabin or associated permanent infrastructure.	Use of the Redwood Canyon Cabin by researchers would be terminated within two years of WSP approval. The cabin and all associated installations would be removed within three years of WSP approval. Future research activities in Redwood Canyon could continue but without the use of a permanent structure.
Element 10: Frontcountry Facilities *Refer to table 52 in chapter 2 for details; page 279*					
Element 11: Commercial Services in Wilderness	Commercial service levels and types would continue to be managed to provide high-quality visitor experiences while protecting wilderness resources.	Commercial services would be allowed but would be restricted in specific popular areas and areas with other limiting factors (e.g., Mount Whitney Management Area)	There would be increased opportunities for provision of commercial services (types and amounts of services).	Overall the types, amounts, and areas in which commercial services are allowed would be notably reduced compared to alternative 1.	Overall the types, amounts, and areas in which commercial services are allowed would be reduced commensurate with reduced use.
Element 11: Commercial Services in Wilderness Bearpaw Meadow High Sierra Camp	The Bearpaw Meadow High Sierra Camp would continue to be operated by a park concessioner.	Commercial services would be provided at the Bearpaw Meadow High Sierra Camp as in alternative 1.	The Bearpaw Meadow High Sierra Camp would be retained and would continue to be operated by a concessioner. Some expansion (season of use and/or size of facilities) would be considered provided it can be accomplished within the existing footprint and would not cause additional adverse impacts on resources.	The Bearpaw Meadow High Sierra Camp, including any historic elements, would be removed and the area rehabilitated.	The Bearpaw Meadow High Sierra Camp would be reduced in size and its season of operation would be shortened.
Element 11: Commercial Services in Wilderness Pear Lake Ski Hut	The Pear Lake Ski Hut would continue to be operated during winter months as a ski hut (lodging facility) by a cooperating association under a cooperative agreement.	Commercial services would be provided at the Pear Lake Ski Hut as in alternative 1.	Use of the Pear Lake Ski Hut would continue through a cooperating association or as a concession-operated facility.	Use of Pear Lake Ski Hut as a commercial facility would be discontinued.	The Pear Lake Ski Hut would be used as a warming hut with no overnight use and operated by the NPS.

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The SUMMP establishes the management system and tools for stock use and includes site-specific opening dates for grazing, grazing management, use levels, protection of Sierra Nevada bighorn sheep ewe-lamb ranges, installation of drift fences, stock and camp etiquette, implementation of temporary variances, and other closures. The SUMMP also establishes a monitoring program to inform and modify management as necessary to reduce resource impacts.

Alternative 2: Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative). The overarching idea behind alternative 2 is that the WSP would incorporate much of the current management strategies and tools used by the parks to protect wilderness. Rather than imposing restrictions on a broad scale, this alternative would evaluate conditions in specific areas and mitigate impacts through targeted actions. The goal is to encourage wilderness use and minimize restrictions while preserving wilderness character.

This alternative recognizes that there is variation in visitor-use levels throughout the wilderness: day use (close to frontcountry), popular overnight areas (e.g., HST, PCT, and Rae Lakes Loop), and less-visited areas (e.g., the Middle Fork of the Kings, the Hockett Plateau, and off-trail areas). It further recognizes that, under current management, prevailing projected visitor-use levels pose few threats to wilderness character in the less-popular or less-visited areas.

Alternative 2 acknowledges, however, that there are some challenges in the most popular areas and in areas with sensitive resources that can be mitigated through targeted improvements in management.

As with current management, this alternative would protect the wilderness character and resource values while providing for a range of visitor opportunities, but adds some limits in specific popular and sensitive resource areas to improve wilderness character.

Some popular areas would have additional restrictions (e.g., closing additional meadows along the JMT and HST to grazing), but less popular areas would have some restrictions eased (e.g., allowing campfires in specific areas, increased night limits, etc.). Education would be essential to inform visitors of where they could expect fewer encounters and how to practice Leave No Trace© travel and camping techniques in wilderness.

The most popular areas where concerns regarding visitation levels exist include Bishop Pass (Dusy Basin), Bubbs Creek (Rae Lakes Loop), Cottonwood Lakes / New Army Pass (Mount Whitney and Mount Langley), Cottonwood Pass (Mount Whitney), HST (from Crescent Meadow and Wolverton), Lakes Trail (Emerald and Pear lakes), Sawtooth Trail (Monarch Lakes), and Woods Creek (Rae Lakes Loop). Lamarck Col (Darwin Canyon), while not busy, may have increasing use and is a sensitive area.

Visitors traveling with stock would continue to have access to most trails in the parks, with some trails reserved for hiker use only. The combined length of trails open to hiker or backpacker traffic only (i.e., closed to stock) would increase by approximately 25 miles over current conditions. Off-trail stock travel would continue to be allowed in four areas of the parks: on the Monarch Divide, in the Roaring River area, on the Hockett Plateau, and along the western side of the Kern River watershed south from the Chagoopa Plateau. Stock access and grazing would be constrained primarily by ecological parameters, with a limited number of new restrictions adopted to provide for visitor safety and to accommodate social values (e.g., scenic and aesthetic values). Grazing would be managed to optimize protection of natural and cultural resources while allowing visitors traveling with stock access to forage for their animals. Recognizing that the opportunity to observe and experience ungrazed meadows is of value to many park visitors, a selection of meadows along popular travel routes would be closed to grazing.

To meet the objectives of this alternative, commercial services would be retained at levels similar to alternative 1 (no-action / status quo) in most locations. Commercial services would be reduced in some of the most frequently visited areas and in some areas with particularly sensitive resources. More types of commercial services could be permitted to support a range of recreational opportunities consistent with the objectives of this alternative. Commercial services would be allowed to the extent necessary to provide opportunities for visitors of diverse abilities and interests to engage in a variety of wilderness activities that are proper for realizing the public purposes of wilderness (i.e., recreational, scenic, scientific, educational, conservation, and historical use, per §4(b) of the Wilderness Act).

Alternative 3: Provide More Opportunities for Primitive Recreation. The overarching idea behind alternative 3 is that the WSP would focus on increasing opportunities for primitive recreation by allowing additional use, which would be expected to occur mostly in popular areas.

Allowing use to increase under this alternative would result in more visitors in the parks' wilderness. This would result in decreased opportunities for solitude and more visitors could have an increased impact on the resources. Therefore, to preserve the natural quality of wilderness, the popular use areas in wilderness would require additional development and restrictions on visitor behavior.

Quotas would generally remain at current levels in low-use areas, as there is no demand above current levels, but quotas would be increased for some of the most popular areas.

Most wilderness trails in the parks would remain open to stock under this alternative. Stock would continue to be allowed to travel up to one-half mile off maintained trails to reach campsites. Off-trail stock travel would continue to be allowed in four areas of the parks: on the Monarch Divide, in the Roaring River area, on the Hockett Plateau, and along the western side of the Kern River watershed south from the Chagoopa Plateau.

To increase access for visitors traveling with stock along the most popular trail corridors (JMT, HST, and PCT), additional controls would be placed on grazing, night limits, and party-size limits. In areas subject to high visitation or vulnerable to resource impacts, designated camping areas may be established.

There would be increased opportunities for commercial services commensurate with increased use (types of services and amount of use). Increased commercial services would be necessary to support a wider range of visitor skill levels and recreational opportunities.

Alternative 4: Emphasize Undeveloped Quality and Non-commercial Recreation. The overarching idea behind alternative 4 is that the WSP would focus on emphasizing the undeveloped and non-commercial qualities of the parks' wilderness. Removal of development and reduction of commercial services would increase opportunities for solitude and encourage self-reliance in wilderness recreation.

This alternative would eliminate some of the development currently in wilderness to emphasize the undeveloped quality of wilderness. There would be fewer signs, bridges, stock-related facilities, and ranger stations. Restrooms/privies and food-storage boxes would be removed and there would be no designated campsites.

Because fewer resource-protecting developments would remain in place, the amount of use would need to be reduced to protect the natural quality of wilderness.

Trailhead quotas would remain at current levels or be slightly reduced in the most popular areas. In low-use areas, current trailhead quotas would be reduced to prevent increasing use by visitors who cannot get a permit when quotas for the most popular trailheads fill.

Commercial services would be notably reduced in both quantity and area where they would be available. Types of commercial services would be similar to current conditions. The majority of wilderness would be managed for self-directed exploration and self-reliant travel, increasing the primitive and unconfined qualities of recreation.

Private parties traveling with stock would continue to have access to most trails in the parks, and stock would continue to be allowed to travel off-trail in four designated areas. However, commercial stock use would be limited to certain destinations and trails. No private, commercial, or administrative stock grazing would be allowed under this alternative.

Campfires would not be allowed in wilderness under this alternative.

Alternative 5: Emphasize Opportunities for Solitude. The overarching idea behind alternative 5 is that the WSP would focus on enhancing the quality of solitude available in wilderness. To achieve this, the total number of wilderness visitors allowed in wilderness would be reduced, as would party size.

The presence of fewer visitors in wilderness would in turn allow for reduced levels of development, along with reduced restrictions on visitor behavior (fewer people need fewer facilities). Reducing the numbers of visitors would also result in reduced impacts on resources.

Trailhead quotas would be reduced to protect against future increases in use wilderness-wide, even at trailheads that currently do not meet quotas.

Because there would be reduced use, stock use and grazing would be allowed in most areas where overnight use is permitted.

Commercial services would be allowed, but less use would be expected overall with reduced trailhead quotas for all visitors (including commercial service providers) and reduced party sizes.

IMPACT TOPICS SELECTED FOR DETAILED ANALYSIS

The following impact topics were identified based on internal and external scoping; federal laws, regulations, and executive orders; NPS *Management Policies*; site visits; NPS knowledge of limited or easily impacted resources; and the potential for measurable effects on these resources. These topics were evaluated in this WSP/FEIS in "Chapter 4: Environmental Consequences." Table ES-2 (page xxiii) summarizes the impacts of each alternative

Wilderness Character: This WSP/FEIS would establish a framework for managing wilderness, replacing the current guiding documents, the BMP and the SUMMP. Preserving wilderness character is the fundamental purpose of wilderness, per the Wilderness Act. For that reason, the evaluation of how each alternative affects wilderness character is an integral part of this WSP/FEIS. Activities occurring in wilderness have the potential to impact wilderness character and values through recreational and management activities.

Soils: Several elements of the alternatives have the potential to affect soils, including constructing, maintaining, or restoring trails, placing or removing food-storage boxes, establishing designated camps, and general visitor use.

Water Quality: Visitor use and administrative actions near lakes, streams, ponds, and rivers has the potential to impact water quality through increased turbidity from runoff, and from human and stock waste.

Mount Stewart and Black Spur

Vegetation: Vegetation can be affected by activities such as trampling by visitors and stock, grazing in meadows, collecting wood for campfires, administrative actions, and transporting and establishing nonnative vegetation. Vegetation subtopics included in this WSP/FEIS are wetlands and meadows, subalpine trees, alpine vegetation, park sensitive plant species, and invasive species.

Wildlife: Wildlife, particularly bears, can be affected by visitor use and administrative activities related to food storage. Native birds could be negatively affected by stock use if it increases nest parasitism by cowbirds. Invertebrates can be affected by grazing and visitor use.

Special-status Species: Some special-status species can be affected by visitor use and administrative activities. Special-status species analyzed in this WSP/FEIS include Yosemite toad (*Anaxyrus canorus*), the northern distinct population segment of mountain yellow-legged frog (*Rana muscosa*), and the Sierra Nevada yellow-legged frog (*Rana sierrae*), and the Sierra Nevada bighorn sheep (*Ovis canadensis sierrae*).

Cultural Resources: The alternatives considered in the WSP/FEIS have the potential to affect historic structures and archeological sites.

Socioeconomics: Alternatives related to visitor use and access and commercial use, have the potential to affect the region's socioeconomic resources.

Visitor Use: There are a number of elements within the alternatives that could affect visitor use and experiences (other than those addressed in the "Wilderness Character" section), including actions that affect aesthetic and social values of wilderness.

Park Operations: Park operations may be affected by changes to visitor use and wilderness infrastructure and facilities.

NPS PREFERRED AND ENVIRONMENTALLY PREFERABLE ALTERNATIVE

Alternative 2 is the NPS preferred alternative. It was selected by comparing the relative advantages of each alternative and examining how each alternative met the goals, objectives, and desired conditions for wilderness stewardship. Park managers believe that alternative 2 provides the most balanced, comprehensive approach to protecting wilderness character when compared with any other alternative. Overall, alternative 2 provides the best combination of management strategies, resulting in a practical, common sense approach to wilderness management. It protects the qualities of wilderness, supports a balance of resource preservation and use over the long term, and welcomes visitors to participate in stewardship and use of one of the world's finest wilderness areas.

The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) requires that an agency identify its preferred alternative or alternatives in a final EIS [1502.14(e)]. The preferred alternative is the alternative "which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors" (Question 4a of the Council on Environmental Quality's "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations" (1981)). The NPS has identified alternative 2 as the preferred alternative. All of the alternatives would fulfill all of the above CEQ requirements to some degree. The action alternatives (alternatives 2 – 5) would fulfill these requirements somewhat equally, through continuation of existing wilderness and resource management policies, ecological restoration of fragile meadow and riparian areas, protection of water quality, and protection of archeological resources. The alternatives would vary primarily in protection of historic resources, sensitive meadows and riparian areas, protection of downed wood and sensitive species, and the diversity of recreational (primitive and unconfined) opportunities and opportunities for solitude provided to the public. All alternatives provide for as safe an environment as possible, given that wilderness recreation involves inherent risks.

The NPS has determined that alternative 5 is the environmentally preferable alternative. Alternative 5 best promotes the requirements of the national environmental policy expressed in section 101(b) of NEPA. It is the alternative that causes the least amount of impacts on the biological and physical environment and that best protects, preserves, and enhances historic, cultural, and natural resources, and best achieves the short- and long-term goals for protecting and improving wilderness character. Alternative 5 best meets these requirements.

ENVIRONMENTAL CONSEQUENCES

The summary of environmental consequences considers the actions being proposed and the cumulative impacts on resources from occurrences inside and outside the park. The potential environmental consequences of the actions are addressed for wilderness character, soils, water quality, vegetation, wildlife, special-status species, historic structures and districts, cultural landscapes, ethnographic resources, socioeconomics, visitor use, and park operations. Table ES-2 presents a comparison of the effects of the alternatives on the resources of the parks (see page xxiii).

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TABLE ES-2: SUMMARY OF IMPACTS

Resource	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Wilderness Character Untrammeled Quality	Impacts on the untrammeled quality would be of a limited intensity and duration, and wilderness would in general remain dominated by natural processes.	Impacts on the untrammeled quality would be of a limited intensity and duration, and wilderness would in general remain dominated by natural processes.	Impacts on the untrammeled quality would be of a limited intensity and duration, and wilderness would in general remain dominated by natural processes.	Impacts on the untrammeled quality would be of a limited intensity and duration, and wilderness would in general remain dominated by natural processes.	Impacts on the untrammeled quality would be of a limited intensity and duration, and wilderness would in general remain dominated by natural processes.
Wilderness Character Natural Quality	The natural quality of wilderness would continue to be preserved.	The natural quality of wilderness would continue to be preserved. Overall visitor-use levels would remain similar to current use levels; on a wilderness-wide scale this alternative would have few detectable effects on the natural quality of wilderness. However, site-specific changes would result in improvement of this quality that would be detectable at a local scale. These local effects result from changes in the way that campfires, food storage, human waste, camping, and hiker and stock use, and commercial services are managed.	The natural quality of wilderness would continue to be preserved. Daily trailhead quotas would be increased; however, on a wilderness-wide scale this alternative would result in few detectable impacts on the natural quality of wilderness. Localized improvements on the natural quality could occur as a result of changes in the way that trails, campfires, food storage, human waste, camping, and hiker and stock use, and commercial services are managed.	The natural quality of wilderness would continue to be preserved. This alternative would result in few detectable effects on the natural quality of wilderness. The local improvements result from changes in food storage, human waste, and campsite management. The more substantial effects would result from the changes in campfire restrictions, elimination of grazing, and lower levels of commercial services.	The natural quality of wilderness would continue to be preserved. Under alternative 5, overall visitor-use levels would be reduced; however, on a wilderness-wide scale this alternative would have few detectable effects on the natural quality of wilderness. The local improvements would result from changes in campfire, food storage, human waste, camping, stock-use, and commercial services.
Wilderness Character Undeveloped Quality	The level of development related to visitor management would remain constant. There would be no change to the undeveloped quality.	Alternative 2 would result in a decrease in privies and food-storage boxes resulting in a slight improvement to the undeveloped quality.	Alternative 3 would result in more development in wilderness and therefore would result in adverse effects on the undeveloped quality.	Alternative 4 reduces development more than any other alternative, resulting in beneficial effects on the undeveloped quality.	Alternative 5 would result in a decrease in privies and food-storage boxes resulting in a slight improvement to the undeveloped quality.
Wilderness Character Opportunities for Solitude or Primitive and Unconfined Recreation	Under current conditions, the parks' wilderness provides outstanding opportunities for solitude and primitive and unconfined recreation, except at a few locations where visitor densities are relatively high and impacts on solitude occur. There would be no change to opportunities for solitude or primitive and unconfined recreation.	Alternative 2 would continue to provide outstanding opportunities for solitude and primitive and unconfined recreation in many areas, but in a few areas additional management controls would reduce the unconfined aspect, and slightly improve the solitude aspect.	Alternative 3 would result in improvements to opportunities for primitive and unconfined recreation in many areas, but in a few areas additional management controls would reduce the unconfined aspect. Alternative 3 would allow for increased overall wilderness use, reducing the opportunity for solitude, particularly in popular areas.	Alternative 4 would result in site-specific improvements in opportunities for solitude and primitive and unconfined recreation in many areas, but additional management controls would reduce the unconfined aspect.	Alternative 5 would result in improvement to opportunities for solitude and decrease opportunities for primitive and unconfined recreation throughout wilderness due to decreases in the number of visitors allowed in the wilderness.
Wilderness Character Other Features of Value	This alternative does not provide for a focused assessment of trails and other historic features, thus, until such assessment is undertaken under another program or project, the historic features may not be adequately protected. There would be no changes to scientific study.	One historic feature, the Mission 66-era ranger station at Bearpaw Meadow, would be removed. There are no changes proposed for scientific activities.	One historic feature, the Mission 66-era ranger station at Bearpaw Meadow, would be removed. There are no changes proposed for scientific activities.	One historic district and three historic features (the Bearpaw Meadow High Sierra Camp, Redwood Meadow and Tyndall Creek ranger stations, and the Simpson Meadow Patrol Cabin) would be removed. There would be no changes to scientific study.	One historic district would be reduced in size. The Mission 66-era Bearpaw Meadow Ranger Station would be removed. There would be no changes to scientific study.
Soils	The effects of current visitor and administrative activities are not currently posing recognizable threats to soils. There would be no change under this alternative.	In general, this alternative seeks to maintain visitation into the parks' wilderness. Therefore, the impacts from continued visitor use would be similar to current conditions as described under alternative 1. Additional beneficial effects could result from removal of some installations, and establishment or restoration of trails. Adverse impacts could occur from installation of new privies and the establishment of campsites. Impacts would be localized and not measurably different from current conditions.	In general, this alternative would allow for increased visitation in wilderness. As a result, adverse impacts on soils may increase slightly in localized areas from an increase in visitors, stock, and development wilderness-wide.	This alternative seeks to maintain or slightly reduce visitation into the parks' wilderness. As a result, adverse impacts on soils may decrease slightly overall from reduced use. Beneficial effects would occur from a decrease in the number of stock, the elimination of grazing wilderness-wide, and the removal of installations. Adverse effects would result from the establishment of stock hold and feed areas. Beneficial and adverse effects would be localized and slight; and would not result in a measurable change on a wilderness-wide scale.	Visitor use would be reduced from current levels. Fewer visitors could result in fewer effects from visitor use overall, such as the development of social trails and new campsites. Beneficial effects would occur from a decrease in the number of stock and hikers and the removal of installations. Beneficial and adverse effects would be localized and slight; and would not result in a measurable change.

TABLE ES-2: SUMMARY OF IMPACTS TABLE (CONTINUED)

Resource	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Water Quality	No changes to the management of parks' wilderness would occur. Humans and stock appear to have had little impact on water quality or on the overall health of the aquatic ecosystem when compared to environments with very little use. Some measurable impacts have occurred, especially near the most heavily visited locations; however, the impacts remain below accepted thresholds of health or ecological concern. It is likely that the prevailing environmental conditions would persist under this alternative.	Under alternative 2, visitor use would remain at about the same levels. Therefore, the impacts from continued visitor use would be similar to current conditions as described under alternative 1. The prohibition of grazing in selected meadows may result in a small, beneficial effect on water quality.	Alternative 3 provides for increased visitor use levels in certain areas. Studies indicate that visitors have some small adverse impact on water quality, and it is reasonable to assume that additional users will likely result in more impacts, but the impacts should remain small and would remain below accepted thresholds of health or ecological concern.	Alternative 4 provides for a slight decrease in visitor use levels in certain areas. A reduction in users may result in small beneficial effects, but at a scale too small to measure. This alternative would likely result in some beneficial effects on water quality in the areas which had been open to grazing.	Alternative 5 provides for a reduction of visitor use levels wilderness wide. Wilderness visitors have a small, but adverse impact on water quality. A reduction in users would likely result in small, beneficial effects, but likely at a level below any detectable limits.
Vegetation Wetlands and Meadows	Impacts from human traffic would remain similar to current levels and insignificant at the landscape scale. The extent and severity of trampling, grazing, and nonnative species impacts due to stock use would be expected to remain comparable to current levels. Stock parties would have access to 64% of the meadow area; 51% of meadow area would be open to grazing The amount of grazing would be similar to current levels. Grazing capacities would be adopted in popular destinations. Grazing intensity outside of these areas would be a function of variable annual stock use patterns and productivity.	Impacts from human traffic would remain similar to current levels and insignificant at the landscape scale. The extent and severity of trampling, grazing, and nonnative species impacts due to stock use would be reduced from current levels. Stock parties would have access to 54% of the meadow area; 48% of meadow area would be open to grazing. The amount of grazing would be similar to current levels. The intensity of grazing in named forage areas (and therefore the extent and severity of impacts) would be limited by grazing capacities.	Impacts from human traffic would increase but remain insignificant at the landscape scale. There would be a decrease in the extent but an increase in the severity of trampling, grazing, and nonnative species impacts due to stock use as higher use would be concentrated in fewer destinations. Stock parties would have access to 55% of the meadow area in the parks; 37% of all meadow area would be open to grazing. The amount of grazing would be greater than current levels. The intensity of grazing in named forage areas (and therefore the extent and severity of impacts) would be limited by grazing capacities.	Impacts from human traffic would remain similar to current levels and insignificant at the landscape scale. The extent and severity of impacts due to stock use would be greatly reduced. Parties traveling with stock would continue to have access to 44% of the meadow area in the parks. Total stock use would decrease relative to current levels. Grazing would be prohibited throughout the park; therefore, grazing impacts would be eliminated. Trampling impacts would be nearly eliminated. Nonnative species impacts due to stock use would be expected to decrease, with a chance for increased impacts due to a greater amount of carried feed used.	Impacts from human traffic would decrease and remain insignificant at the landscape scale. The extent and severity of trampling, grazing, and nonnative species impacts would decrease with lower overall stock use and fewer areas open to grazing. Stock parties would have access to 43% of the meadow area; 37% of meadow area would be open to grazing. The amount of grazing would be less than current levels. The intensity of grazing in named forage areas (and therefore the extent and severity of impacts) would be limited by grazing capacities.
Vegetation High-elevation Long-lived Trees	Campfires would be prohibited in 439,515 acres while being allowed in 44,212 acres of high-elevation conifer habitat that supports the four subalpine long-lived tree species.	Campfires would be prohibited in 442,096 acres while being permitted in 35,857 acres of high-elevation conifer habitat that supports the four subalpine or upper montane long-lived tree species (whitebark pine, foxtail pine, limber pine, and Sierra juniper).	Campfires would be prohibited in 543,965 acres while being permitted in 13,126 acres of high-elevation conifer habitat that supports the four subalpine long-lived tree species.	Campfires would be prohibited in 837,806 total acres of the parks or 100% of wilderness. It would include all areas of high-elevation conifer habitat where the four long-lived tree species occur within the parks. This would include a wide range of vegetation types distributed throughout wilderness from low to high elevations.	Campfires would be prohibited in 412,530 total acres of the parks, while being permitted in 37,144 acres of high-elevation conifer habitat that supports the four subalpine long-lived tree species.
Vegetation Alpine Vegetation	Direct removal of alpine vegetation would continue to occur infrequently. Trampling of alpine vegetation along trail corridors, at popular destinations, and in alpine meadows would continue, particularly in areas of concentrated visitor use and where grazing occurs. Under current use levels and patterns, vegetation in untrailed alpine areas would remain largely undisturbed. Approximately 64% of mapped alpine vegetation areas would be closed to stock, which would serve to protect these areas from potential grazing and trampling impacts.	Impact types would be the same as described for alternative 1. If visitor use increases in off-trail areas, impacts on alpine vegetation could increase in extent and severity. Impacts would be reduced by limiting certain areas to pass through or day-use and by closing certain trails and meadows to stock access completely. Under this alternative 70% of the mapped alpine vegetation areas would be closed to stock, providing increased protection from potential grazing and trampling impacts.	Impact types would be similar to alternative 1; however, the increased use levels and use patterns would likely increase trampling impacts on alpine vegetation, particularly in popular areas and around new food-storage boxes. Impacts along trails would continue, and if visitor use increases in off-trail areas, impacts on alpine vegetation could increase in extent and severity. Under this alternative, 69% of the mapped alpine vegetation areas would be closed to stock, providing increased protection from potential grazing and trampling impacts.	Impacts on alpine vegetation would be similar to alternative 1, but could be reduced by limitations on visitor use, which could result in reduced use in off-trail areas. Trampling in alpine meadows by stock would largely cease due to grazing restrictions. However, the areas used for holding and feeding stock could be subject to increased trampling impacts. Under this alternative, 76% of the mapped alpine vegetation areas would be closed to stock, providing increased protection from potential grazing and trampling impacts.	Impacts on alpine vegetation would be expected to decrease relative to current conditions, as a result of overall decreased visitor use. There could continue to be trampling impacts associated with grazing where it occurs. Under this alternative, 83% of the mapped alpine vegetation areas would be closed to stock, providing increased protection from potential grazing and trampling impacts.

TABLE ES-2: SUMMARY OF IMPACTS TABLE (CONTINUED)

Resource	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Vegetation Plants of Conservation Concern	Direct removal and trampling of the plants of conservation concern by visitors would be expected to be infrequent under current levels and patterns of use. Although species in the meadows and uplands may suffer incidental trampling by visitors traveling through meadows or on cross-country routes, this would not be expected to result in population level impacts. Localized impacts from stock use could affect plants of conservation concern. There is no evidence that current use levels and patterns are resulting in population level impacts on these species.	Impacts on vascular plants and mosses of conservation concern would be similar to alternative 1. Restrictions and closures of certain areas to stock grazing and access would reduce the potential for impacts from trampling and grazing. Because grazing intensity in meadows would be managed through the implementation of site-specific grazing capacities, impacts on these species would continue to be localized and would not be expected to result in large scale losses or declines that could lead to the listing of any of the species.	The potential for trampling of the plants of conservation concern by hikers could rise with the increased visitor use. Species in the meadows and uplands may be subject to incidental trampling by visitors traveling through meadows or on cross-country routes, although this would not be expected to result in population level impacts. Localized impacts from stock use and grazing could affect plants of conservation concern. Because grazing intensity in meadows would be managed through the implementation of site-specific grazing capacities, impacts on these species would continue to be localized and would not be expected to result in large scale losses or declines that could lead to the listing of any of the species.	The potential for impacts on plants of conservation concern would be reduced due to the reduction in overall use and the elimination of grazing.	The potential for impacts on plants of conservation concern would be reduced as a result of reduced visitor use, smaller party sizes, and the elimination of cross country travel by stock. Because grazing intensity in meadows would be managed through the implementation of site-specific grazing capacities, impacts on these species would continue to be localized and would not be expected to result in large scale losses or declines that could lead to the listing of any of the species.
Vegetation Nonnative Plants	Disturbance associated with visitor use, including off-trail travel and grazing, would remain the same, and there would be no change in the use of unprocessed hay and hay cubes. Thus there would continue to be the potential for the introduction and spread of nonnative species in popular areas of the wilderness and those frequented by stock.	The overall probability of nonnative introductions would be approximately the same as current conditions. However, beneficial effects would occur from slightly less off-trail stock travel and grazing, and the required use of processed (i.e. weed-seed free) feed. Although the probability of nonnative introductions would be less than current conditions, the spatial distribution of impacts would be similar to current conditions.	The overall probability of nonnative introductions would be approximately the same as current conditions. A slight reduction in off-trail travel and grazing, coupled with requirements for processed feed would mitigate some of the impacts from increased visitor and stock use and administrative activities. More meadows would have a lowered risk of nonnative plant introduction, as they would be closed to stock access.	The extent of disturbed land would be lowered due to reduced visitor and group sizes, and a reduction in facility maintenance. Overall, propagule pressure, the probability of nonnative introduction into wetlands, and the spatial distribution of impacts would be substantially lower than current conditions due to the elimination of grazing and a reduction in off-trail stock travel.	Similar to alternative 4, there would be beneficial effects on native plant communities due to reduced visitor use wilderness wide.
Wildlife Black Bear	Under alternative 1, bears would continue to have benign encounters with people throughout wilderness, which would lead to habituation, which is often a precursory behavior to food-conditioning that occurs when bears associate people with food. Incidents would continue to remain relatively rare and bear population dynamics in wilderness would be dominated by natural processes.	Because the visitor use levels would be similar to present levels, there would be little change in undesirable bear behavior under this alternative. However, the removal of nearly half of the existing food-storage boxes and establishing new campsites could increase habituation and food-conditioning, leading to adverse impacts. If proper food storage is regularly practiced, increases in human/bear conflicts as a result of this action would be expected to be minimal.	Potential increases in human/bear encounters (and thus, increased habituation and food-conditioning) would result from increased visitor use and additional established campsites. These impacts would be mitigated by adding 35 new food-storage boxes, moving existing food-storage boxes to more appropriate locations, and increasing portable food container requirements. Overall, the change in impacts from current conditions would be minimal.	Reduced visitor use could result in a reduction of bear-human encounters. Beneficial effects from reducing visitor use, however, would be outweighed by the adverse impacts of removing all food-storage boxes. There would likely be a net increase in food-conditioned bears because a percentage of visitors would likely not properly store their food.	Beneficial effects from reducing visitor use would be outweighed by the adverse impacts of removing all food-storage boxes. There would likely be a net increase in food-conditioned bears because a percentage of visitors would likely not properly store their food.

TABLE ES-2: SUMMARY OF IMPACTS TABLE (CONTINUED)

Resource	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Wildlife Birds	In wilderness, brown-headed cowbird abundance and parasitism would continue to be uncommon and impacts on native bird species would continue to be minimal because of the lack of development although there could be potential for localized problematic areas near ranger stations or other highly visited sites. Brown-headed cowbird abundance and parasitism rates could be relatively high near frontcountry developments (e.g., campgrounds, picnic areas, administrative and stock facilities, etc.), particularly for species restricted to lower elevations, and could limit population growth.	Additional meadow closures and decreases in stock party sizes could cause a reduction in available brown-headed cowbird habitat, limiting their impact on native bird species in wilderness. However, any increase in the use of supplemental feed products could increase habitat and food sources for the cowbird, potentially increasing opportunities for nest parasitism. Increased development in frontcountry sites may cause a slight increase in brown-headed cowbird abundance at these sites. However, the impacts on native bird species from brown-headed cowbird parasitism are not expected to increase substantially from current conditions.	Increased stock party sizes, establishment of stock campsites, and any increase in the use of supplemental feed products could increase habitat quality for brown-headed cowbirds, thus increasing the potential for parasitism of host species. Slight beneficial effects on native bird species would occur from reducing stock grazing in off-trail areas, reducing brown-headed cowbird habitat.	The closure of all meadows to grazing could contribute to reduced habitat quality for brown-headed cowbirds and could result in a decrease in parasitism to host species near these sites, relative to alternative 1. This would result in a beneficial effect on native birds. However, adverse impacts could result from use of supplemental feed carried into wilderness and the development of frontcountry sites, as described for alternative 2.	Abundance of brown-headed cowbirds would likely be reduced by the reduced stock party sizes, removal of stock campsites, and the reduced number of meadows open to grazing. However, adverse impacts could result from the use of supplemental feed carried into wilderness and the development of frontcountry sites, as described for alternative 2.
Wildlife Invertebrates	Invertebrates would continue to be adversely affected by human and stock trampling, stock grazing, and stock fording of streams. The impact intensity would be scale dependent. Wilderness-wide, impacts would be undetectable; however, on a localized scale, measureable impacts would continue to occur.	Similar visitor use levels would result in impacts similar to those described under alternative 1. The closure of additional meadows to grazing would result in beneficial effects on invertebrates at these sites. These beneficial effects are anticipated to be minimal.	Increased visitor use would provide increased opportunities for invertebrates to be affected by trampling; however, the difference in impacts would not be measurable relative to alternative 1. Additional areas would be closed to grazing, providing beneficial effects on invertebrates in the newly closed meadows when compared to current conditions. These beneficial effects are anticipated to be minimal.	Reduced visitor use levels would result in a slight beneficial effect on invertebrates, but the effects would be similar to those described under alternative 1. The closure of all meadows to grazing would result in beneficial effects on invertebrates at these sites. These beneficial effects are anticipated to be minimal.	Reduced visitor use levels would result in a slight beneficial effect on invertebrates, but the effects would be similar to those described under alternative 1. The closure of additional meadows to grazing and off-trail stock travel would result in beneficial effects on invertebrates. These beneficial effects are anticipated to be minimal.
Special-status Species Yosemite Toad	Visitors would continue to encounter Yosemite toads in wilderness, which could result in disturbance and/or trampling. Disturbance would not have an impact on toad populations. The small amount of potential trampling that may affect Yosemite toads under this alternative would be expected to result in no effect on their populations. Under this alternative stock use and grazing would continue to be managed to prevent unacceptable habitat degradation; therefore, while there may be adverse impacts on individual toads, the potential for population-wide effects is small.	As in alternative 1, the potential for disturbance to Yosemite toads from visitor encounters and trampling would continue to occur. However, additional stock access restrictions, and the elimination or reduction in grazing in known toad habitat would reduce the potential of trampling and habitat degradation, and would be expected to result in a beneficial effect on Yosemite toads.	With an increase in use, there is an increased potential for visitors to disturb or trample Yosemite toads. However, additional stock access restrictions, and the elimination or reduction in grazing in known toad habitat would reduce the potential of trampling and habitat degradation, and would be expected to result in a beneficial effect on Yosemite toads.	As in alternative 1, the potential for disturbance to Yosemite toads from visitor encounters and trampling would continue to occur, but would be reduced with reduced visitor access in toad habitat. Additional stock access restrictions and the elimination of grazing in known toad habitat would reduce the potential of trampling and habitat degradation, and would be expected to result in a beneficial effect on Yosemite toads.	With decreased use overall, the potential for disturbance to Yosemite toads from visitor encounters and trampling would be reduced from current levels. Additional stock access restrictions, and the elimination or reduction in grazing in known toad habitat would reduce the potential for trampling and habitat degradation, and would be expected to result in a beneficial effect on Yosemite toads.

TABLE ES-2: SUMMARY OF IMPACTS TABLE (CONTINUED)

Resource	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Special-status Species Mountain Yellow-legged Frog	Visitors would continue to encounter mountain yellow-legged frogs in wilderness, which could result in disturbance and/or trampling of frogs. Disturbance would not have an impact on frog populations. Trampling could adversely impact individual frogs, but would not have an impact on frog populations. The degradation of mountain yellow-legged frog habitat could occur in high use areas or near trails, but given the few locations where frog populations inhabit areas near trails, the potential for habitat degradation has been shown to be small.	The potential for visitors to disturb or trample mountain yellow-legged frogs would be similar as described under alternative 1. Additional stock access and grazing restrictions would protect frogs and frog habitat, and thus would be expected to result in beneficial effects.	With increased use, there is an increased potential for visitors to disturb or trample mountain yellow-legged frogs. However, additional stock access and grazing restrictions would protect frogs and frog habitat, and thus would be expected to result in beneficial effects.	The potential for visitors to disturb or trample mountain yellow-legged frogs would be similar as described under alternative 1. Additional stock access restrictions and the elimination of grazing would protect frogs and important frog habitat, and thus would be expected to result in beneficial effects.	The potential for visitors to disturb or trample mountain yellow-legged frogs would be reduced from alternative 1 due to reduced visitor use. Additional stock access and grazing restrictions would protect frogs and important frog habitat, and thus would be expected to result in beneficial effects.
Special-status Species Sierra Nevada Bighorn Sheep	Visitors would continue to encounter Sierra Nevada bighorn sheep in wilderness, which could result in disturbance. There is no evidence of adverse impacts on bighorn sheep from hikers and stock use under current use levels; therefore, these disturbances would not be of biological importance.	There could be an increased frequency of bighorn sheep/human encounters if new Class 1 trails are established in bighorn sheep habitat. However, such trails could concentrate visitor use and benefit bighorn sheep by making human activity more predictable. Reducing stock party sizes and areas open to grazing could benefit bighorn sheep in portions of their habitat. These beneficial effects are anticipated to be minimal. There could be short-term adverse effects from project activities in bighorn sheep habitat.	Trailhead quotas could increase on trails that intersect bighorn sheep habitat and new Class 1 trails could be established in bighorn sheep habitat; these actions could result in an increase in bighorn sheep-human interactions. It is probable that adverse impacts of increased bighorn-human interactions would continue to remain below the level of biological significance, and new Class 1 trails could concentrate use and benefit bighorn sheep by making human activity more predictable. Reducing areas open to grazing could benefit bighorn sheep in portions of their habitat. These beneficial effects are anticipated to be minimal. There could be short-term adverse effects from project activities in bighorn sheep habitat.	There would be beneficial effects on bighorn sheep because trailhead quotas would be reduced, stock would be allowed to travel on fewer trails, and party size would be reduced. Overall the effects would be beneficial and long-term; however, the beneficial effects are anticipated to be minimal. There could be short-term adverse effects from project activities in bighorn sheep habitat.	There would be beneficial effects on bighorn sheep from decreased visitor use and closures of areas to stock, specifically off-trail areas. Overall the effects would be beneficial and long-term; however, the beneficial effects are anticipated to be minimal. There could be short-term adverse effects from project activities in bighorn sheep habitat.
Cultural Resources	Cultural resources in wilderness would continue to be protected. There would be no adverse effects on cultural resources.	Most cultural resources in wilderness would continue to be protected. The ranger station at Bearpaw Meadow would be removed, resulting in an adverse impact on an historic resource. The level of impact could be somewhat mitigated through documentation strategies developed in consultation with the California State Historic Preservation Office (CA SHPO).	Most cultural resources in wilderness would continue to be protected. The ranger station at Bearpaw Meadow would be removed, resulting in an adverse impact on an historic resource. The level of impact could be somewhat mitigated through documentation strategies developed in consultation with the CA SHPO.	Most cultural resources in wilderness would continue to be protected. The removal of Bearpaw Meadow High Sierra Camp, including the ranger station, and the ranger stations or patrol cabins at Redwood Meadow, Simpson Meadow, and Tyndall would result in an adverse impact on those historic resources. The level of impact could be somewhat mitigated through documentation strategies developed in consultation with the CA SHPO.	Most cultural resources in wilderness would continue to be protected. The removal of the ranger station at Bearpaw Meadow would result in an adverse impact on an historic resource The level of impact could be somewhat mitigated through documentation strategies developed in consultation with the CA SHPO.

TABLE ES-2: SUMMARY OF IMPACTS TABLE (CONTINUED)

Resource	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Socioeconomics	There would be little change from current conditions. At the regional level, the effects on socioeconomics related to park wilderness visitation and operations would be both beneficial and adverse.	Similar to alternative 1; however, the more direct consequences of the restrictions placed in the busiest areas of wilderness (i.e., reductions in quotas for specific busy trails, limits on commercial services in the Mount Whitney Management Area, and limits on grazing), could result in lower use and the redistribution of use geographically and could adversely affect individuals or businesses. Alternative 2 allows for near current or slightly increased levels of overall use supported by commercial services, including stock-based use, providing potential economic benefits for some commercial service providers and supporting businesses. Alternative 2 would result in beneficial and adverse impacts over the long term.	Increased visitor use may result in long-term increases in the economic and social benefits from increased spending by wilderness visitors at local stores, motels and hotels, and other tourism-related businesses and attractions. Alternative 3 allows for increased use supported by commercial services, including stock-based use, providing potential economic benefits for some commercial services providers and supporting businesses. Alternative 3 would result in beneficial effects over the long term.	This alternative may result in limited economic and social effects. The decreased use could reduce income and increase costs for outfitters, adversely affecting the long-term economic viability of some outfitters, potentially to the point that one or more outfitters may choose to forego pursuit of Commercial Use Authorizations. Such a decision could have indirect effects in one or more gateway communities. Individual outfitters and guides could be affected differentially by changes associated with this alternative.	Same as alternative 4.
Visitor Use and Experience	Alternative 1 provides a positive visitor experience for the majority of visitors throughout the parks' wilderness. In the most popular areas, visitor experience could be adversely or beneficially impacted due to the condition of the wilderness (campsite conditions), the existence of facilities, and the availability of commercial services to support visitor use.	Alternative 2 would continue to provide a positive experience for the majority of visitors throughout the parks' wilderness, with localized improvements occurring in selected areas. However, some visitors may not be able to travel in the area of their choice due to new restrictions on access and stock use, campfire limits, and reductions in commercial services in the Mount Whitney Management Area. Visitor-related facilities would be reduced, resulting in both adverse and beneficial effects on the visitor experience, depending on their expectations.	Alternative 3 would continue to provide a positive experience for the majority of visitors throughout the parks' wilderness. However, increased use in the most popular areas and increased level of restrictions would result in adverse effects on the visitor experience when compared with the other alternatives. Visitor-related facilities would be increased, resulting in both adverse and beneficial effects on the visitor experience, depending on their expectations.	Under alternative 4, certain uses would be limited. Campfires would not be allowed. All food-storage boxes would be removed. Grazing would be prohibited. There would be decreased opportunities wilderness-wide for visitors to use commercial service providers. The increased restrictions and decreased visitor-related facilities would result in both adverse and beneficial effects on the visitor experience depending on their expectations.	Under alternative 5, visitor access would be limited to the lowest amount when compared with the other alternatives. There would be reduced opportunities for visitors traveling with stock due to off-trail restrictions. There would be fewer visitor-related facilities. There would be decreased opportunities wilderness-wide for visitors to use commercial service providers. Overall this alternative would result in both adverse impacts to those visitors who are unable to gain access to the wilderness, and beneficial effects on those visitors who gain access and experience wilderness.
Park Operations	There would be no change to current operations.	There would be cost and work associated with the removal of facilities, but a reduction in long-term expenditures with reduced maintenance requirements. After initial changes to the wilderness-related programs, this alternative would result in impacts that are not substantially different from alternative 1 (no-action / status quo).	There would be cost and work associated with the installation of new facilities, and long-term maintenance requirements. After initial changes to the wilderness-related programs, this alternative would result in impacts that are not substantially different from alternative 1 (no-action / status quo).	There would be cost and work associated with the removal of facilities, but a reduction in long-term expenditures with reduced maintenance requirements. There would be long-term costs associated with having to buy feed to allow the continued use of administrative stock. For other wilderness-related programs, this alternative would result in impacts that are not substantially different from alternative 1 ((no-action / status quo)).	There would be cost and work associated with the removal of facilities, but a reduction in long-term expenditures with reduced maintenance requirements. Fewer visitors in wilderness would likely result in a decrease in administrative activities resulting from wilderness management.

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ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
APE	Area of Potential Effect
BMP	Backcountry Management Plan
CCC	Civilian Conservation Corps
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CFU	Colony Forming Units
CNDDB	California State Natural Diversity Database
CNPS	California Native Plant Society
CPRE	Comprehensive Plan for Resource Education
CUA	Commercial Use Authorization
DEIS	Draft Environmental Impact Statement
DPS	Distinct Population Segment
DPWA	Designated Potential Wilderness Additions
EA	Environmental Assessment
EIS	Environmental Impact Statement
END	Extent Necessary Determination
EPH	Encounters per Hour
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FY	Fiscal Year
FMSS	Facility Management Software System
GMP	General Management Plan
HST	High Sierra Trail
IDT	Interdisciplinary Planning Team
JMT	John Muir Trail
KICA	Kings Canyon National Park
MRA	Minimum Requirements Analysis
NEPA	National Environmental Policy Act of 1969
NF	National Forest
NHPA	National Historic Preservation Act
NPATMA	National Parks Air Tour Management Act
NPS	National Park Service
National Register	National Register of Historic Places
NWPS	National Wilderness Preservation System

Parks	Sequoia and Kings Canyon National Parks
PCT	Pacific Crest National Scenic Trail
PEPC	Planning, Environment, and Public Comment
PL	Public Law
RMP	Resources Management Plan
ROD	Record of Decision
RSS	Resources Stewardship Strategy
SEIS	Supplemental Environmental Impact Statement
SEKI	Sequoia and Kings Canyon National Parks
SEQU	Sequoia National Park
SHPO	State Historic Preservation Office(r)
SNFPA	Sierra Nevada Forest Plan Amendment
SUMMP	Stock Use and Meadow Management Plan
USEPA	Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VUD	Visitor-use days
WSP	Wilderness Stewardship Plan
WVCM	Weighted Value per Campable Mile
YOSE	Yosemite National Park

Chapter 1

Purpose and Need

ON THE PREVIOUS PAGE
Looking down off the High Sierra Trail
Photo Courtesy of Rick Cain

CHAPTER 1: PURPOSE AND NEED

HOW THIS DOCUMENT IS ORGANIZED

This Wilderness Stewardship Plan and final Environmental Impact Statement (WSP/FEIS) provides direction for the National Park Service (NPS) to make decisions regarding the future use and protection of the parks' wilderness, in accordance with the Wilderness Act. It follows and documents the planning process in accordance with the National Environmental Policy Act (NEPA), the National Historic Preservation Act (NHPA), the Wilderness Act, the Endangered Species Act (ESA), and other legal mandates governing decision making by the NPS.

The WSP/FEIS is a two-volume set. Volume 1 includes chapters 1 through 5, the glossary, and references. Chapter 1 introduces the plan and its purpose, includes the background of the plan and legal requirements, and provides an overview of the issues and concerns brought forth in the public scoping and plan development process. Chapter 2 describes a reasonable range of alternatives, including the preferred alternative (alternative 2), mitigation measures, alternative elements considered but dismissed from detailed analysis, and the environmentally preferable alternative. Chapter 3 describes those resources that are expected to experience environmental effects as a result of implementing any of the alternatives. It is not a comprehensive look at all the resources in the parks' wilderness; it is a focused discussion on what the NPS knows about the resources that may be affected by any of the alternatives. Chapter 4 describes the environmental impacts of the alternatives. Chapter 5 describes the methods that were used to collect information from the public, tribes, and agencies in order to determine what issues to address in the plan and to refine the alternatives. The glossary and reference sections include definitions of terms, and lists papers, plans, and other documents that were used or cited in plan development.

Volume 2 includes appendices A through S, including implementation strategies for components of the WSP/FEIS, as well as background information on resources, wilderness legislation and regulation, commercial services, and research in wilderness. Volume 2 also includes the Public Comment Analysis Report for the WSP and draft Environmental Impact Statement (DEIS) (appendix Q).

INTRODUCTION

The wilderness areas of Sequoia and Kings Canyon National Parks (the parks) protect one of America's most superlative scenic landscapes. An extraordinary continuum of ecosystems is arrayed along the greatest vertical relief (1,370 to 14,494 feet in elevation) of any protected area in the lower 48 states. Its magnificent glacially carved canyons, broad lake basins, lush meadows, and sheer granite peaks — hallmarks of the most rugged portion of the High Sierra — form the core of the largest expanse of contiguous wilderness areas in California, which is visited and valued by people from around the world.

Many characteristic species of the western American mountains occupy this vast and diverse protected area, including black bears (*Ursus americanus*), mule deer (*Odocoileus hemionus*), acorn woodpeckers (*Melanerpes formicivorus*), American pika (*Ochotona princeps*), red-tailed hawks (*Buteo jamaicensis*), and lodgepole pine (*Pinus contorta*), as well as uncommon species such as Sierra Nevada bighorn sheep (*Ovis canadensis sierrae*), Sierra juniper (*Juniperus grandis*), foxtail pine (*Pinus balfouriana* ssp. *austrina*), and the iconic giant sequoia (*Sequoiadendron giganteum*). Four major river systems (Kings, Kaweah, Kern, and the South Fork of the San Joaquin) originate in the parks' wilderness and deliver snowmelt to the Sacramento/San Joaquin Delta and the dry Tulare and Buena Vista lake regions. The Kern is the only Sierran river that runs parallel to the north-south axis of the Sierra Nevada. It owes its distinctive dry environment inhabited by unique species assemblages to the rain shadow cast by the Great Western Divide.

How Visitor Use is Estimated

The average number of wilderness visitors to the parks for the past 10 years (2003–2012) is approximately 21,600. This accounts for an average of 86,530 visitor-use nights per year.

These numbers are compiled from permits issued by Sequoia and Kings Canyon National Parks, and by Inyo, Sequoia, and Sierra national forests. This does not include Pacific Crest National Scenic Trail hikers coming from south of Sequoia National Forest or coming from north of Inyo and Sierra national forests, or John Muir Trail hikers coming from Yosemite National Park or other points north of Sierra National Forest.

It is estimated that these additional 3,000 to 3,500 visitors account for an additional 24,500 visitor-use nights (based on projected numbers of hikers and projected nights of use). The estimate of visitor-use nights per trip per person for Pacific Crest National Scenic Trail hikers and for John Muir Trail hikers is seven.

The combined information leads to an informed annual use estimate of 24,000 overnight visitors accounting for 110,000 visitor-use nights.

Cave and karst formations form another outstanding physical feature of the parks' wilderness. They include Lilburn Cave (California's longest), uncommon high-elevation caves such as White Chief, and many other caves with outstanding, pristine mineral formations.

These and many other outstanding resource features make the parks' wilderness enormously valuable, particularly in light of its proximity to California's major population centers. This wilderness welcomes thousands of visitors each year: More than 8,600 permits were issued for overnight wilderness stays during the 2012 permit season, accounting for more than 85,000 visitor nights. An estimated 81,000 people take day trips into wilderness each year. The area provides diverse opportunities for activities, including hiking and backpacking, horseback riding and packing, mountaineering, fishing, boating, and other recreational and educational activities. The parks' wilderness contains more than 650 miles of trail, and the open nature of the Sierra's high-elevation basins makes these expanses unusually well suited for cross-country travel.

The large number of visitors that take advantage of the excellent opportunities to visit these scenic areas is an indicator of the great public value the parks' wilderness provides. It also means that those values must be wisely managed to protect wilderness character for present and future generations.

Total Area of the Parks

865,964 acres

Total Area of the Parks Managed as Wilderness

837,806 acres

(nearly 97% of the parks)

This plan will provide management direction for two designated wilderness areas, several potential wilderness additions, and an area of proposed wilderness. The California Wilderness Act of 1984 (Public Law [PL] 98-425) designated the Sierra Crest portion of both parks as the Sequoia-Kings Canyon Wilderness. The Omnibus Public Land Management Act of 2009 (PL 111-11) designated the John Krebs Wilderness in Sequoia National Park; it also expanded the Sequoia-Kings Canyon Wilderness to include the North Fork Kaweah area and Redwood Canyon area. The parks' total designated wilderness is now 808,078 acres — approximately 93.3% of the total parks' acreage of 865,964. In addition, because the southern end of the Hockett Plateau (approximately 29,500 acres) remains proposed wilderness, it is managed as wilderness, according to law (PL 111-11) and National Park Service (NPS) policy. The parks also contain several designated potential wilderness additions (DPWA), including the area around the Pear Lake Ski Hut and Bearpaw Meadow High Sierra Camp. These would become wilderness when and if the non-conforming activities (e.g., commercial enterprise) and/or facilities are removed. Altogether, designated and proposed wilderness areas comprise nearly 97% of the total acreage of Sequoia and Kings Canyon National Parks (figures 1 and 2).

Wilderness Acreages in Sequoia and Kings Canyon National Parks:

- Designated Wilderness: 808,078 acres (93.3% of the parks)
- Designated Potential Wilderness Additions: 212 acres (0.02% of the parks)
- Proposed Wilderness: 29,516 acres[1] (3.4% of the parks)

PURPOSE AND NEED FOR THE PLAN

The Wilderness Act of 1964 mandates federal land-management agencies to manage wilderness areas "for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, [and] the preservation of their wilderness character (§2(a))."

Looking east over the Great Western Divide from 11,204-foot-high Alta Peak

To provide for use of wilderness that also leaves it unimpaired, both the parks and their visitors are called upon to apply the concept of stewardship — protecting and being responsible — for their use and management of wilderness. This Wilderness Stewardship Plan (WSP or plan) will establish a framework for managing wilderness and areas managed as wilderness within Sequoia and Kings Canyon National Parks to meet these critical objectives:

- preserve wilderness character;
- provide opportunities for and encourage public use and enjoyment of wilderness in accordance with the Wilderness Act and other laws and policies;
- improve conditions in areas where there may be unacceptable levels of impacts on wilderness character; and
- protect the natural and cultural resources within wilderness.

[1] This number is based on boundaries set using standard wilderness boundary protocols. If this area were to receive wilderness designation, the size of the wilderness may vary from this acreage.

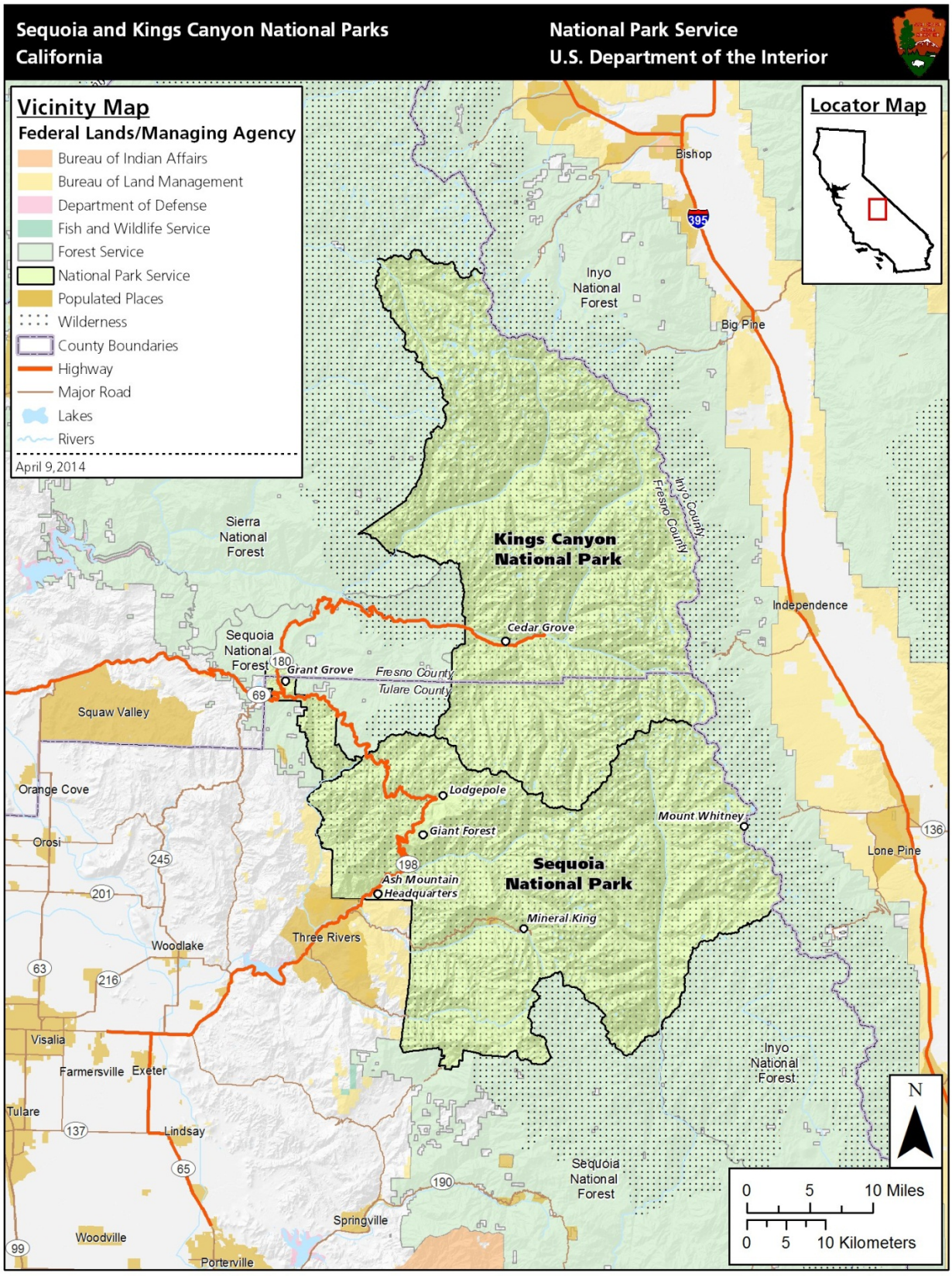


Figure 1: Vicinity Map

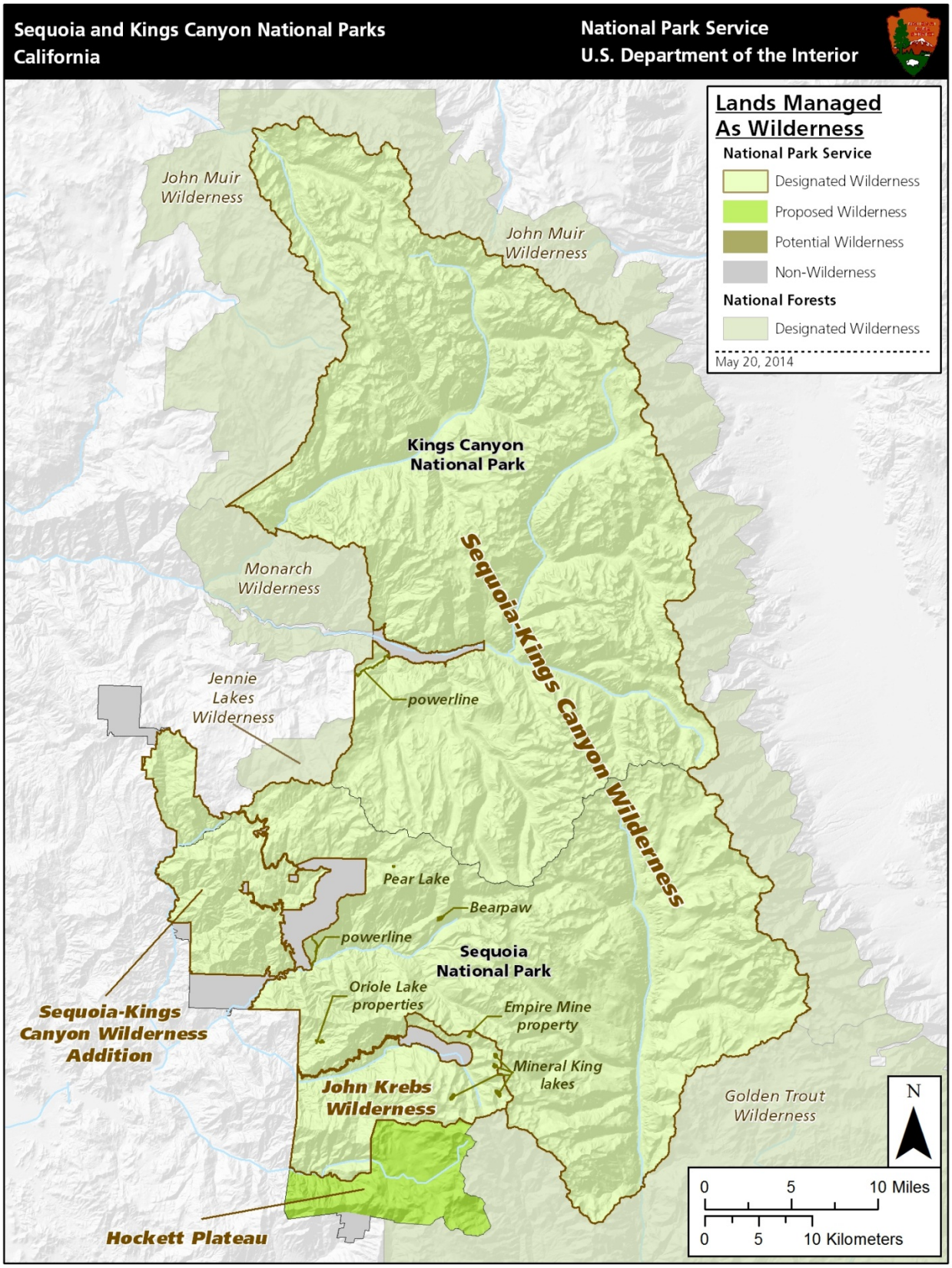


Figure 2: Wilderness Areas In and Around Sequoia and Kings Canyon National Parks

The purposes of the WSP include implementing the long-term vision for protecting wilderness character that is contained in the parks' *Final General Management Plan* (GMP) */ Final Environmental Impact Statement*, as well as enhancing established programs and actions for managing these areas as wilderness. (Note: In an order dated May 29, 2012, the U.S. District Court for the Northern District California issued an opinion in a lawsuit that challenged the parks' GMP [High Sierra Hikers Association v. U.S. Department of the Interior].) The Court's order "vacate[d] all portions of the GMP and Record of Decision (ROD) which provide programmatic guidance regarding the type or level of commercial stock services necessary in the Sequoia and Kings Canyon National Parks wilderness or direction as to need, appropriateness, or size of developments, structures, or facilities used completely or partially for commercial stock services." Where the GMP is referred to in this document, only those sections not vacated by the court order apply.) The WSP addresses recent servicewide guidance (NPS *Management Policies 2006* [NPS 2006a]), reflects provisions of the California Wilderness Act of 1984 and the Omnibus Public Land Management Act of 2009, incorporates new research findings, and uses a new interagency planning framework for the preservation of wilderness character. The WSP also replaces the current plans of record, the 1986 *Backcountry Management Plan* (BMP) and its accompanying 1986 *Stock Use and Meadow Management Plan* (SUMMP).

The WSP is needed to establish more specific goals and objectives for the management of visitors and certain administrative activities within the parks' wilderness. It includes desired conditions, and identifies measures and standards that establish resource conditions and serve as triggers for management action to reduce visitor impacts.

A variety of controversial or long-standing issues are addressed in the WSP, including visitor capacity (appendix A), wilderness permitting, party (group) size limits for people and stock, campfire regulations, camping locations and regulations, food-storage requirements, human-waste management, stock access, stock grazing, maintenance of facilities and trails, and management of frontcountry facilities that support wilderness use. The WSP also analyzes and determines the types and levels of commercial services that may be performed for activities that are proper for realizing the recreational or other wilderness purposes of the areas, as required by §4(d)(5) of the Wilderness Act (Extent Necessary Determination, appendix B).

Definitions of Key Terms

Desired condition *— qualitatively describes an ideal condition of wilderness character. This is both a holistic condition, as well as the desired condition for all qualities of wilderness character: untrammeled, natural, undeveloped, and opportunities for solitude or primitive and unconfined recreation, and the other features of value quality.*

Indicator *— a distinct and important element within each quality of wilderness character, which has measurable attributes that can be the focus of wilderness character monitoring. These function as categories that have one or more measures within them, and are established in Keeping It Wild (Landres et al. 2008).*

Measure *— a specific aspect of wilderness resources or character that can be measured or quantified. Specific feature(s) used to quantify an indicator, as specified in a monitoring or sampling protocol. One or more specific measures may be used to quantify or qualitatively evaluate the condition of an indicator at a particular place and time.*

Standard *— a threshold which conditions should not exceed. Standards identify the minimum level of acceptable wilderness condition, beyond which management action to improve conditions is triggered.*

Management Action *— implemented following a problem analysis; triggered by monitoring of a measure against a defined standard.*

Definitions derived from Landres et al. 2008, NPS 1997, and NPS 2014a.

In accordance with §102(2)(C) of the National Environmental Policy Act of 1969 (NEPA; PL 91-190), the parks have prepared this WSP and FEIS to consider alternative strategies for

future management of the parks' wilderness. Five alternatives for achieving wilderness-stewardship objectives, including the no-action alternative, are identified and analyzed. They describe five different ways to provide appropriate types and levels of access for visitors and authorized users, preserve wilderness character, protect cultural and natural resources, and adhere to legally required management and preservation objectives.

The Sequoia and Kings Canyon National Parks Backcountry Access Act (PL 112-128), enacted on June 5, 2012, provides a deadline for completion of the WSP. The Act directs the parks to complete the WSP within three years, by June 5, 2015.

PLANNING FRAMEWORK

The framework of this WSP/FEIS is founded on describing the wilderness character of the parks, defining the goals and objectives for managing wilderness visitor use and impacts, describing desired conditions for the visitor experience and wilderness character, developing visitor-use capacities, and determining the types and levels of commercial services necessary to support wilderness purposes.

ADAPTIVE MANAGEMENT

This plan will incorporate and adopt the practices of adaptive management. Adaptive management is a structured, iterative process by which system monitoring is incorporated into management practices to achieve desired results. Adaptive ecosystem management requires continuing monitoring and investigations to advance the understanding of stressors impacting native species and wilderness resources so that managers remain informed about which stressors are most serious, which stressors are manageable, and the ways stressors can be managed. Scientific research allows for expansion of management tools available today and provides information that can be incorporated into future management activities.

Adaptive management is a system of management practices based on clearly identified desired conditions and monitoring to determine whether management actions are achieving objectives and, if not, facilitating management changes that would best ensure that desired conditions are met or re-evaluated (Walters and Holling 1990; Williams et al. 2007). Adaptive management is a technique employed for charting a decision-making course to obtain a desirable condition. An effective monitoring program is required to provide the navigational framework needed for successfully meeting the challenges of adaptive management.

Adaptive management integrates science and management (Lee 1993). From a science perspective, management objectives become the primary response of interest and the source of questions being posed. From a management perspective, the management objectives remain the primary concern, but learning becomes an additional, explicit objective. Thus, management takes on a part of science (i.e., learning), and science takes on a part of management (i.e., the objectives). More detailed information about the use and implementation of adaptive management is given in *Adaptive Management: The U.S. Department of the Interior Technical Guide* (Williams et al. 2007).

WILDERNESS CHARACTER AND QUALITIES

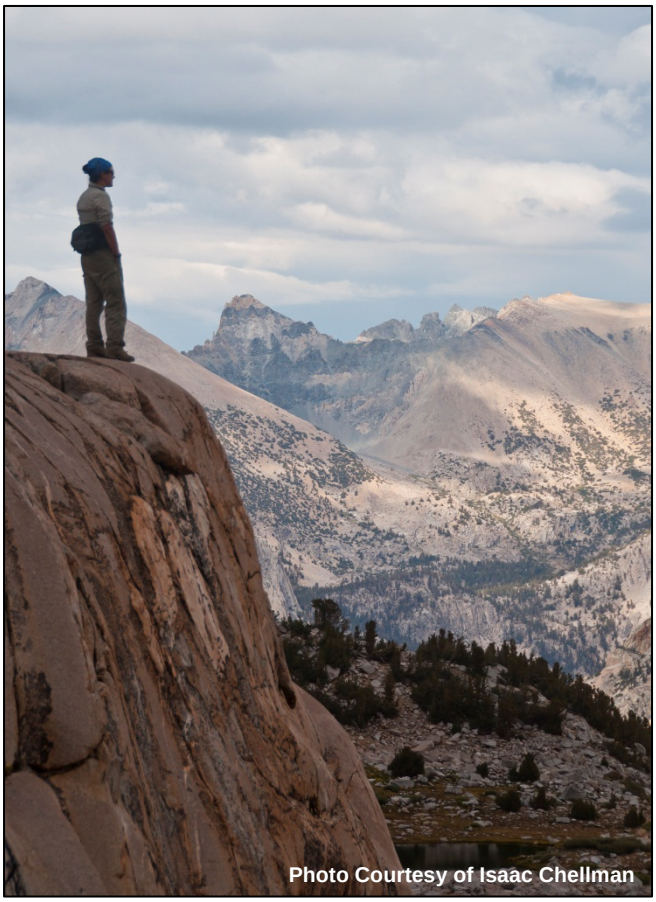
Wilderness stewardship planning focuses on preservation of wilderness character, the responsibility assigned to managers by the Wilderness Act. Wilderness character, however, is not specifically defined in the Wilderness Act. After carefully studying the act and its history, a formal interagency team developed *Keeping It Wild: An Interagency Strategy to Monitor Trends in Wilderness Character across the National Wilderness Preservation System* (Landres et al. 2008). This document describes wilderness character as

"the combination of biophysical, experiential, and symbolic ideals that distinguishes wilderness from other lands. These ideals combine to form a complex and subtle set of relationships among the land, its management, its users, and the meanings people associate with wilderness." In total, these relationships and meanings are described as "wilderness character."

The interagency team identified and developed a national framework for monitoring wilderness character that defines four foundational qualities that comprise wilderness character. These qualities were selected to be tangible, to link local conditions and management directly to the language of the Wilderness Act, and to apply to every wilderness regardless of size, location, or agency administration.

Four qualities that contribute to wilderness character are:

- *Untrammeled* — The Wilderness Act states that wilderness is "an area where the earth and its community of life are untrammeled by man" that "generally appears to have been affected primarily by the forces of nature." Therefore, wilderness is essentially unhindered, free from the actions of modern human control or manipulation. This quality is influenced by any activity or action intended to control or manipulate the components or processes of ecological systems. Actions that are taken to preserve or restore the natural quality often degrade the untrammeled quality, even when these actions are taken to protect resources, such as removing invasive plants or nonnative animals, or reducing unnatural fuel loads by cutting fuels or through management-ignited prescribed fires.
- *Natural* — The Wilderness Act states that wilderness is "protected and managed so as to preserve its natural conditions." Ecological systems within wilderness are substantially unaffected by modern civilization. This quality aims to preserve native species, patterns, and ecological and evolutionary processes, and to understand and learn from natural systems. This quality is degraded by such things as loss of native species, occurrence of nonnative species, alteration of ecological processes such as water flow or fire regimes, effects of climate change, and many other factors.
- *Undeveloped* — The Wilderness Act defines wilderness as "an area of primeval character and influence, without permanent improvements or human habitation…where man himself is a visitor who does not remain" and "with the imprint of man's work substantially unnoticeable." Wilderness retains its primeval character and influence. This quality is influenced by what are commonly called *Section 4(c) prohibited uses* — the presence of structures, installations, habitations, and aircraft landings, and the use of motor vehicles, motorized equipment, or mechanical transport. Removal of structures and avoiding these 4(c) prohibited uses preserves or improves this quality.
- *Solitude or a primitive and unconfined type of recreation* — The Wilderness Act states that wilderness offers "outstanding opportunities for solitude or a primitive and unconfined type of recreation." This quality is primarily about the opportunity for people to experience wilderness, and is influenced by factors that affect these opportunities. It provides for primitive recreation; the use of traditional skills; personal challenge, risk, and self-discovery; and freedom from constraints of modern life. This quality is preserved or improved by management actions that reduce visitor encounters, signs of modern civilization inside wilderness, facilities, and management restrictions on visitor behavior. In contrast, this quality is degraded by management actions that increase these restrictions.



Looking east from North Guard basin near East Lake

In addition to these four qualities, there are other values identified in the enabling legislation of the parks or wilderness that may contribute in a positive way to the overall concept of wilderness character. Wilderness Act Section 2(c)(4) states that a wilderness "may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value"; these may include paleontological features, cultural resources, or even mining structures that are of wilderness-enhancing historical value. It is important to capture these other, often intangible values within the wilderness character framework and within wilderness stewardship planning. Wilderness areas in these parks contain valuable historic and cultural features and scientific features. These features contribute to the wilderness character of the parks and are described in "Chapter 3: Affected Environment."

There are also intangible aspects, such as symbolic and spiritual meanings, that are often unique to a single wilderness area or to specific places within a wilderness.

To determine how wilderness character could be applied to enhance wilderness preservation in national parks, the NPS formed a Wilderness Character Integration Team in 2010. This team produced two seminal documents to provide additional NPS guidance: *Wilderness Stewardship Plan Handbook: Planning to Preserve Wilderness Character* (NPS 2014a) and *Keeping it Wild in the National Park Service: A User Guide to Integrating Wilderness Character into Park Planning, Management, and Monitoring* (NPS 2014b). Sequoia and Kings Canyon National Parks have used the guidance of both documents in developing this WSP.

GOALS AND OBJECTIVES

Goals and objectives are key elements of a wilderness stewardship plan, as they establish and provide the direction for the parks' wilderness management program and reflect the purpose and need for planning. Wilderness goals and objectives flow from law, policies, park and wilderness enabling legislation, GMP objectives, public input, and more. The following identify what the WSP needs to address to achieve long-term successful management and protection of wilderness:

- Preserve ecological, geological, scientific, educational, scenic, and historical values of wilderness, including culturally significant resources and paleontological resources within wilderness, as important and prominent values, consistent with the Wilderness Act, California Wilderness Act, and applicable planning guidance from the GMP.
- Manage archeological, historical, and ethnographic sites in a manner that is compatible with wilderness and historic-preservation laws.

- Preserve dark night skies.
- Preserve natural soundscapes.
- Work to reduce conflicts between user groups as well as between users and sensitive resources.
- Determine the types and levels of commercial services that will be allowed in wilderness and manage these services subject to applicable laws and policies.
- Foster an inspired and informed public and park staff who value preservation of the parks' wilderness.
- Promote the Leave No Trace© minimum-impact practices.
- Promote safety within the context of wilderness where users are expected to be self-reliant.

DESIRED CONDITIONS

Desired conditions are the natural and cultural resource conditions that the NPS aspires to achieve and maintain over time, and the conditions necessary for visitors to understand, enjoy, and appreciate those resources. In the context of a wilderness stewardship plan, *desired conditions* qualitatively describe an ideal condition of wilderness character. Some desired conditions may not be fully attainable due to factors unrelated to visitor use or the parks' management activities (e.g., due to external factors such as climate change and air pollution). However, the Wilderness Act requires that as a minimum, wilderness character be preserved from the time of designation, although Management Policies also allows for improvements to wilderness character. In this WSP, desired conditions are defined for the four primary qualities of wilderness character. More specific desired conditions are also provided under the qualities that relate specifically to visitor use management.

- The untrammeled quality of wilderness character would be preserved by limiting deliberate manipulation of ecological systems except as necessary to promote another quality of wilderness character.
- The natural quality of wilderness would be preserved by mitigating the impacts of modern civilization on ecosystem structure, function, and processes. The NPS aspires to minimize or localize adverse impacts caused by visitor use and administrative activities. In the wilderness, natural processes would dominate:
    - ecosystem structure and function
    - native biodiversity
    - water quality and quantity
    - decomposition, nutrient cycling, and soil forming processes
    - meadow and wetland productivity
    - fire regimes
    - soundscapes, dark skies, and viewsheds.

Additionally the NPS seeks to minimize adverse impacts caused by visitor use and administrative activities to cultural, historical, and pre-historical resources.

- The undeveloped quality of wilderness character would be preserved through the removal of installations that are unnecessary for the protection of other wilderness character qualities.

- Outstanding opportunities for solitude or primitive and unconfined recreation would be provided to support visitor use and enjoyment of the parks' wilderness areas in balance with the protection of other wilderness character qualities.
    - Visitors with diverse backgrounds and capabilities would have opportunities to use and be encouraged to enjoy wilderness;
    - Visitors would have opportunities to experience solitude, a state of being alone or feeling remote from society, although these opportunities could vary by location and time;
    - Visitors would have opportunities to participate in a variety of primitive recreation activities, characterized by non-motorized, non-mechanical travel and reliance on personal skill; primitive recreation activities would be managed to preserve other wilderness character qualities;
    - Visitors would have opportunities to recreate in an unconfined, self-directed manner, subject only to those regulations that are necessary to preserve wilderness character.

Key Elements

Because each alternative emphasizes different approaches to protecting wilderness character, alternative-specific objectives for the eleven planning elements were also developed. These can be found in "Chapter 2: Alternatives." These overarching element-specific objectives are:

- Visitor-use Levels — Visitor use and enjoyment of wilderness would be promoted while ensuring the preservation of wilderness character.
- Trails — The trail system would facilitate access for visitor use and enjoyment of the wilderness. Trails would be well suited to the types and levels of visitor use.
- Campfires — Visitors would have the opportunity to enjoy campfires where campfires are compatible with the protection of vegetation and downed wood resources.
- Food Storage — Native wildlife would subsist only on naturally obtained food, uninfluenced by the presence of human food.
- Human Waste Management — Human waste would not contaminate water or create unsanitary or unsightly conditions. Management of waste would not unduly impact the undeveloped quality.
- Party Size — Party size would be set at levels high enough to allow for a variety of experiences, but low enough to protect wilderness character from impacts associated with large groups.
- Camping/Campsites — Visitors would have the opportunity to choose camping locations, except in areas where camping would result in unacceptable impacts.
- Stock Use — Visitors would have opportunities to travel with stock, from day rides to multi-day trips, in a manner that ensures the protection of wilderness character.
- Administrative Structures and Development — Installations and developments would be the minimum necessary for the administration of wilderness.
- Frontcountry Facilities to Support Wilderness — Frontcountry facilities that support activities in wilderness would encourage and/or facilitate visitor use and enjoyment of wilderness.
- Commercial Services — Commercial services may be performed to the extent necessary for activities which are proper for realizing the recreational or other wilderness purposes of the areas and in a manner that ensures the preservation of wilderness character. Commercial services (wherein a service is performed for a fee or charge) would support visitor use and enjoyment of wilderness in a variety of appropriate ways.

Hockett Meadow Ranger Station

VISITOR CAPACITY AND VISITOR-USE MANAGEMENT

The Wilderness Act requires the NPS, and three other federal land management agencies, to administer designated wilderness areas "for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, [and] the preservation of their wilderness character . . ." The Act does not have an express requirement to determine or establish visitor capacity. However, NPS *Management Policies 2006* states: "The wilderness management plan will identify desired future conditions, as well as establish indicators [i.e., measures], standards, conditions, and thresholds beyond which management actions will be taken to reduce human impacts on wilderness resources" (6.3.4.2). NPS *Management Policies 2006* defines visitor capacity as "the type and level of visitor use that can be accommodated while sustaining the desired resource and visitor experience conditions in the park."

One component of this WSP/FEIS is to identify visitor capacities for managing visitor use and to identify ways to monitor for and address unacceptable impacts on park resources and visitor experiences. Visitor capacity includes managing all components of visitor use (levels, types, behavior, timing, and distribution), with an understanding that with any use comes some level of impact that must be accepted. It is the responsibility of the NPS, to determine what level of impact is acceptable and what actions are needed to keep impacts within acceptable limits.

Visitor capacity has been determined to be a useful means of protecting wilderness character currently and in the future, is consistent with NPS *Management Policies 2006*, and is an element of the comprehensive wilderness planning process as defined by the NPS *Wilderness Stewardship Plan Handbook: Planning to Preserve Wilderness Character*. Development of the WSP includes several steps to determine the kinds and amounts of visitor use that the Sequoia-Kings Canyon, John Krebs, and proposed wilderness in the parks could sustain without unacceptable impact on wilderness character. These steps are identified in appendix A.

The number of stock in wilderness is also considered to determine if a stock capacity level could be established in addition to an overall visitor capacity level. The number of stock is controlled by trailhead quotas, party-size limits on and off trail, visitor service-day limits placed on commercial services

(appendix B), and grazing-capacity limits placed on individual meadows and forage areas. In addition, stock use is considered as integral within the overall visitor-capacity framework.

The WSP follows the three basic steps of accepted visitor-capacity frameworks (from Manning 2011):

1. Define desired conditions to be maintained or achieved.
2. Determine appropriate measures and establish standards for acceptable levels. Measures are then monitored to ensure they remain within standard. The monitoring component of visitor capacity helps test the effectiveness of management actions and provides a basis for informed adaptive management of public use.
3. For those measures that may exceed established standards, apply adaptive management actions or practices to return the measure to standard to prevent degradation of wilderness character.

Visitor capacity decision making is a continuous process that evaluates the results of monitoring efforts based on identified measures and standards. Management actions are taken when needed to control and maintain the impacts to remain within standard. The measures and standards included in this WSP would generally not change in the future. However, as monitoring of conditions in the wilderness of Sequoia and Kings Canyon National Parks continues, managers may decide to modify, add, or delete measures if better techniques/approaches are found to measure important changes in resource and social conditions. These changes related to measures, standards and monitoring, would be communicated to the public with a clear rationale to enable the public to provide input and track progress (see appendices A, B, C, and D for more thorough details on visitor capacity and wilderness character monitoring).

BACKGROUND

Prior to designation of the Sequoia-Kings Canyon Wilderness in 1984, the terms *wilderness* and *backcountry* were often used interchangeably. Two plans developed in 1983 and updated in 1986, the BMP and the SUMMP, used the word *backcountry* to refer to all remote areas, including designated wilderness. The scope of these older plans, which included management of visitor use, stock use, and various resource-protection efforts, bears strong similarity to contemporary WSPs. However, the plans did not address certain issues that are specific to congressionally designated wilderness, such as applying the minimum-requirement concept to management actions, managing in a manner that preserves the whole of wilderness character, and establishing "extent necessary" for commercial services. The NPS recognized, as early as the late 1980s, that a future wilderness plan would need to reflect both the language and the statutory requirements of the Wilderness Act of 1964 (16 USC § 1131 et seq., PL 88-577). More information on the BMP and SUMMP can be found in the section "Previous Wilderness Planning Efforts."

In 1993, the NPS released an environmental assessment (EA) supporting an increase in the maximum stock-party size from 20 to 25 head (*stock* includes horses, burros, mules, and llamas), to align NPS party-size limits with those of surrounding wilderness areas managed by the United States Forest Service (USFS) and Yosemite National Park. This plan was subsequently litigated (High Sierra Hikers Association v. Kennedy [1995 WL 382369, N.D. Cal.]) resulting in a return to the lower stock-party size in 1995. The central deficiency, reliance on an inadequate EA rather than developing a more detailed and thoroughly analyzed EIS, again pointed to the need for a comprehensive WSP.

In 1996, the NPS launched a public-involvement effort to kick off a comprehensive wilderness-planning effort. Several public-scoping workshops were hosted, and six internal workshops were held with park employees, to gather information on issues and desired conditions in wilderness. In the spring of 1997, the parks announced the intent to prepare an EIS for a wilderness management plan. The Notice of Intent

was published April 30, 1997 (*Federal Register* 23482, April 30, 1997). This was followed by the development and distribution in May 1998 of a "wilderness workbook" designed to obtain feedback from the public about wilderness issues, concerns, and possible management solutions (NPS 1998a).

However, after receiving national guidance on planning priorities, park managers determined that the wilderness-planning process would be suspended until a GMP was prepared for the parks. This intensive process was initiated in October 1997 and culminated with a ROD in September 2007. The GMP reaffirmed the need to develop a wilderness plan.

In the fall of 2009, the High Sierra Hikers Association brought suit against the NPS for failing to comply with the NPS Organic Act of 1916 (16 USC 1, 204), NEPA, the Wilderness Act, and the Administrative Procedure Act (PL 79-404, 60 Stat. 237) in the development of the GMP. The complaint revolved primarily around commercial stock services in wilderness. The court found that the GMP did not violate the NPS Organic Act, NEPA, or the Administrative Procedures Act. However, the court found that the GMP was deficient for failing to contain a specialized finding of necessity regarding the type and amount of commercial services that may be performed in park-managed wilderness (High Sierra Hikers Association v. U.S. Department of the Interior, 848 F. Supp. 2d 1036 [N.D. Cal. 2012]). The court directed the NPS to include such a finding in a WSP, which had been re-initiated with a Notice of Intent (*Federal Register* 23335, April 26, 2011).

The court also "vacate[d] all portions of the GMP and ROD which provide programmatic guidance regarding the type or level of commercial stock services necessary in the [parks'] wilderness area or direction as to the need, appropriateness, or size of developments, structures, or facilities used completely or partially for commercial stock services. This includes all references to the future development or installation of stock facilities" (High Sierra Hikers Association v. U.S. Department of the Interior, 848 F. Supp. 2d 1046 [N.D. Cal. 2012]). The court order further provided that the WSP could consider both frontcountry and backcountry issues in the WSP, and that the WSP "must consider imposing limits on group size, number of stock, trail suitability for various stock use types and the necessity of additional stock use facilities."

Soon after the court order was issued, Congress enacted the Sequoia and Kings Canyon Backcountry Access Act (PL 112-128), which was signed into law on June 5, 2012. The Backcountry Access Act directs the NPS to complete the WSP by June 5, 2015. The Act also invalidated the portion of the court order that had imposed an interim limit on the number of stock use nights that the NPS could authorize prior to completing a WSP. During the preparation of the WSP, the Act allows the NPS to authorize commercial services in wilderness at levels deemed appropriate by the Secretary.

LEGAL REQUIREMENTS

This section summarizes the legal background in which this current wilderness planning effort is undertaken.

The NPS mission, along with other applicable laws, policies, and plans, directs wilderness management within the parks: "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations," (NPS Organic Act of 1916) and "The National Park Service preserves unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations" (NPS *Management Policies 2006*).

The following laws, policies, and plans, in addition to those identified in the "Goals and Objectives" section, provide direction for wilderness management and are relevant to the planning effort for this WSP/FEIS.

In addition to determining the environmental consequences of implementing the preferred and other alternatives, NPS *Management Policies 2006* (section 1.4) requires analysis of potential effects to determine whether proposed actions would impair park resources and values. As required, an impairment determination will be included in the ROD for the plan.

Definition of Key Terms

Commercial Enterprise *– For the purposes of this plan, the Bearpaw Meadow High Sierra Camp and the Pear Lake Ski Hut are the only commercial enterprises in the lands managed as wilderness in Sequoia and Kings Canyon National Parks (pursuant to the House Report 98-40).*

Commercial Service *– An activity in which any duties or work are provided by one person or entity for another person or entity in exchange for money; it includes diverse services commonly associated with guiding and outfitting.*

Wilderness legislation as it pertains to Sequoia and Kings Canyon National Parks is presented in appendix E. Additional wilderness regulations and permit conditions are presented in appendix F.

WILDERNESS ACT OF 1964

16 USC Sections 1131-1136, September 3, 1964, as amended 1978 — The Wilderness Act established the National Wilderness Preservation System (NWPS). More than 100 million acres have been included in the NWPS. Wilderness is a federal designation and the highest level of protection for wildlands that are found eligible for inclusion. By definition, wilderness is, "An area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or habitation, and which:

- generally appears to have been affected primarily by the forces of nature, with man's imprint substantially unnoticeable;
- has outstanding opportunities for solitude or a primitive and unconfined type of recreation;
- has at least 5,000 acres of land or is of sufficient size to make practicable its preservation; and
- may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value."

Wilderness lands are managed under the provisions of the Wilderness Act of 1964 "for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and to provide for the protection of these areas and the preservation of their wilderness character" (sec. 2(a)).

Commercial Services — The Wilderness Act prohibits commercial enterprise but allows commercial services "to the extent necessary for activities which are proper for realizing the recreational or other wilderness purposes of the [wilderness] areas." The parks permit (through a formal process) guided hiking and mountaineering trips and hired stock trips throughout much of wilderness. This WSP/FEIS includes the specialized finding to determine which commercial services are appropriate in wilderness and to what extent they would be authorized (appendix B).

CALIFORNIA WILDERNESS ACT OF 1984

Public Law 98-425 — September 28, 1984 — The California Wilderness Act of 1984 (PL 98-425) authorized the addition of more than three million acres of land within the State of California, to the NWPS established by the Wilderness Act of 1964.

> NATIONAL PARK WILDERNESS - SEC. 106: The following lands are hereby designated as wilderness in accordance with section 3(c) of the Wilderness Act (78 Stat. 890; 16 USC 1132(c)) and shall be administered by the Secretary of the Interior in accordance with the applicable provisions of the Wilderness Act.
>
> (2) Sequoia and Kings Canyon National Parks Wilderness, comprising approximately seven hundred and thirty-six thousand nine hundred and eighty acres; and potential wilderness additions comprising approximately one hundred acres, as generally depicted on a map entitled 'Wilderness Plan – Sequoia-Kings Canyon National Parks – California', numbered 102- 20, 003-E and dated July 1980, and shall be known as the Sequoia-Kings Canyon Wilderness. (pp. 9, California Wilderness Act of 1984)

OMNIBUS PUBLIC LAND MANAGEMENT ACT OF 2009

Public Law 111-11 — March 30, 2009 — On March 30, 2009, the Omnibus Public Land Management Act of 2009 (PL 111-11) designated 52 new wilderness areas and added acreage to 26 existing areas in the United States, adding a total of more than 2 million acres to the NWPS.

In Sequoia and Kings Canyon National Parks, this act established the John Krebs Wilderness and expanded the Sequoia-Kings Canyon Wilderness.

> SEC. 1902, DESIGNATION OF WILDERNESS AREAS:
>
> In accordance with the Wilderness Act (16 USC 1131 et seq.), the following areas in the State are designated as wilderness areas and as components of the NWPS:
>
> (1) JOHN KREBS WILDERNESS —
>
> (A) DESIGNATION — Certain land in Sequoia and Kings Canyon National Parks, comprising approximately 39,740 acres of land, and 130 acres of potential wilderness additions as generally depicted on the map numbered 102/60014b, titled ''John Krebs Wilderness'', and dated September 16, 2008.
>
> (2) SEQUOIA-KINGS CANYON WILDERNESS ADDITION — Certain land in Sequoia and Kings Canyon National Parks, California, comprising approximately 45,186 acres as generally depicted on the map titled ''Sequoia-Kings Canyon Wilderness Addition'', numbered 102/60015a, and dated March 10, 2008, is incorporated in, and shall be considered to be a part of, the Sequoia-Kings Canyon Wilderness.

SEQUOIA AND KINGS CANYON BACKCOUNTRY ACCESS ACT OF 2012

The Sequoia and Kings Canyon Backcountry Access Act (PL 112-128), enacted on June 5, 2012, authorizes the Secretary of the Interior to allow the continuation of commercial stock services within the parks' wilderness until an "analysis and determination required under the Wilderness Act" is completed, or for four years, whichever is sooner. The act also directs the NPS to complete a WSP by June 5, 2015.

HIGH SIERRA HIKERS ASSOCIATION V. U.S. DEPARTMENT OF THE INTERIOR, 2012 U.S. DIST. LEXIS, 74124 (N.D. CAL.)

This court order, as described in the "Background" section, vacated the portions of the parks' GMP that provided programmatic guidance regarding the type or level of commercial stock services in wilderness

as well as those portions of the GMP that provided guidance on facilities used to fully or partially support commercial stock services. In compliance with this court order, the NPS has not used these provisions of the GMP as guidance for this plan.

NATIONAL PARKS OMNIBUS MANAGEMENT ACT OF 1998

The National Parks Omnibus Management Act of 1998 (P.L. 105-391) directs the Secretary of the Interior "to assure that management of units of the National Park System is enhanced by the availability and utilization of a broad program of the highest quality science and information." It established the framework for fully integrating natural resource monitoring into the management process of the NPS. Section 5934 of the Act requires the Secretary of the Interior to develop a program of "inventory and monitoring of NPS resources to establish baseline information and to provide information on the long-term trends in the condition of the National Park System resources." The message of the Parks Omnibus Management Act of 1998 was reinforced by Congress in the FY 2000 Appropriations bill.

PRIVATE LANDS, NON-CONFORMING USES, AND RETAINED RIGHTS

Bearpaw Meadow High Sierra Camp in Sequoia National Park

The private lands, non-conforming uses, and retained rights on lands adjacent to or surrounded by wilderness, and therefore most relevant to this WSP/FEIS, are summarized below:

Two inholdings (private lands surrounded by public lands) are present in the parks' wilderness. The first consists of several parcels of land owned by multiple owners, comprising 12 acres with five cabins near Oriole Lake in Sequoia National Park. Oriole Lake and adjacent park lands are designated wilderness, as is the primitive road that provides access to these private lands. The other inholding with land adjacent to wilderness is a private-land parcel of approximately 17 acres on Empire Mountain in the Mineral King area.

The historic Pear Lake Ski Hut is used as a ranger station during the summer, and is operated as a ski hut in the winter months by the parks' cooperating association. The California Wilderness Act of 1984, and its accompanying House of Representatives Committee Report 98-40 (1983), provided for continued winter operation of the Pear Lake Ski Hut unless this nonconforming use is deemed to have unacceptable wilderness impacts. The five-acre area is categorized as a DPWA based on the nonconforming use of a commercial enterprise (winter ski-hut operation) in wilderness.

The Bearpaw Meadow High Sierra Camp, operated during the summer months, is a commercial lodging enterprise. A contracted concessioner operates the camp within a 32-acre DPWA, per the California Wilderness Act (1984) and its accompanying House of Representatives Committee Report 98-40 (1983).

Access to and maintenance of hydrologic, meteorological, and climatological devices, facilities, and associated equipment (e.g., snow pillows and storage sheds) throughout the parks' wilderness is allowed (House of Representatives Committee Report 98-40; and PL 111-11, Sec. 1903 Administration of Wilderness Areas). These devices and facilities are used by the California Department of Water Resources to determine water content of snow for downstream agricultural and domestic uses and to predict flood potential.

The operation and maintenance of four constructed dams to hold and regulate water runoff for electrical-power generation (a total of 112 acres of lands and impounded surface water in the Mineral King area) is authorized per Public Law 108-447 (118 Stat. 3068, December 8, 2005, amending Public Law 99-338, 100 Stat. 641, June 19, 1986). In the early 1900s, Congress authorized the development of hydroelectric facilities on forks of the Kaweah River adjacent to and within Sequoia National Forest (in what is now wilderness). These facilities are owned and operated by the Southern California Edison Company. In 2006, the NPS issued a 10-year special-use permit that allows the continued maintenance and operation of these hydroelectric facilities. The NPS is authorized to issue two subsequent 10-year permits for these facilities. Southern California Edison Company's current special-use permit is valid until September 8, 2016.

Two utility-powerline corridors are present in designated potential wilderness additions. The two rights-of-way are a 60-foot-wide corridor running from 0.5 miles northeast of Moro Rock summit south to the Middle Fork Road, and a 60-foot-wide corridor on the west side of Kings Canyon National Park from near Lookout Peak to the Cedar Grove vicinity (approximately 12 and 22 acres respectively).

RELATIONSHIP TO OTHER PLANNING

This section includes previous wilderness plans, existing planning efforts, and planning efforts of adjacent wilderness areas that are relevant to wilderness management at the parks.

PREVIOUS WILDERNESS PLANNING EFFORTS

A description of the previous wilderness planning efforts at Sequoia and Kings Canyon National Parks can be found below.

General Management Plan (2007) — The GMP and EIS process was initiated in October 1997 and culminated with a ROD in September 2007. It commits the parks to preparing a tiered plan for managing wilderness resources, and explains that this tiered plan would be an implementation-level plan that focuses on both the parks' wilderness stewardship overall and on stock use within wilderness.

The GMP establishes a vision for what these national parks should be. The GMP:

- establishes the parks' mission and defines the parks' significance (the significance is presented in the next section of this chapter);
- determines the appropriate amounts of visitation, types of experiences, and facilities;
- establishes broad desired conditions for natural and cultural resources and for visitor experiences;
- provides a management framework for the next 15 to 20 years; and
- calls for the development of a wilderness plan.

It is a function of the GMP to prescribe desired future conditions. Because the GMP is a conceptual plan, it does not assess whether it is feasible to achieve those prescribed conditions within the life of the plan. It

identifies what the parks should ultimately provide for resource protection and visitor experience. The GMP suggests the types and kinds of actions needed to reach the desired condition, but does not specify a course of action; that is the role of the strategic plan, implementation plans, and annual performance/work plans. The determination of whether each of the prescribed conditions will be achieved is also left up to subsequent plans.

The GMP affirms the need and desire of the parks to develop a wilderness plan. The purposes of the WSP include serving as an implementation-level guide to applying the GMP's long-term vision for protecting wilderness character, and to enhance established programs and actions deemed necessary for managing these areas as wilderness.

Backcountry Management Plan (1986) — The parks' current BMP was approved in 1986 and provides direction for managing wilderness and backcountry areas. The goal of the plan is to provide for the enjoyment of the parks while protecting park resources, the natural processes which shape them, and the quality of experience distinctive to them. The plan discusses the approach to backcountry/wilderness management necessary for the achievement of the goal of the plan, and provides an overview of the facilities and resources in the backcountry/wilderness. The plan also describes the management objectives for various activities in the backcountry/wilderness and the policies and actions required to implement them. The WSP will replace the BMP.

Stock Use and Meadow Management Plan (1986) — Recognizing that stock has distinctive effects on park resources, a SUMMP was developed concurrently with the 1986 BMP. Since 1986, stock use has been managed and regulated by the SUMMP. The SUMMP discusses the character of the parks' meadow resources and reviews the history of stock use and management. It provides the basis for use patterns and levels, and specific management prescriptions for those areas where grazing is allowed. It establishes controls to prevent areas open to grazing from further induced change in plant composition, density, cover, and/or vigor. The plan ensures that a series of meadows, including representatives of all types within the parks, be protected from grazing to provide opportunities to compare ungrazed meadows with grazed meadows as part of the monitoring program, provide opportunity for other scientific study of meadows that are not affected by stock grazing, and to provide opportunity for park visitors to observe a representative sample of meadows, in proximity to general travel routes, that are not affected by grazing. The SUMMP also establishes a monitoring program to provide continuing information about the effects of stock on the resources of the parks, so that guidelines can be modified to protect park resources or allow additional use to occur. This WSP will replace the SUMMP.

EXISTING AND ONGOING PLANNING EFFORTS RELEVANT TO THE WILDERNESS STEWARDSHIP PLAN

This section includes a summary of existing and ongoing park plans that are pertinent to the WSP/FEIS.

Aquatic/Water Resources Management Plan (1989) — The Aquatic/Water Resources Management Plan describes park water resources information base and problems, along with park-specific objectives for management of aquatic and water resources. Data-collection efforts include developing water quality monitoring programs, identifying impacts in both frontcountry and wilderness areas, and monitoring species. Actions include managing visitor use, managing wet meadows, mitigating acidic deposition, and fostering public education, as well as conducting research. The parks' Resources Management Plan and GMP are both largely consistent with objectives identified in the 1989 Aquatic/Water Resources Management Plan. In addition, the Water Resources Information and Issues Overview Report (2005), prepared jointly by the NPS Water Resources Division and parks staff, updated the parks' water resources information base, identifies current issues, and provides considerations for future actions. Components of the 2005 report are used in the development of time-sensitive management strategies and actions relating

to water resource issues, in concert with emerging implementation plans including the Restoration of Native Species in High Elevation Aquatic Ecosystems Plan, the Resources Stewardship Strategy, and this WSP.

Bear Management Plan (1992) — Black bears are an important wildlife resource generally found below timberline throughout both parks. Although most of the bears subsist on natural foods, others learn to forage for human foods. In the front-country, human food becomes available to bears from several sources: intentional feeding by visitors, improper use of bear-proof garbage cans, inadequate garbage-collection schedules, inadequate design of garbage and/or food-storage facilities, and food left unattended. Because of their large home ranges, bears that become food-conditioned in front-country areas can travel to wilderness areas. Human food becomes available to bears in wilderness primary through insufficient food storage techniques that are easily overcome by bears (e.g., storing in backpacks, hanging in trees, etc.), or through improper use of food storage lockers and portable bear-resistant containers. Once bears discover human food, they often alter their wild behavior and foraging habits to obtain it, and closely approach people. The ensuing conflicts between bears and humans result in damaged property, personal injuries, and destruction of some bears. The goal of the Bear Management Plan is to restore and perpetuate the natural distribution, ecology, and behavior of black bears, free of human influences. Bear-management objectives include: eliminating human-food sources and human activities that may significantly modify bear populations; minimizing and mitigating human/bear interactions that result in a learned orientation of bears toward people, a negative experience for people, and/or a need to destroy bears; and providing opportunities for visitors to understand and appreciate the black bear in its natural environment.

Cave Management Plan and Environmental Assessment (in process) — More than 250 caves have been found within Sequoia and Kings Canyon National Parks, most of them within designated wilderness. The purpose of the Cave Management Plan and EA is to provide a comprehensive plan that considers future management and protection of cave and karst resources, while allowing safe and controlled public use and enjoyment of caves in accordance with law, policy, and regulations. It is the intent of the plan and assessment to identify a range of appropriate tools and management actions that could be used to achieve the plan's purpose and to ensure adherence to wilderness mandates and policies.

Comprehensive Plan for Resource Education (2006) — Even more than in the past, successful park management now requires a well-informed public that understands and supports the parks' mission and management. With the parks contending with a broader array of issues (such as global climate change) than ever before, interpretation for park visitors is increasingly seen as an important element in a larger initiative called "resource education." Resource education is usefully defined as an integrated program of communication initiatives intended to involve not only visitors but also park neighbors, interested parties, and the general public in relevant park issues. The general goals of resource education are: (1) strengthening public interest in the parks; (2) increasing public awareness of the NPS and its mission; (3) generating increased awareness of the accelerating problems facing parks; and (4) building public support for NPS management initiatives and programs as it works to preserve parks in the 21st century.

The GMP establishes long-term goals for the parks to pursue over the next several decades. The Sequoia and Kings Canyon National Parks Comprehensive Plan for Resource Education (CPRE), on the other hand, is intended to provide guidance for a shorter period of only 5 to 10 years. The CPRE identifies and pursues those portions of the GMP vision that seem most appropriate and possible for the life of this plan. The CPRE defines the role of interpretation and education at the parks, identifies appropriate methods for pursuing this work, calls for and defines a park-specific Comprehensive Interpretive Plan, and provides a general vision of the role of resource education in the parks.

Fire and Fuels Management Plan (2003, with limited annual and comprehensive five-year updates [2013]) — Wildland fire has long been recognized as one of the most significant natural processes affecting and shaping Sierra Nevada ecosystems. Virtually all vegetation communities show evidence of fire dependence or tolerance. At the same time, wildland fire has the potential to threaten human lives, health, and property. Consequently there is a need to manage wildland fire to reduce threats, while at the same time restoring and/or maintaining its function as a natural process. The parks have developed a Fire and Fuels Management Plan (NPS 2013a) to provide long-term direction for achieving goals related to human safety and ecosystem management. The plan also satisfies the requirements and direction provided in policy, legislative authority, park-purpose statements, higher-level planning documents, and natural/cultural resource-management objectives with regard to wildland fire.

Natural and Cultural Resources Management Plan (1999) and Resource Stewardship Strategy (in process) — The Resources Management Plan (RMP) serves as the foundation for the parks' resource stewardship programs. The purpose of the RMP is to propose and justify a coordinated program to identify, protect, preserve, and enhance the natural and cultural resources of the parks. This plan draws upon appropriate legislation and NPS policy as well as on knowledge of the resources of the parks and their special needs.

The parks are updating the RMP with a Resources Stewardship Strategy (RSS) (expected completion in 2016). This will recommend science- and scholarship-based approaches to achieve and maintain the desired conditions of the parks' natural and cultural resources. It will focus on ways to conserve natural and cultural resources in an era of rapid change and uncertain conditions. The RSS will apply to all areas of the parks. The conservation goals outlined in the strategy will adhere to the law and the mission of the NPS and use the best available science to adaptively manage for the long term. Strategies to conserve native regional biodiversity and ecological integrity, and to preserve cultural values, will be identified in the RSS. In addition, future implementation plans would be developed based on the direction identified by the RSS.

Restoration of High Elevation Aquatic Ecosystems Plan and EIS (in process) — The purposes of this Restoration Plan are: 1) to guide NPS management actions to restore and conserve native-species diversity and ecological function to selected high-elevation aquatic ecosystems that have been adversely impacted by human activities (primarily the introduction of nonnative fish), and 2) to increase the resistance and resilience of these species and ecosystems to human-induced environmental modifications such as nonnative fish, disease, and climate change. Once completed, the Final Restoration Plan/Final EIS would be implemented over a period of 25 to 35 years, with an internal evaluation of management effectiveness scheduled every 5 to 10 years. The plan is expected to be completed in 2016 and will include a comprehensive discussion of appropriate management tools for restoring high-elevation aquatic ecosystems in the parks' wilderness.

PLANNING EFFORTS OF ADJACENT LANDS AND WILDERNESS AREAS

Wilderness and related plans of adjacent USFS lands and Yosemite National Park are described in this section. Three national forests are immediately adjacent to the parks: the Sierra, Sequoia, and Inyo National Forests. Each of these has shared wilderness boundaries with Sequoia and Kings Canyon National Parks. Coordination with the adjoining USFS wilderness areas and Yosemite National Park was ongoing throughout the WSP/FEIS process and will continue in the future.

United States Forest Service Wilderness Management Plan (Inyo and Sierra National Forests) — The Inyo and Sierra National Forests released the ROD for the Final EIS/Wilderness Management Plan for the Ansel Adams, John Muir, and Dinkey Lakes wildernesses in 2001. This document is a joint plan for these forests' wilderness areas and replaces management direction in the Land Resource Management

Plans for the Ansel Adams, John Muir, and Dinkey Lakes wildernesses. The Wilderness Management Plan addresses issues associated with visitor use, commercial activities, and resource conditions. Key elements of the management direction for these wildernesses include commercial and non-commercial trailhead quotas, commercial services, wilderness permits, managing different areas for different levels of use, day use, system and user-created trails, single-use trails, campsite densities and conditions, closures for campfires, food storage, recreation-stock forage, structures, and cultural values.

Sierra Nevada Forest Plan Supplemental Environmental Impact Statement (2010) — Stretching along a north-south axis for more than 400 miles, the Sierra Nevada forms one of the longest continuous mountain ranges in the lower 48 states. The USFS manages nearly 11.5 million acres of land under the Sierra Nevada Forest Plan. In January 2004, the USFS issued the Sierra Nevada Forest Plan Amendment (SNFPA), which applies to eleven national forests in the Sierra Nevada to improve the protection of old-growth forests, wildlife habitats, watersheds, and communities in the Sierra Nevada and on the Modoc Plateau. The amendment is a Land and Resource Management Plan formulated and promulgated pursuant to the National Forest Management Act (16 USC §1604). The National Forest Management Act requires the USFS to provide for and to coordinate multiple uses of the national forests, including "outdoor recreation, range, timber, watershed, wildlife and fish, and wilderness" (16 USC §1604(e)(1)).

In 2010, a supplemental EIS (SEIS) was released to address two orders issued by the Eastern District Court of California in 2009. This supplemental document provides an objective comparison of all the alternatives considered in detail in the 2004 SNFPA Final SEIS, including those carried forward from the 2001 SNFPA Final SEIS. It also compares the alternatives in terms of the objectives of reducing stand density for forest health, restoring and maintaining ecosystem structure and composition, and restoring ecosystems after severe wildfires and other large catastrophic events.

Giant Sequoia National Monument Plan (2012) — The Giant Sequoia National Monument is located adjacent to Sequoia and Kings Canyon National Parks and covers 328,315 acres administered by the USFS within Sequoia National Forest. It was created by presidential proclamation on April 15, 2000. The plan provides strategic direction at the broad program level for managing the monument and its resources over the next 10 to 15 years. It includes the direction required by the proclamation and it replaces, in its entirety, all previous management direction for the monument — including direction in the 1988 Sequoia National Forest Land and Resource Management Plan for this part of the Sequoia National Forest. It is the single comprehensive management plan for this area. Parts of the Golden Trout and Monarch wilderness areas are within the monument; therefore, this planning document is important to consider in the WSP.

Sierra, Sequoia, and Inyo National Forest Assessments and Forest Plan Revisions (in process) — In December 2013, the USFS released the Final National Forest Assessments for the Sierra, Sequoia, and Inyo National Forests. These assessments resulted from the 2012 Planning Rule to provide a process and structure to create local land- and resource-management plans for national forests in California. The rule establishes an ongoing, three-phase process: 1) assessment; 2) plan development or revision; and 3) monitoring, and is intended to create understanding around landscape-scale management. It takes an integrated and holistic approach that recognizes the interdependence of ecological processes with social and economic systems. The assessments are designed to rapidly evaluate readily available existing information about relevant ecological, economic, and social conditions, trends, and sustainability and their relationship to the current land and resource management plan within the context of the broader landscape. The assessments are not decision-making documents, but provide current information on planning topics. The next steps in the forest plans revision process include identifying need-to-change and desired conditions for the forests as well as completing an EIS. The need-to-change identifies the areas that need a change in direction from the current management. The preliminary need-to-change is based on what is important to people; threats to resources; undesirable trends in social, economic, or ecological sustainability; and a need to correct current direction in plans that are not meeting needs to provide

benefits sustainably. Desired conditions (or goals) set forth the desired social, economic, and ecological goals of the USFS. The forest plans are anticipated to be completed in early 2016.

Yosemite National Park Wilderness Plan (future) — Yosemite National Park has begun the process of updating their existing Wilderness Management Plan. Sequoia and Kings Canyon National Parks and Yosemite National Park have much in common in regard to wilderness resources and use. During the development of this WSP/FEIS, several meetings were held between wilderness, planning, and resource staffs of these NPS units. The intent was to identify common issues and seek to devise common approaches to ensure as much consistency as possible in wilderness planning and management. Sequoia, Kings Canyon, and Yosemite National Parks are moving forward in a coordinated manner and will seek consistent management approaches. Yosemite National Park will likely be initiating wilderness planning in 2015.

PURPOSE AND SIGNIFICANCE OF THE PARKS

An essential part of the planning process is understanding the purpose, significance, and mission of the parks for which this WSP/FEIS is being prepared. Along with the NPS Organic Act, the enabling legislation for Sequoia and Kings Canyon National Parks provides the legal basis of the parks. The parks' GMP outlines the purpose, significance, and park-specific mission and establishes overall management direction.

ENABLING LEGISLATION

Enabling legislation is the statute that establishes a national park. Enabling legislation often describes the parks' purposes — a description of the special attributes that caused the area to be set aside for protection and enjoyment.

Sequoia National Park was established as the nation's second national park on September 25, 1890 (16 USC 41, 26 Stat. L., 478). The primary purpose for establishing the park is described in the act's preamble:

> Whereas, the rapid destruction of timber and ornamental trees in various parts of the United States, some of which trees are the wonders of the world on account of their size and limited number growing, makes it a matter of importance that at least some of said forests should be preserved.

The legislation also stipulated that Sequoia National Park is to be a place "dedicated and set apart as a public park, or pleasuring ground, for the benefit and enjoyment of the people," and it is to be managed "for the

Young and mature Sequoias

preservation from injury of all timber, mineral deposits, natural curiosities or wonders . . . [and for] their retention in their natural condition."

One week later, on October 1, 1890, legislation was enacted that nearly tripled the size of Sequoia National Park and established General Grant National Park (26 Stat. L., 650). This legislation extended the same protection to these new areas.

An act of July 3, 1926 (16 USC 688, 44 Stat. L., 818) again enlarged Sequoia National Park and instructed the secretary of the interior to establish regulations aimed at "the freest use of said park for recreational purposes by the public and for the preservation from injury or spoliation of all timber, natural curiosities, or wonders within said park and their retention in their natural condition . . . and for the preservation of said park in a state of nature so far as is consistent with the purposes of this Act."

Kings Canyon National Park was established by an act on March 4, 1940, absorbing General Grant National Park lands (16 USC 80, 54 Stat. L., 41). One purpose of the park included in the enabling legislation was "to insure the permanent preservation of the wilderness character of the Kings Canyon National Park." An act of August 6, 1965 (79 Stat L., 446, PL 89–111), added the Kings Canyon proper (the canyon of the South Fork of the Kings River, also known as the Cedar Grove area) and Tehipite Valley to Kings Canyon National Park and instructed that these lands be managed "subject to all the laws and regulations applicable to such park."

The National Parks and Recreation Act of November 10, 1978 (PL 95-625), added USFS lands in the Sequoia National Game Refuge to Sequoia National Park to "assure the preservation . . . of the outstanding natural and scenic features of the area commonly known as the Mineral King Valley . . . and enhance the ecological values and public enjoyment of the area."

In 2000, PL 106-574 authorized the addition of the Dillonwood sequoia grove to Sequoia National Park. This area was officially added on December 4, 2001, as a result of fundraising efforts by the Save the Redwoods League and a major contribution from the Wildlife Conservation Board, an agency affiliated with the California Department of Fish and Wildlife. The 1,518-acre tract has 1,180 acres of sequoia groves and is contiguous with the Garfield Grove on what was the southern boundary of Sequoia National Park. This addition protects a major sequoia grove and enhances opportunities for public enjoyment related to the parks' purposes.

PARKS' PURPOSES

Sequoia and Kings Canyon National Parks are two separate national parks which share miles of boundary and are managed as one NPS unit. The purpose of Sequoia and Kings Canyon National Parks, as defined in the parks' GMP, is as follows:

- Protect the greater Sierran ecosystem – including the sequoia groves and high Sierra regions of the parks – and its natural evolution forever.
- Provide appropriate opportunities to present and future generations to experience and understand park resources and values.
- Protect and preserve significant cultural resources.
- Champion the values of national parks and wilderness.

PARKS' SIGNIFICANCE

Park-significance statements capture the essence of a national park's importance to the natural and cultural heritage of the United States. Significance statements do not inventory the parks' resources; rather, they describe the parks' distinctiveness and help place the parks within regional, national, and international context. Defining the parks' significance helps managers make decisions that preserve the resources and values necessary to accomplish the purpose of the national park. Sequoia and Kings Canyon National Parks are significant because they contain the following resources (NPS 2007a):

- the largest giant sequoia trees and groves in the world, including the world's largest tree – the General Sherman Tree;
- an extraordinary continuum of ecosystems arrayed along the greatest vertical relief (1,370 to 14,494 feet in elevation) of any protected area in the lower 48 states;
- the highest, most rugged portion of the high Sierra, which is part of the largest contiguous alpine environment in the lower 48 states;
- magnificent, deep, glacially carved canyons, including Kings Canyon, Tehipite Valley, and Kern Canyon;
- the core of the largest area of contiguous designated wilderness in California, the second largest in the lower 48 states;
- the largest preserved southern Sierran foothills ecosystem;
- more than 250 known caverns, many inhabited by cave wildlife that is found nowhere else; and
- a wide spectrum of prehistoric and historic sites documenting human adaptations in their historic settings throughout the Sierran environments.

The purpose and significance statements recognize the parks' responsibility to manage legally designated wilderness within the boundaries, as well as recognize the significance of the parks' wilderness as a component of a larger, interagency wilderness area.

PARKS' MISSION

The mission of the parks, based on the mission of the NPS as defined in the NPS Organic Act, is "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." The parks' mission statement articulates the broad ideals and vision that NPS is striving to achieve within the parks:

> The mission of Sequoia and Kings Canyon National Parks is to protect forever the greater Sierran ecosystem – including the sequoia groves and high Sierra regions of the parks – and its natural evolution, and to provide appropriate opportunities to present and future generations to experience and understand park resources and values.

SCOPE OF THE PLAN

This section includes a summary of the public comment process for scoping and for the preliminary draft alternatives. A summary of the comments from the public is also presented.

PUBLIC SCOPING COMMENTS

To include the public in the planning process, the NPS used a variety of methods. First, information about the Wilderness Stewardship Plan and Draft Environmental Impact Statement (WSP/DEIS) was added to the parks' public website starting in late 2010 to inform the public of the upcoming plan. The parks used the NPS Planning, Environment, and Public Comment (PEPC) website to provide the public with background materials and information about the upcoming planning process. The first news release with information about the WSP/DEIS was issued on March 30, 2011. In addition, the NPS used social media such as Facebook and Twitter to reach out to the public and provide information on public meetings and the scoping process.

The public was notified of the upcoming scoping period and public meetings for the WSP/DEIS first in a letter dated March 30, 2011. Notifications were sent by U.S. Postal Service mail (341) or by email (382) to individuals, businesses, interest groups, agencies, and tribal groups. The Notice of Intent to prepare an EIS was published on April 26, 2011, in the *Federal Register* (76 FR 23335-23337). The NPS issued a public scoping newsletter on April 11, 2011, and issued subsequent news releases on April 20, 2011, to remind the public about upcoming public meetings, and on May 5, 2011 to remind the public about the public scoping opportunity (all scoping materials are included in appendix G). The newsletter included a description of the proposed WSP, the need for action, goals of the scoping process, and information on the planning process. The newsletter also provided details on upcoming public scoping meetings and about how to comment during the public scoping period. This newsletter was sent to individuals, businesses, agencies, and organizations, and a news release was issued inviting the public to comment.

Five public scoping meetings were held in California in 2011: Fresno (April 25), Oakland (April 26), Bishop (April 27), Los Angeles (April 28), and Visalia (April 29). Each meeting began with a presentation on the history of the parks, wilderness legislation, the significance of the parks, the purpose and need for the WSP/DEIS, potential issues and concerns, and the planning processes. After the presentation, NPS staff was on hand to discuss attendees' issues and concerns, and to answer questions.

A total of 108 individuals attended the public scoping meetings.

- Fresno – 11 attendees
- Oakland – 20 attendees
- Bishop – 18 attendees
- Los Angeles – 14 attendees
- Visalia – 45 attendees

In addition, park staff provided information and received input on the WSP/DEIS at agency meetings with the Sequoia National Forest and Sierra National Forest staff on April 26, 2011, with Inyo National Forest staff on April 28, 2011, and with Yosemite National Park staff on December 5, 2011. Information on the WSP/DEIS was provided to the attendees at the Sierra and Sequoia Tribal Forum Meetings on May 12, 2011, and June 8, 2011, respectively, and an update on the WSP/DEIS planning process was provided to the Sierra Nevada Native American Coalition on February 12, 2012.

The public was invited to submit comments on the scope of the plan and potential issues and concerns related to wilderness management through July 25, 2011. On July 14, 2011 the deadline for comments was extended to August 31, 2011. Information about scoping was published in the *Kaweah Commonwealth* (April 15, July 22, August 19, 2011) and *Inyo Register* (May 10, 2011), and included on

several public websites: National Parks Traveler website (April 4, 2011); High Sierra Topix (April 20, 2011); and Sierrawild.gov (July 25, 2011).

During the entire scoping process, 912 pieces of correspondence were received from 41 states and four countries (Australia, Germany, Slovakia, and the United States). All comments were read and analyzed; similar comments were grouped together and concern statements were developed to reflect the public sentiment for specific topics. Numerous commenters were concerned about issues that have been under discussion for years while others brought forward new wilderness management considerations and ideas. Full text of the public scoping comments and the Public Scoping Comment Summary Report are both available on the NPS PEPC website at: www.parkplanning.nps/sekiwild.

Comments received from the public covered many topics and issues. The following is a summary of the most common comments received.

The topics that received the majority of comments were stock use, commercial services, education of wilderness visitors, the protection of park resources, and appropriate management of visitor use of wilderness. The public comments were utilized by the NPS to help identify key topics to include in the preliminary draft alternatives.

- Commenters were divided on stock use. Many thought that stock use is appropriate in wilderness while others want it further restricted. There was concern that the meadows are being impacted by stock; others thought that there is no negative effect of grazing by horses and other stock on the meadows.
- Commercial services provision was a topic that the public commented on frequently. Views on commercial services focused on whether these services should or should not be allowed in wilderness.
- Many commenters recommended expanding the education program to improve wilderness ethics.
- Other topics related to visitor use, such as permits/quotas, trail and bridge maintenance, campfires, food storage, human-waste management, party (group size), and camping / campsites were brought forward.

PRELIMINARY DRAFT ALTERNATIVE CONCEPTS

Because of the complexity of the alternatives, the NPS determined it appropriate to conduct an additional public review period to allow people the opportunity to provide feedback on the preliminary draft alternatives. On July 16, 2012, the parks provided a news release to 161 area media outlets announcing the upcoming public review of preliminary draft alternatives. A postcard announcing the impending public comment period and public meetings was sent (403) or emailed (921) to individuals, businesses, interest groups, and agencies, and provided to 64 area tribes and tribal groups. On October 25, 2012, the parks released the preliminary draft alternatives for the WSP/DEIS for public review. The review period ended November 19, 2012. During the 2012 comment period, NPS held five public meetings in California: Bishop (October 25), Los Angeles (October 26), Oakland (October 29), Visalia (October 30), and Three Rivers (November 5). These meetings presented information on the purpose and need for the WSP/DEIS, background on the parks' wilderness and planning process, wilderness legislation, concepts and elements of the alternatives, topics common to all alternatives, and the planning timeline in a formal presentation format. After the presentation, NPS staff was available to discuss attendees' questions and concerns. A total of 93 individuals attended the public scoping meetings:

- Bishop – 15 attendees

- Los Angeles – 4 attendees
- Oakland – 18 attendees
- Visalia – 36 attendees
- Three Rivers – approximately 20 attendees (a specific count of attendees is not available because the public meeting was incorporated into the monthly Three Rivers Town Hall meeting and no sign-in sheet was used)

The public were able to submit their comments on the plan using any of the following methods:

- electronically through the NPS PEPC website;
- in person at the public meetings; and
- by mailing comments to the NPS.

Information on the comment period and public meetings was published in the *Kaweah Commonwealth* on July 20 and November 16, 2012, and also included on several websites: National Park Traveler (July 27, 2012); *Clovis Independent* (July 19, 2012); Mineral King District Association website (July 16, 2012); Yosemite News website (July 19, 2012); and the George Wright Society website (July 27, 2012).

All comments received through November 26, 2012, were incorporated in the public alternative scoping process. A total of 201 pieces of correspondence providing feedback on the preliminary draft alternatives were received from 16 states and 2 countries (Canada and the United States). Of these letters, approximately 77% were submitted by individuals living in California. All comments were read and analyzed. Similar to the Public Scoping Comment Summary Report, public comments on the preliminary draft alternatives were grouped by similar topics, and concern statements were developed to capture the essence of the comment. The topics that received the majority of comments were stock use, grazing, commercial services, and zoning. Full text of the public comments and the Preliminary Draft Alternative Public Scoping Summary Report are available on the NPS PEPC website at: www.parkplanning.nps/sekiwild. The following is a summary of the most common comments received.

Comments received from the public on the preliminary draft alternatives covered many topics and issues. Many of the same issues that were expressed by the public during the scoping process were also brought forward during alternatives scoping:

- The appropriateness of stock use was a topic that the public commented on frequently. There were also differing views on whether to allow stock to graze in the parks.
- As in public scoping, views on commercial services varied as to whether these services should or should not be allowed in the parks.
- There were specific comments related to reopening the pack station at Mineral King and closing or maintaining the Bearpaw Meadow High Sierra Camp.
- Many commenters opposed the zoning strategy outlined in the preliminary draft alternatives, commenting that it was too complicated. Some felt that wilderness should not be zoned since the entirety of wilderness should be managed with the same goals. Commenters recommended either simplifying the zoning by having two zones: on-trail and off-trail zones, or eliminating zones. Others commented that the zoning regulations should be adopted, as these regulations would guide appropriate research and monitoring for different areas.

- Other elements included in the alternatives such as permits/quotas, trails/signs, campfires, food storage, human-waste management, party (group size), camping/campsites, and night limits generated many comments from the public. Many commenters felt that current conditions are adequate to support wilderness use and management, while others suggested changes.
- General comments included that the alternatives should be based not on limiting numbers of visitors but on improving the nature of the wilderness experience. It was proposed that the alternatives be restructured to achieve acceptable use without limiting visitor use. An alternative with only minimal infrastructure support was also suggested.
- Other suggestions included providing more visitor services and accepting the resulting impacts on wilderness areas.

Many of the comments submitted during the public review of the preliminary draft alternatives were used to update the alternatives and to further refine the framework for the WSP/DEIS. However, not all comments will be addressed in this plan. A summary of the comments received but not considered, and the justification for not including them in the WSP/FEIS, are described in the section "Elements or Topics Outside the Scope of the Plan" in this chapter and "Alternative Elements Considered but Dismissed from Detailed Analysis" in chapter 2.

PUBLIC REVIEW OF THE WSP/DEIS

The WSP/DEIS was available to the public, federal, state, and local agencies, tribes, and organizations for a 60-day public review period from June 27 to August 25, 2014. The NPS distributed the WSP/DEIS beginning June 26, 2014, and a Notice of Availability (NOA) was published in the Federal Register on June 27, 2014. The NPS posted electronic copies of the WSP/DEIS to the NPS Planning, Environment, and Public Comment (PEPC) website at http://parkplanning.nps.gov/sekiwild on June 26, 2014. Printed or CD copies of the WSP/DEIS were provided to 236 interested parties on the parks' mailing list and to those who requested them. A printed copy was provided to 18 area public libraries in Tulare, Inyo, Fresno, and Kern counties. In addition, a NOA of the WSP/DEIS was sent by email or regular U.S. mail to 1,870 people on the parks' mailing list, and to 53 commercial use authorization holders. A news release was distributed to 151 media outlets, and was placed on the parks' website.

Park staff presented elements of the WSP/DEIS at seven public meetings, including three informational meetings (in Oakland, Bishop, and Visalia), three meetings with focused discussions on the commercial service portion of the WSP/DEIS (two in Bishop and one in Visalia) and a webinar on the management preferred alternative. Total attendance at the public meetings was 79; 25 people viewed the webinar. Park staff also conducted meetings with Inyo and Sequoia National Forest staff, and presented information at area tribal forum meetings. The public meeting schedule was as follows:

- July 8, 2014: Inyo National Forest headquarters, Bishop, CA
- July 9, 2014: Inyo National Forest headquarters, Bishop, CA
- July 15, 2014: Comfort Inn, Visalia, CA
- July 23, 2014: Richard Trudeau Training Center, Oakland, CA
- July 24, 2014: Eastern Sierra Tri-county fairgrounds, Bishop, CA
- July 28, 2014: Visalia Marriott Hotel, Visalia, CA
- August 14, 2014: Webinar on Management Preferred Alternative

The NPS received public comment letters through the PEPC system, by fax, U.S. mail, and hand delivery. The full text of public comment letters received can be viewed on the project website at: http://parkplanning.nps.gov/sekiwild. Personal information included with the comments (e.g., names and contact information) is redacted in the correspondence posted online to protect individuals' privacy. Information is included if the comment was submitted by agencies, tribes, businesses, and organizations.

During the 60-day public review period, the parks received 255 public comment letters: 212 from individuals; 4 from federal, state, county, or local governments; 1 from a non-governmental organization; 23 from recreational or conservation-related interest groups; and 14 from businesses. The analysis of these letters identified 1,040 discrete comments, from which 240 concern statements were generated. The results of the public comment analysis process and the NPS responses to substantive public comments are provided in "Appendix Q: Public Comment Analysis Report."

PLAN REVISIONS IN RESPONSE TO PUBLIC REVIEW

The key revisions in this WSP/FEIS made in response to comments received during the public review of the draft plan and EIS are summarized below:

Visitor Capacity Framework — The most recent available data has been added to the visitor capacity framework specifically as it relates to trail encounter sampling (chapter 2 and appendix A).

Trails — The purpose and outcome of establishing a trails management and classification system has been clarified (chapter 2 and appendix K). The preferred alternative has been slightly modified to include the future construction of Class 1 and 2 trails. Under the preferred alternative, the Lower Big Arroyo trail has been designated as an abandoned trail; off-trail stock travel would continue to be allowed in Big Arroyo. The off-trail area from Glacier Pass to Spring Lake has been added to the list of areas to monitor for informal trail impacts. The preferred alternative has been modified to allow stock to travel up Miter Basin to a tie-up area at 11,300 feet in elevation below Sky Blue Lake.

Stock Use and Grazing — The preferred alternative has been updated to allow grazing only by private stock users in the Lower Soldier Lake Meadow. The specific area to be closed to grazing in the preferred alternative on the Bighorn Plateau has been clarified, and additional meadows have been opened to grazing by burros and llamas (Woods Lake Basin Meadow and the Lake South America Loop/ Kern Headwaters). The site-specific night limit at Ouzel Meadow would be removed.

Administrative Structures in Wilderness — The preferred alternative has been updated to allow the continued use of the Redwood Canyon Cabin for the administration of wilderness, primarily by researchers, but with a smaller footprint and fewer associated installations.

Frontcountry Facilities to Support Wilderness — The preferred alternative has been updated to provide for short-term use of the Wolverton corral by private parties and commercial service providers. There would be no permanent occupation of the facility by a commercial pack station for wilderness use.

Affected Environment and Environmental Analysis — Information has been added to the affected environment (chapter 3) and the environmental analysis (chapter 4) related to climate change. The analysis in chapter 4 has been updated for soils, water resources, and vegetation.

Extent Necessary Determination — Commercial service days for 2013 have been added to the extent necessary determination and used to update the preferred alternative (chapter 2 and appendix B).

Climbing Management Strategy — The Climbing Management Strategy (appendix J) has been refined to clarify the definition of fixed anchors.

Research and Science — The National Parks Omnibus Management Act of 1998 has been added to the list of applicable laws and legislation (chapter 1), and considered when updating the preferred alternative (chapter 2).

ISSUES AND IMPACT TOPICS

This section includes a summary of the planning elements that are addressed in this plan, impact topics selected for detailed analysis, impact topics that were considered for this plan but were dismissed, and planning issues or topics that are outside the scope of this plan.

PLANNING ELEMENTS TO BE ADDRESSED

Specific planning elements or topics to be addressed in the plan were developed for discussion and to set the framework for the alternatives. Each of these topics will be addressed under each alternative and a comparison of the environmental consequences of each alternative will be completed. These planning topics were identified based on internal and external scoping; federal laws, regulations, and executive orders; NPS *Management Policies 2006*; site visits; and public comments. A brief rationale for the selection of each topic is given below.

MANAGEMENT ACTIONS APPLICABLE TO ALL ALTERNATIVES

Wilderness Education — Education is a critical component of wilderness stewardship. Programs that help visitors and staff to understand wilderness values and ethics are extremely important across all alternatives. Information explaining proper wilderness behavior and how to access less-visited areas of wilderness could help reduce the impacts of visitors on the environment and one another's experiences, as well as disperse use (Cole et al. 1987). Understanding the qualities and benefits of wilderness also leads to improved stewardship. A wilderness information and education strategy has been developed as part of this plan (appendix H).

Aviation (Military, Commercial, and Private) — Managing military and private aviation above the parks' wilderness is outside the scope of the WSP; however, the plan will determine the future of commercial air tours over wilderness. Through this planning effort, Sequoia and Kings Canyon National Parks would be permanently removed from the Federal Aviation Administration (FAA) list of NPS units where air tours are allowed. The parks will continue to work cooperatively with regional and national military leadership to ensure that military aviation operations are no more than minimally disruptive to the experience of wilderness visitors. Private aircraft use would continue to be managed by the FAA, and the NPS will continue to work cooperatively with the FAA to resolve problems.

Administrative Communications in Wilderness — Effective radio-communication systems are necessary to support resource protection actions, emergency services, the safety of wilderness staff, and transmittal of information on wilderness conditions to the frontcountry to inform wilderness visitors. Radio repeaters in wilderness exist in strategic and remote locations and require maintenance. Helicopter use may be authorized to maintain radio repeaters if it is determined by the superintendent to be the minimum requirement needed to achieve the purposes of the area as wilderness, including the preservation of wilderness character. As future technologies are developed, the existing structures would be considered for replacement, with replacement outside of wilderness preferred. If structures are able to be removed, the installation sites would be restored to natural conditions.

Administrative Activities (e.g., Ranger Patrols and Operations, Maintenance Activities, Resource Management Activities, Park Aviation, etc.) and Minimum Requirement Standards — Administrative presence may impact opportunities for solitude and unconfined recreation. Rangers, trail crews, and resource management crews are stationed in the parks' wilderness to educate and assist visitors, enforce regulations and restrictions, carry out projects, and perform maintenance activities to protect and preserve wilderness character. Many of these actions, such as those requiring the use of helicopters, are approved only after a MRA determines that the actions are appropriate in wilderness (appendix I).

Tree Hazard Management — The removal of hazard trees in wilderness is not a normal or desirable activity, but may be allowed under certain circumstances after a MRA is undertaken to determine that the actions are appropriate and necessary to administer the area as wilderness.

Research — The parks are recognized for advancing scientific research and integrating knowledge gained from scientific inquiry into the management of wilderness resources. Researchers from outside entities submit approximately 60 to 80 requests for permits each year to study aspects of the wilderness environment. For some park visitors, interaction with agency personnel and researchers may reduce the unconfined feeling or opportunities for solitude (Fauth and Tarpinian 2011; NPS 2011a). Other research actions may result in a temporary trammeling of wilderness but may improve the natural quality of wilderness over time. Research that has the potential to affect wilderness character, or that proposes a prohibited action, is evaluated separately through a MRA (appendix I).

Winter Use — A wide range of activities can be experienced in the wilderness during the winter, generally from November through mid-May. Due to the high-elevation, demanding terrain, and potentially extreme weather of the parks' wilderness, winter activities can be challenging and hazardous for the inexperienced user. However, users of the winter environment will find the quiet, solitude, and beauty of the parks' wilderness extraordinary and inspiring. The winter use of the wilderness will be managed consistently across the alternatives.

Climbing Management — Climbing management in national park wilderness is directly guided by relevant NPS management policies, director's orders, and reference manuals. The U.S. Code of Federal Regulations and the parks' Superintendent's Compendium also provide indirect and direct management control of climbing and related activities. Director's Order #41: Wilderness Stewardship provides specific guidance on the management of climbing in wilderness. A climbing management strategy has been developed as part of this WSP and is included as appendix J.

KEY ELEMENTS CONSIDERED IN THE ALTERNATIVES

The following elements summarized below represent key aspects of managing wilderness. In chapter 2, each one is discussed under each alternative. The variations in these elements are what make the alternatives different.

Visitor Use — Sequoia and Kings Canyon National Parks rely on permits and quotas as primary controls to effectively manage wilderness visitor use. In certain areas of wilderness, use has increased (particularly the Pacific Crest National Scenic Trail [PCT], John Muir Trail [JMT], High Sierra Trail [HST], Rae Lakes Loop, Bishop Pass, and Mount Whitney) and impacts on wilderness character and other resources may be occurring. The alternatives consider different options for day use and overnight permits, as well as modifications to the existing trailhead quota system, to protect wilderness character and meet the specific goals of a given alternative.

Trails — A network of trails and appropriate signs would continue to be maintained in the parks' wilderness. A trail management and classification system, adapted from elements of the USFS Trail Management Handbook, has been developed as a component of the WSP (appendix K). The phrase *trail class* describes the level of development and expected recreational experience along a given segment of trail, and *designed use* describes the modes of travel for which the trail is designed and maintained, including trail suitability for various use types, including stock use. The same trail classes would be adopted across all action alternatives, but the trails included in the different classes may vary based on the overall objective of a given alternative.

Campfires — Campfires are currently restricted by elevation to support the protection of park resources. Campfires can result in significant loss of woody debris and damage to trees, impacts on ecosystem components, and the permanent loss of paleo resources. However, restricting campfires can also affect the primitive and unconfined recreation quality of wilderness. The alternatives consider a variety of methods to balance both of these qualities.

Food Storage — Proper food storage prevents wildlife from obtaining human food, which protects both wildlife and visitors. Visitor use is concentrated around food-storage boxes, and large parties tend to camp near them, which can affect natural qualities and opportunities for solitude. Facilities such as food-storage boxes also impact the undeveloped quality of wilderness. A range of methods are considered within the alternatives to ensure proper food storage while limiting developments in wilderness.

Human Waste Management — The parks have constructed privies and restrooms, recommended the use of carry-out waste bags, and promoted visitor education as methods to manage human waste. The alternatives consider ways to reduce development by removing unnecessary toilet facilities; protecting natural and cultural resources; protecting human health; reducing litter created by improperly disposed of toilet paper; and increasing visitor knowledge of appropriate sanitation and toilet-paper disposal in wilderness.

Party Size (Group Size) — Size of parties traveling and/or camping together is managed to preserve the opportunities for solitude of other visitors and to reduce adverse impacts on the natural quality of wilderness. The number of stock and people per group is managed to protect resources, preserve opportunities for solitude, and to control impacts on wilderness character created by limiting the number of stock and people traveling and camping together. Different party sizes are considered across all alternatives, based on the overall objective of a given alternative.

Camping/Campsites and Night Limits — The designation of campsites and the establishment of limits on the number of nights a party may stay in one place are effective methods for managing visitor impacts. Establishing *designated campsites* helps to confine use to a certain area, and night limits can reduce the effects of visitors camping in a single area for an extended period of time. However, designated campsites can detract from opportunities for primitive and unconfined recreation, and maintenance of designated campsites/camp areas can necessitate removing native vegetation (e.g., hazardous trees), which results in an adverse effect on the natural quality of wilderness. The alternatives examine a variety of ways to manage camping and campsite impacts.

Stock Use —Recreational stock use is a historically and culturally significant traditional use that is an appropriate means for fulfilling the recreational purpose of wilderness. The GMP stated that administrative and recreational stock use would continue to be allowed, with controls that would keep the effects of such use within acceptable limits (NPS 2007a). Based on the court order in HSHA v. U.S. Dept. of the Interior, the GMP cannot be used to provide programmatic guidance on commercial stock use. As a result, this plan evaluates commercial stock use as part of the specialized finding for commercial services (appendix B).

Stock use both by visitors and park staff can have distinctive effects on the natural qualities of wilderness, including increased risk of introduction of nonnative plant species, impacts on sensitive plants and animals, and impacts on water quality. Overlapping uses of hikers and stock can create safety concerns. The alternatives consider ways to mitigate the impacts from stock use on resources, visitor safety, and visitor experience.

Grazing by stock has been allowed in the parks' wilderness since well before they were established. The impacts of grazing are analyzed and alternatives for grazing and grazing management are considered. The alternatives also evaluate the necessity of all stock-related structures and facilities (e.g., drift fences and hitchrails) and a range of options for their management is provided. Appendix D includes an updated Stock Use and Meadow Monitoring and Management Strategy.

Administrative Structures and Facilities — Administrative facilities such as ranger stations, administrative pastures, crew camps, and research facilities are important for the administration of wilderness. However, these facilities can adversely affect the undeveloped quality of wilderness. Ranger stations can reduce opportunities for solitude and primitive and unconfined recreation by attracting larger numbers of visitors. Administrative pastures, crew camps, and research facilities may also affect wilderness character. Different options for the retention or removal of these structures and facilities are considered across the alternatives, depending on the overall objective of the alternative.

Frontcountry Facilities that Support Wilderness Use — Development or enhancement of facilities in the frontcountry that support wilderness use would affect opportunities for recreation and education, and would possibly reduce development in wilderness. The alternatives offer a range of options for frontcountry facilities to support visitor use of wilderness, but any modifications to frontcountry facilities would require separate implementation planning and compliance.

Commercial Services — The Wilderness Act prohibits commercial enterprise but allows commercial services to the extent necessary for activities which are proper for realizing the recreational or other wilderness purposes of the [wilderness] areas. This WSP/FEIS incorporates the specialized finding to determine which commercial services are appropriate in wilderness and to what extent they would be authorized (appendix B). The alternatives present a range of options for the types and levels of commercial services that would be authorized.

DERIVATION OF ISSUES AND IMPACT TOPICS

NEPA requires an "early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" (40 *Code of Federal Regulations* [CFR] 1501.7). Issues are problems, opportunities, and concerns regarding the current and potential future management strategies for managing wilderness as well as impacts of management actions that are included in this WSP/FEIS.

Specific impact topics were developed for discussion and to allow comparison of the environmental consequences of each alternative. Impact topics and issues were identified based on internal and external scoping; federal laws, regulations, and executive orders; NPS *Management Policies 2006*; site visits; NPS knowledge of limited or easily impacted resources; and the potential for measurable effects on these resources.

The resources that could be affected and the impacts that could occur are described in detail in "Chapter 3: Affected Environment" and "Chapter 4: Environmental Consequences."

A brief rationale for the selection of each impact topic is given below, followed by issue statements associated with that resource.

IMPACT TOPICS SELECTED FOR DETAILED ANALYSIS

Impact topics are resources of concern that could be affected, either beneficially or adversely, by the range of alternatives presented in this plan. The NPS defines *measurable effects* as those with moderate or greater impacts and *no measurable effects* as those impacts that are minor or less. The reason the NPS uses *no measurable effects on* is to determine whether impact topics are dismissed from further evaluation so the WSP/FEIS can concentrate on issues that are truly significant to the action in question, rather than amassing unneeded detail, in accordance with Council on Environmental Quality (CEQ) regulations at 1500.1(b).

It was determined that there would be a measurable effect on the following resources (table 1):

Table 1: Impact Topics Selected for Detailed Analysis

Impact Topic or Issue	Reasons for Retaining Impact Topic	Relevant Laws, Regulations, and Policies
Wilderness Character Untrammeled Undeveloped Natural Solitude or a primitive and unconfined type of recreation	Preserving wilderness character is the fundamental purpose of wilderness, per the Wilderness Act. For that reason, the evaluation of how each alternative affects wilderness character is an integral part of this WSP/FEIS and this topic will be included for further analysis.	NPS Organic Act of 1916 Wilderness Act of 1964 California Wilderness Act of 1984 Omnibus Public Land Management Act of 2009 NPS *Management Policies 2006* NPS Director's Order 41: *Wilderness Stewardship* Sequoia and Kings Canyon Management Directive 49: *Minimum Requirement Analysis and Determination*
Soils	Several elements of the alternatives have the potential to affect soils, including constructing, maintaining, or restoring trails, placing or removing food-storage boxes, establishing designated camps, and general visitor use. Therefore, this topic will be further evaluated.	NPS Organic Act of 1916 NPS *Management Policies 2006*
Water Quality	Visitor use and administrative actions near lakes, streams, ponds, and rivers has the potential to impact water quality through increased turbidity from run off, and from human and stock waste. Therefore, this topic will be further evaluated.	NPS Organic Act of 1916 Clean Water Act of 1972

Table1: Impact Topics Selected for Detailed Analysis (continued)

Impact Topic or Issue	Reasons for Retaining Impact Topic	Relevant Laws, Regulations, and Policies
Vegetation Wetlands Meadows Long-lived high-elevation trees Alpine vegetation Special-status species Invasive species	Vegetation can be affected by activities such as trampling by visitors and stock; grazing in meadows; collecting wood for campfires; constructing, maintaining, and restoring trails; and transporting and establishing nonnative vegetation. Therefore, this topic will be further evaluated.	NPS Organic Act of 1916 Executive Order 11990, "Protection of Wetlands" Executive Order 13112, "Invasive Species" NPS *Management Policies 2006* NPS Director's Order 77-1: *Wetland Protection*
Wildlife Black bears Birds Invertebrates	Wildlife, particularly bears, can be affected by visitor use and administrative activities related to food storage. Stock use can lead to the introduction of nonnative cowbirds. Invertebrates can be affected by grazing and visitor use. Therefore, this topic will be further evaluated.	NPS Organic Act of 1916 NPS *Management Policies 2006* NPS Director's Order 77-1: *Wetland Protection*
Special-status Species Sierra Nevada bighorn sheep Yosemite toad Mountain yellow-legged frog Sierra Nevada yellow-legged frog	Some special-status species can be affected by visitor use and administrative activities. Therefore, this topic will be further evaluated.	NPS Organic Act of 1916 Endangered Species Act of 1973 NPS *Management Policies 2006* NPS Director's Order 77: Natural Resource Protection California Endangered Species Act
Cultural Resources	The alternatives considered in the WSP/FEIS have the potential to affect historic structures and archeological sites. Therefore, this topic will be further evaluated.	NPS Organic Act of 1916 National Historic Preservation Act of 1966 Native American Graves Protection and Repatriation Act NPS *Management Policies 2006* NPS Director's Order 41: *Wilderness Stewardship*
Socioeconomics	Alternatives related to visitor use and access and commercial services have the potential to affect the region's socioeconomic resources. Therefore, this topic will be further evaluated.	NPS *Management Policies 2006*
Visitor Use and Experience (other than those addressed under Wilderness Character)	There are a number of elements within the alternatives that could affect visitor use and experiences (other than those addressed in the "Wilderness Character and Qualities" section), including actions that affect aesthetic and social values of wilderness. Therefore, this topic will be further evaluated.	NPS Organic Act of 1916 The Redwood Act, 1978 Concessions Management Improvement Act of 1998 NPS *Management Policies 2006* NPS Director's Order 77: Natural Resource Protection NPS Director's Order 41: *Wilderness Stewardship*

Table1: Impact Topics Selected for Detailed Analysis (continued)

Impact Topic or Issue	Reasons for Retaining Impact Topic	Relevant Laws, Regulations, and Policies
Park Operations	Park operations would be affected by changes to visitor use and wilderness infrastructure and facilities. Therefore, this topic will be further evaluated.	NPS *Management Policies 2006*

OTHER ISSUES CONSIDERED

Climate Change — Accelerated climatic change and other global changes are likely to be the greatest challenges that wilderness stewards have ever faced (Stephenson and Millar 2012). Evidence of climatic change and its effects on resources are seen in the region as well as within the parks.

Temperatures have warmed significantly in the Southern Sierra Nevada this century, and are expected to continue to rise. Regardless of uncertain projected future precipitation, warming temperatures will increase the fraction of rain relative to snow, speed the onset of snowmelt, push the snowline uphill, and amplify the amount of water evaporated to the atmosphere. Stream flows and soil moisture may increase during winter, but water availability in summer will decline. Recent increases in wildfire activity are expected to persist and accelerate in most future scenarios. More severe storms and flooding may interact with fire activity to increase soil erosion.

Potential consequences of these biophysical changes on wilderness resources include drying of wetland and aquatic habitat; rising incidence of drought stress and insect and disease outbreaks in woodlands and forests; shifts in seasonality and ranges of plants and animals; new or intensified nonnative species invasions; changes in wildlife behaviors; and die-off of species that cannot adapt to these changes. Cultural resources are vulnerable to increased fire activity and erosion.

Climate change may amplify health and safety risks to park visitors and staff, including fires, floods, extreme hot temperatures, ozone, and expansion of toxic plants or poisonous, aggressive, or disease-carrying animals. Visitation to the parks could change, including the magnitude, distribution, seasonality, and type of wilderness recreation.

Key climate change vulnerabilities include:

- Warming temperatures
- Reduced water availability especially in summer
- More severe storms and flooding
- More frequent and severe wildfires
- Increased erosion
- Increased insect and disease outbreaks
- Shifts in the distribution of species

While accelerated climate change is a major concern for the future of the parks' wilderness, a full analysis of climate change and its effect on the parks' resources is beyond the scope of this WSP. However, the

WSP/FEIS does consider climate change in the alternatives and in the analysis. First, the WSP is designed to be responsive to shifting environmental conditions. This allows managers to protect wilderness resources by responding to natural variability as well as to directional change in environmental conditions. For example, monitoring provides information on meadow condition that can then be used to revise stock grazing regulations for a given year, if needed. Second, there are several impact topics where climate change warrants consideration in the analysis (e.g., soils, vegetation, wildlife, and special-status species). Therefore, background information on climate change is included in chapter 3 for specific impact topics. Climate change is also considered in the environmental consequences (chapter 4). A full analysis of climate change and strategies for management response will be addressed in the Sequoia and Kings Canyon Resource Stewardship Strategy (in process).

IMPACT TOPICS OR ISSUES DISMISSED FROM FURTHER ANALYSIS

Air Quality and Greenhouse Gas Emissions — The 1977 amendment to the Clean Air Act of 1963 (42 USC 7401 et seq., PL 88-206) requires federal land managers to protect the parks' air quality. Sequoia and Kings Canyon National Parks were designated Class I under the 1970 Clean Air Act, as amended. A Class I area is subject to the most stringent regulations of any designation. Further, the 1970 Clean Air Act provides the federal land manager (the parks' superintendent) with an affirmative responsibility to protect the parks' air-quality-related values (including visibility, plants, animals, soils, water quality, cultural and historic resources and objects, and visitor health) from adverse air-pollution impacts. Section 118 of the Clean Air Act requires the parks to meet all federal, state, and local air-pollution standards.

Most of the air pollutants within the parks originate outside park boundaries. Air-quality conditions in the parks are a consequence of the parks' geographic location relative to significant sources of air pollution. The parks are downwind of numerous major urban areas and associated industrial activity; two heavily traveled transportation corridors (I-5 and CA 99); and the extensive San Joaquin Valley agricultural landscape, one of the most productive in the U.S. The parks and their wilderness areas are within the San Joaquin Valley Air Pollution Control District. Nonpoint or area sources are the major contributor of air pollutants in the San Joaquin Valley Air Pollution Control District, including cars, trucks, farm equipment, and other agricultural activities. Wildland fires also contribute to air pollutants in the region.

Greenhouse gases contribute to climate change on a global scale. Naturally occurring greenhouse gases include carbon dioxide, methane, and nitrogen oxide. Human activities (e.g., fuel combustion and waste generation) lead to increased concentrations of these gases in the atmosphere.

While greenhouse gases have global impacts, the impacts of criteria air pollutants (those with established human-health thresholds) are often local and regional in nature. Deposition of air pollutants on the parks' landscapes has the potential to adversely alter terrestrial or aquatic ecosystems (Fenn et al. 2008; Sickman et al. 2001). Spatially, the air-quality condition (an assessment that takes into account the worst of all the air-quality threats—e.g., ozone, nitrogen) is assessed as being *poor* at lower elevations in the western region of the park, due to proximity to pollution sources. Air quality improves to *good* at higher elevations and towards the eastern side of the park. Wilderness encompasses the entire range of conditions (Panek et al. 2013).

Of pollution generated within the parks, data from a 2006 inventory of emissions from park operations shows that transportation contributes 66% of the parks' greenhouse gases and criteria air pollution. The largest portion of this is from visitor vehicle miles travelled. In an effort to reduce air-pollution sources within the park, the parks have formed a partnership with the U.S. Environmental Protection Agency through the Climate-Friendly Parks Program. The parks have developed an action plan to reduce both criteria air pollutants and greenhouse gases. Transportation strategies described in the plan include improving vehicle efficiency and reducing idling (NPS 2008a).

Air quality in localized areas would be temporarily affected due to certain elements of the WSP (i.e., the use of helicopters to transport materials, trail maintenance, campfires, and dust from visitor and stock use). Helicopter flight-path data from 2009, which includes fuel use, was used to calculate an example of ongoing impacts. Using the Climate Friendly Parks emission-calculation program, emissions, specifically of criteria air pollutants, were calculated. Jet fuel used by the helicopter in all of 2009 equaled 7,232 gallons. This equates to 0.30 ton of nitrogen oxides, 15.2 tons of carbon monoxide, and 0.30 ton of volatile organic compounds. These values of criteria pollutants are considered a negligible-to-minor impact on air quality and air-quality-related values. A proportionate increase in flights due to increased administrative activities would likely remain at a minor impact or less.

Project-specific activities would require site-specific planning and analysis. While these activities could result in slight degradation of air quality in localized areas, effects would not likely exceed National Ambient Air Quality Standards and would last only as long as project activities.

Overall, air quality in the parks is primarily affected by activities and sources outside park boundaries. Impacts on regional air quality would be negligible to minor for WSP/FEIS alternatives; therefore, air quality was dismissed as an impact topic.

Caves — The parks contain about 250 known caves; most are located in wilderness. They formed in Mesozoic marble originally deposited on the margins of marine islands (one exception being caves and karst in Paleozoic rocks on the east side of Kings Canyon National Park). The parks' caves are generally formed by sinking streams. During the spring months, these streams typically flood due to snowmelt and winter rains. Inside the caves, floods typically overwhelm existing passages and promote the development of mazes of parallel passages. Such mazes are very common in all larger caves in the parks. Cave temperatures in the parks vary from 31°F to 62°F, with lower-elevation caves being the warmest and some higher-elevations caves containing permanent ice. Many caves have brisk winds that develop due to temperature variation between the inside of the caves and the surface.

Diverse minerals found in caves include barite, tungsten, copper minerals, sulfates, and oxides. Calcite deposits found in the parks' caves include the common stalactites, stalagmites, and flowstone, but also unusual speleothems including filamental helictites and shields, which have not been documented outside of the parks.

Karst features represent an important and diverse resource in the parks. Karst is defined as an area of marble (more commonly limestone in areas outside the parks) affected by chemical solution erosion as well as mechanical erosion. Unique features associated with karst landscapes are karst springs, sinkholes, sinking streams, collapsed former caves, shallow pits, rillen and runnels in bedrock marble, travertine, and tufa. Arguably the most important aspect of these features is karst hydrology — subsurface streams, lakes, and aquifers — which can host aquatic cave-adapted animals and which can transport pollutants and contaminants much more quickly than typical ground water. Karst hydrology also includes numerous natural aquifers in the parks where water is retained within the karst system and released via springs to surface streams.

Cave and karst features are managed under the separate *Cave Management Plan* (NPS 1998b). The current *Cave Management Plan* was adopted in May 1997. A new plan is being drafted at this time and its direction is being informed by this WSP. Actions proposed under the WSP alternatives would have indirect and no, or negligible, impact on cave resources. Therefore, caves will not be analyzed in this WSP/FEIS.

Hydrology — Hydrology is the study of the movement and distribution of water. In the simplest sense, the movement and distribution of water is often depicted as a water cycle, a closed system whereby water

vapor in the atmosphere condenses and falls to the ground as precipitation. When precipitation reaches the ground, it can percolate deeply to recharge aquifers, it can be taken up by vegetation, or it can flow across the earth's surface, where it is concentrated in ever-larger streams and rivers as it flows downslope. At any time in the process, it can reenter the atmosphere as a vapor via evaporation or transpiration. In addition to measuring the frequency, duration, and magnitude of water as it moves through the water cycle, the quality of the water is an important consideration, as this has a direct impact on its suitability for different types of use.

The movement of water can be measured in terms of its frequency, duration, and magnitude. An example of this is rainfall. To place any rainfall event into its proper context, it is important to ask "How often does it rain?" (frequency), "How long has it been raining?" (duration), and "How hard is it raining?" (magnitude). The answers to these three questions give the amount of water that has fallen in any given area. Another important aspect to consider is whether precipitation falls as rain or snow, as this impacts the timing of runoff and recharge, and melting Sierran snowpack plays a particularly important role in supplying water during summer when precipitation is at a minimum.

No actions or alternatives included in this WSP will impact physical hydrology; therefore, physical hydrology is dismissed from further analysis.

Dark Night Skies — The NPS uses the term "natural lightscape" to describe resources and values that exist in the absence of human-caused light at night. Natural lightscapes are critical to nighttime scenery and to maintaining nocturnal habitat. Many wildlife species rely on natural patterns of light and dark for navigation, to cue behaviors, or hide from predators. Lightscapes can be cultural as well, and may be integral to the historical fabric of a place. Human-caused light may be obtrusive in the same way that noise can disrupt a contemplative or peaceful scene.

Wilderness – and the majority of lands in the parks – falls in the "Naturally Dark Zone," an area defined as having a natural lighting regimen and the absence of artificial light sources (Duriscoe et al. 2011). Visitors to this zone have the best opportunity for adaptation to darkness and experiencing natural lightscapes, such as a natural starry sky, and nocturnal habitat receives maximum protection.

Particulates from anthropogenic sources can reduce clarity of the night sky. Sources of these particulates usually originate from outside the parks boundaries. The WSP proposes no actions that would modify the dark night skies within the wilderness of the parks; therefore, this topic will not be further analyzed.

Wildlife — The diversity of habitats resulting from the range of elevation, climate, and topography at the parks support a diverse assemblage of wildlife. The parks contain more than 331 native vertebrate species, including 12 amphibians, 24 reptiles, 8 fish, 83 mammals, and approximately 204 bird species. Invertebrate species have not been inventoried at the parks, thus the number of species is not known, but it is likely that more than 97% of the animal species in the parks are invertebrates (Buchsbaum et al. 1987).

Although the parks represent only 1% of California's area, 26% of the diversity of vertebrate species within the state is found in the parks (Schwartz et al. 2013). Even though the wildlife found in the parks is relatively similar to wildlife found in areas surrounding them, the parks provide core protected habitat for many species.

The types of impacts associated with wildlife that relate to wilderness visitor use and administrative activities include disturbance or displacement, injury or mortality, habitat alteration, and/or behavior alteration. For most species, these disturbances in wilderness are generally not measurable and are localized; they may affect individuals, but do not affect the species or habitat overall. The alternatives in

the plan, however, may have an effect on black bear, native birds, and invertebrates; these will be further evaluated in "Chapter 4: Environmental Consequences." Special-status species will be considered separately below. The following information summarizes the remaining species that would not be affected by the alternatives, and therefore, will not be further analyzed in this WSP/FEIS.

Mammals — Mammalian species richness peaks at the middle elevations of the parks (4,921 to 8,202 feet) but appears relatively constant across the rest of the elevational gradient (1,312 to 14,445 feet), until a substantial decrease in the high country above 11,483 feet (Schwartz et al. 2013). The most common small mammals captured during a 2004 vertebrate survey were the brush mouse (*Peromuyscus boylii*), deer mouse (*Peromyscus maniculatus*), golden-mantled ground squirrel (*Spermophilus lateralis*), long-tailed vole (*Microtus longicaudus*), and lodgepole chipmunk (*Tamias speciosus*) (Werner 2004). Other small-mammal species considered common in the parks include the American pika (*Ochotona princeps*), mountain pocket gopher (*Thomomys monticola*), and California ground squirrel. While these species may be disturbed or displaced, or their behavior altered by the presence of visitors or administrative activities in wilderness, the effects would be temporary and localized and would not result in more than a negligible effect. Therefore, these species will not be further analyzed in "Chapter 4: Environmental Consequences."

The parks are home to 17 bat species. Most common are the Brazilian free-tailed bat (*Tadarida brasiliensis*), big brown bat (*Eptesicus fuscus*), and Yuma myotis (*Myotis yumanensis*) (NPS 2013b). The Townsend's big-eared bat (*Corynorhinus townsendii*) and western mastiff bat (*Eumops perotis*) are considered particularly rare in the parks (NPS 2013b). Three additional species, the pallid bat (*Antrozous pallidus*), spotted bat (*Euderma maculatum*), and western red bat (*Lasiurus blossevillii*) are not common (NPS 2013b). Human disturbance may compromise the availability of roosts for bats, particularly within the parks' caves if bats are disturbed during times of the year when they are particularly vulnerable (e.g., during the maternity season or hibernation). Additionally, hazard-tree removal as well as hiking and backpacking traffic along trails can negatively affect bats (Chung-MacCoubrey 2013). There would continue to be a slight effect on bats from disturbance or displacement associated with visitor use and administrative activities in wilderness; there would be no additional impact from the WSP alternatives. Since the level of effect is negligible and localized, effects on bats will not be further analyzed.

Larger mammal species found within the parks include coyote (*Canis latrans*), mule deer, black bear, gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), mountain lion (*Puma concolor*), western spotted skunk (*Spilogale gracilis*), and American marten (*Martes americana*). These species all may be impacted slightly by visitor use and administrative actions; however, only the black bear could be affected in more than a minor way. Therefore, the black bear will be further analyzed in this WSP/FEIS, and other large mammal species will be dismissed from further analysis. The Sierra Nevada bighorn sheep, and the fisher (*Martes pennanti*), are discussed in the "Special-status Species" section of this chapter.

Amphibians, Reptiles, and Fish — Most amphibian, reptile, and fish species found within the parks would not be affected by any of the alternatives and will not be analyzed further in this plan. There are 12 species of amphibians and 24 species of reptiles found in the parks. Common amphibians include the Pacific chorus frog (*Pseudacris regilla*), ensatina (*Ensatina eschscholtzii*), and California newt (*Taricha torosa*), while species such as the gregarious slender salamander (*Batrachoseps gregarius*), western toad (*Bufo boreas*), and Kings River slender salamander (*Batrachoseps regius*) are uncommon or rarely seen (NPS 2013b). The Yosemite toad (*Anaxyrus canorus*), the two species of mountain yellow-legged frogs (*Rana muscosa* and *R. sierrae*), and the Mount Lyell salamander (*Hydromantes platycephalus*) are discussed in the "Special-status Species" section below.

Reptile species found in the parks include northern and southern alligator lizards (*Elgaria coerulea* and *Elegaria multicarinata*) and western fence lizard (*Sceloporus occidentalis*). Snake species include the rubber boa (*Charina bottae*), common kingsnake (*Lampropeltis getula*), striped racer (*Masticophis*

lateralis), the western terrestrial garter snake (*Thamnophis elegans*), and the western rattlesnake (*Crotalus oreganus*). One turtle species, the western pond turtle (*Clemmys marmorata*), is commonly found in the parks (NPS 2013b). One skink species confirmed in the parks is the Gilbert's skink (*Eumeces gilberti*). Additionally, the western skink (*Eumeces skiltonianus*) was observed just outside the parks in the 2003 vertebrate surveys (Werner 2004), indicating that it could potentially be found within the parks.

Many lakes and ponds in the parks' high-elevation ecosystems support only very simple food webs due to the unweathered granitic rock, sparse vegetation, and short summer growing season. Most lakes of the Sierra Nevada were historically fishless in part because of the high-elevation (Matthews and Knapp 1999; Rosenthal 2003). Stocking of fish dating back more than 150 years has changed aquatic systems in the Sierra, and now most lakes and streams within the parks contain nonnative fish plus a few native species (Knapp 1996). Native fish in the parks include Sacramento sucker (*Castostomus occidentalis*), California roach (*Hesperoleucus symmetricus*), Kern golden trout (*Oncorhynchus mykiss gilberti*), and Little Kern golden trout (*Oncorhynchus mykiss whitei*) (NPS 2013b). The Little Kern golden trout is listed as federally threatened under the ESA. The Kern golden trout (sometimes called the Kern rainbow trout) and the California golden trout (*Oncorhynchus mykiss aguabonita*) are listed as California species of special concern. These fish are discussed in the "Special-status Species" section. Although these species are listed or species of special concern, the Little Kern golden trout, Kern golden trout, and California golden trout are considered invasive in areas in the parks where they have been transported and have hybridized with nonnative trout species.

There would be slight effects on amphibians and reptiles from visitor use and administrative activities, but these would be localized, short-term, and would result in less than minor effects on individuals. Recreational fishing would continue to be available in the parks, thus there would be occasional mortality to fish, but the overall effect would be negligible. Therefore, amphibians, reptiles, and fish will not be further analyzed in this WSP/FEIS.

Birds — The Sierra Nevada is home to a rich assemblage of bird species. The diversity of habitats within the parks and the lack of extensive development provide an important refuge for many bird species, and birds are found from the foothill zone up to the top of Mount Whitney. Bird diversity is closely correlated with the major river canyons of the parks. Overall, the low-lying southwestern region has the highest diversity, and this peak diversity is associated with montane hardwoods, montane riparian habitats and water.

Some of the common bird species in the parks include the dark-eyed junco (*Junco hyemalis*), mountain chickadee (*Poecile gambeli*), yellow-rumped warbler (*Setophaga coronata*), Steller's jay (*Cyanocitta stelleri*), red-breasted nuthatch (*Sitta canadensis*), American robin (*Turdus migratorius*), California towhee (*Pipilo crissalis*), western tanager (*Piranga ludoviciana*), American kestrel (*Falco sparverius*), and Anna's hummingbird (*Calypte anna*) (Holmgren et al. 2012; NPS 2013b).

Stock grazing and trampling could alter habitat quality (either positively or negatively, depending on the species considered) and disturbance associated with recreational activities could cause behavioral responses and nest failure. Impacts associated with these disturbances would be less than minor across all alternatives. They are briefly described below but will not be further analyzed. Impacts associated with the brown-headed cowbird (*Molothrus ater*), a nonnative species that frequents stock operations, will be further analyzed in "Chapter 4: Environmental Consequences."

Stock grazing and trampling in meadows and riparian areas would adversely impact habitat used by some meadow-dependent bird species (e.g., belted kingfisher [*Megaceryle alcyon*], red-breasted sapsucker [*Sphyrapicus ruber*], Wilson's warbler [*Wilsonia pusilla*]) and enhance habitat used by other species that are benefitted by light to moderate levels of grazing (e.g., Brewer's blackbird [*Euphagus cyanocephalus*],

common poorwill [*Phalaenoptilus nuttallii*], pine siskin [*Carduelis pinus*] [Bock et al. 1993; Steel et al. 2012]). It is probable that more species would be adversely affected than beneficially affected. For the following reasons, it is reasonable to conclude that impacts from stock grazing and trampling to birds would be less than minor (see Steel et al. 2012 for discussions of stock impacts species by species).

- Research conducted within the parks demonstrates that there are minimal impacts of stock grazing to invertebrates, a primary food source for many bird species (see chapter 4).
- Most stock grazing occurs outside of the bird breeding season. In dry, normal, and wet years, 14%, 56%, and 92% of meadow zones respectively, are closed to grazing until July 15 or later (NPS 2008a). Between 1985 and 2012, 65% of overnight stock use nights occurred during August to December (Frenzel and Haultain 2012) after the bird breeding season (mid-May to mid-July).
- Adverse impacts on birds as a result of grazing and trampling are often associated with commercial livestock operations (i.e., cattle and sheep grazing), which involve much higher densities of animals that graze for longer periods of time each year, than what occurs with stock grazing in the parks. Steel et al. (2012) recognized this distinction in an assessment of Sierran birds, noting that "As compared to the greater Sierra Nevada where cattle grazing is widespread, adverse impacts from stock grazing are likely relatively small and localized in [the Sierra Nevada parks]."

Some birds may be disturbed by hikers, backpackers, rock climbers, or even by "intrusive birding" at their nest sites (Steel et al. 2012). Such disturbances would usually be of short duration, localized, and have a negligible effect. It is possible that disturbance could lead to occasional nest failures, but there would be no population level effects. Due to the above stated reasons, birds will not be further analyzed in this WSP/FEIS.

Nonnative Wildlife Species — Through a variety of means, nonnative fish, birds, amphibians, and mammals have become established in the parks. Nonnative species are those that do not naturally live in a given ecosystem; their presence is a result of direct, indirect, or accidental human activities (NPS 2013c). Austin et al. (2013) list 25 nonnative vertebrates (1 amphibian, 11 birds, 9 fish, and 4 mammals) that are either confirmed or suspected of maintaining a presence in the parks, either through a breeding population or through continued replenishment from outside park boundaries. Because four subspecies of the same species were treated separately by Austin et al. (2013) — (rainbow trout [Oncorhynchus mykiss mykiss], California golden trout, Little Kern golden trout, and Kern River golden trout) — this list can be condensed to 22 distinct species (table 2).

Of the nonnative species listed, only the brown-headed cowbird has the potential to be influenced by the management alternatives and therefore, its effects on native birds will be further analyzed in "Chapter 4: Environmental Consequences."

Table 2: Nonnative Vertebrates Confirmed or Suspected of Maintaining a Presence in Sequoia and Kings Canyon National Parks

Common Name	Scientific Name	Is the Species Invasive[1]?
AMPHIBIANS		
American bullfrog	*Rana catesbeiana*	Yes
BIRDS		
Brown-headed cowbird	*Molothrus ater*	Yes

Table 2: Nonnative Vertebrates Confirmed or Suspected of Maintaining a Presence in Sequoia and Kings Canyon National Parks (continued)

Common Name	Scientific Name	Is the Species Invasive[1]?
Barred owl	*Strix varia*	Yes
Chukar partridge	*Alectoris chukar*	No
Rock dove	*Columba livia*	No
White-tailed ptarmigan	*Lagopus leucura*	No
Wild turkey	*Meleagris gallopavo*	No
House sparrow	*Passer domesticus*	No
Indian peafowl	*Pavo cristatus*	No
Great-tailed grackle	*Quiscalus mexicanus*	No
European starling	*Sturnus vulgaris*	No
Black swan	*Cygnus atratus*	No
FISH		
Black bullhead	*Ameiurus melas*	Yes
Green sunfish	*Lepomis cyanellus*	Yes
Rainbow trout	*Oncorhynchus mykiss* spp.	Yes
Brown trout	*Salmo trutta*	Yes
Brook trout	*Salvelinus fontinalis*	Yes
Golden shiner	*Notemigonus crysoleucas*	No
MAMMALS		
Domestic pig	*Sus scrofa*	Yes
Domestic cow	*Bos taurus*	No
Virginia opossum	*Didelphis virginiana*	No
Domestic cat	*Felis silvestris*	No

[1]An invasive species is a nonnative species whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive species display rapid growth and spread, establish over large areas, and persist. Adapted from Austin et al. (2013)

In summary, although wildlife species may be affected by the alternatives in this plan — primarily through disturbance or displacement, injury or mortality, habitat alteration, and/or behavior alteration — these impacts would be localized, affecting individuals but not affecting the species or habitat overall. Therefore, most wildlife has been dismissed from further analysis. The species with the potential to be affected by the alternatives, which will be further evaluated in "Chapter 4: Environmental Consequences," include the black bear, the brown-headed cowbird and its effects on native birds, and invertebrates. Special-status species will be considered separately (below).

Special-status Species — Special-status species are those federally listed species per the ESA or are other species of management concern. Several special-status species are not included in the impacts analysis. These species were eliminated from analysis for one of the following reasons: 1) the species is believed to be extirpated from the parks; or 2) the alternatives would have only a negligible to minor impact on the species or its habitat. A full listing of the species considered but dismissed from analysis is included in appendix L.

The following provides more information on selected special-status species that are of particular management concern:

Little Kern golden trout (Oncorhynchus mykiss whitei) — The Little Kern golden trout was listed as a federally threatened species in 1977 and critical habitat was designated the following year. The critical habitat consists of the entire Little Kern River watershed from one mile below the mouth of Trout Meadows Creek (USDA 2010), which is outside the park. Less than 4% (3,189 acres) of the critical habitat lies with the boundaries of the parks; the majority of the critical habitat (79,450 acres) exists within Sequoia National Forest. Because the Little Kern golden trout, as well as its designated critical habitat, exists only in a discrete area at the southernmost boundary of the parks in an area that is not highly used or likely to be affected by visitors or stock, the Little Kern golden trout will not be discussed further or analyzed in this WSP/FEIS.

California condor (Gymnogyps californianus) — The California condor is a federally and state-listed endangered species. Historically, this condor inhabited the western United States, but its distribution in California is currently limited to reserves in Ventura, Santa Barbara, Kern, Monterey, and San Luis Obispo counties (The Ecology Graduate Student Project Collective and Schwartz 2013). In 2013, the U.S. Fish and Wildlife Service (USFWS) documented the exploratory flight of a single California condor across the parks boundaries over the course of 2 days in July (Scott Scherbinski, pers. comm., 2013), which was the first documentation of the species in the parks since 1981. Given its vagrant status, this species will not be analyzed further.

Swainson's hawk (Buteo swainsoni) — The breeding population of Swainson's hawk is listed by the State of California as threatened. Swainson's hawks generally avoid mountainous terrain or steep canyons; thus they are rare residents and incidental visitors in the parks (NPS 2007a). Therefore, this species will not be analyzed in this WSP/FEIS.

Bald eagle (Haliaeetus leucocephalus) — The bald eagle is currently state listed by California as endangered for the breeding and wintering population. It was removed from federal listing in 2007, although it is still protected by the Migratory Bird Treaty Act and the Bald Eagle and Golden Eagle Protection Act. This species prefers undisturbed areas near large lakes and reservoirs, marshes and swamps, or stretches along rivers where it can find open water for foraging. Because the parks do not provide preferred habitat, bald eagles are only rarely observed. Additionally, there are no known nest sites or communal roosts within the parks (NPS 2007a). For these reasons, the bald eagle will not be analyzed further.

Peregrine falcon (Falco peregrinus) — The peregrine falcon is a species of special concern in the State of California. It was removed from federal listing in 1999. Peregrine falcons occasionally nest at both Moro Rock and Chimney Rocks, and climbing restrictions to protect them from disturbance are enacted during the nesting season each year. Changes proposed under the plan alternatives would have indirect and no or negligible impact on peregrine falcon habitat. Therefore, this species will not be further analyzed in this WSP/FEIS.

Great gray owl (Strix nebulosa) — The great gray owl is listed as an endangered species by California. The preferred habitat of the great gray owl is boreal forests. They use a wide range of habitats and elevations; however, forest and meadow associations are preferred, as these provide foraging and nesting areas (Ulev 2007). These large owls are nonmigratory, and most movement is associated with availability of prey species.

Great gray owls are rarely seen in the parks. A 2004–2005 study included areas near, but not within, Sequoia National Park; no great gray owls were located during this survey (Sears 2006). The results of

this study show that parts of the Sierra National Forest at the border of Yosemite National Park are likely the core habitat for these owls in California (Sears 2006). The parks are likely outside of the normal range of the great gray owl. Based on this information, this species will not be analyzed further in this WSP/FEIS.

Black-backed woodpecker (Picoides arcticus) — The black-backed woodpecker is a nonmigratory species native to the Sierra Nevada. It is a candidate for listing under the California ESA. The black-backed woodpecker lives in mid- to high-elevation coniferous forests with a strong association with recently burned coniferous forests. The primary threats to the species are thought to be certain forest management practices, including fire suppression, thinning to reduce risk of high severity fire, and especially post-fire salvage logging (Bond et al. 2012). Because changes proposed under the WSP alternatives would not affect the parks' Fire and Fuels Management Plan, this species was dismissed from further analysis.

Townsend's big-eared bat (Corynorhinus townsendii) — Townsend's big-eared bat is a candidate for listing under the California ESA; it is found throughout California. Townsend's big-eared bat populations are concentrated in areas with caves and cave-like roosting habitat, such as mines, bridges, buildings, and hollows in large old-growth trees (Gruver and Keinath 2006). Threats to this bat include human disturbance and habitat destruction. It is extremely sensitive to human disturbance during roosting; disturbance can cause hibernating bats to rouse at inappropriate times, resulting in an unnecessary use of energy and possibly death (Gruver and Keinath 2006). Changes proposed under the WSP alternatives would have indirect and no or negligible impact on Townsend's big-eared bat habitat. Therefore, this species will not be analyzed in this WSP/FEIS.

Sierra Nevada red fox (Vulpes vulpes necator) — The Sierra Nevada red fox is a high-elevation-restricted subspecies of the widespread red fox (*Vulpes vulpes*), which is considered nonnative at lower elevations. It is unknown how common the Sierra Nevada red fox may have been in the parks historically, but recent carnivore surveys using track plates and motion-activated cameras failed to detect them. In the winter of 2015, an individual was detected in Yosemite National Park, and the nearest known population is located near Sonora Pass, about 100 miles north of the parks. Because the Sierra Nevada red fox may have been extirpated in the parks and because the WSP alternatives are not expected to impact its habitat, this species was dismissed from further analysis.

Wolverine (Gulo gulo) — The wolverine is listed as a threatened species by the State of California; it is also a candidate for federal threatened status. While potential habitat exists in a large portion of the parks, wolverines are thought to have been extirpated from California in the 1920s. Since the last verified specimen was collected in 1922, there has been only one verified detection of a wolverine in California, which was determined to be a long-distance migrant from the Rocky Mountains (Moriarty et al. 2009). Several unverified reports indicate the possibility of wolverines in the parks as recently as 2008; however, a survey by the Institute for Wildlife Studies did not collect evidence of wolverine presence even though there was an 85% to 98% chance of detecting one if as few as four individuals remained. Because there are no recent sightings and this species is likely extirpated within the parks, it will not be further analyzed.

Pacific Fisher (Martes pennanti) — The distinct west coast fisher population has undergone a substantial range reduction over the last century and is classified as "warranted but precluded" from listing under the ESA (USFWS 2004). The fisher is strongly associated with mature-forest habitat (Powell et al. 2003). The primary threats to the species are small population size and the loss and fragmentation of habitat (e.g., via severe wildfire, habitat conversion, and excessive logging) (USFWS 2004). Because timber harvest generally does not occur in the parks and changes proposed under the WSP alternatives would not affect the parks' Fire and Fuels Management Plan, this species was dismissed from further analysis.

Tompkins' sedge (Carex tompkinsii) **—** Tompkins' sedge is a perennial herb that is a California state-listed rare plant. This species is found mostly within protected public lands, including Kings Canyon National Park. Tompkins' sedge inhabits chaparral, cismontane woodland, and montane conifer forest habitats and grows in soils derived from metamorphic or granitic rock in the Sierra Nevada. This perennial grass-like herb grows on steep, dry, south-facing rocky slopes as well as shady mesic, north-facing slopes and moist riparian areas (CDFG 2005). In Kings Canyon, it grows on gentle-to-steep slopes at elevations that range from 4,160 to 6,000 feet in canyon live oak (*Quercus chrysolepis*) – California laurel (*Umbellularia californica*) and canyon live oak – singleleaf pinyon *(Pinus monophylla)* associations and mixed coniferous forest (NPS 2003). There are ten known populations in Kings Canyon National Park, seven of which are in the Cedar Grove area of the South Fork of the Kings River canyon; three are along the Middle Fork of the Kings River in Tehipite Valley. The Cedar Grove populations represent the southernmost extent of this species range.

While Tompkins' sedge is listed as a rare species, it is now known to grow in a wider variety of habitat types than when it was listed in 1979. Surveys conducted in 2003 and 2004 estimated Tompkins' sedge population size at 706% above estimates based on early 1980s surveys (Huber et al. 2013). Therefore, Tompkins' sedge is recognized as less vulnerable than previously considered (CDFG 2005). In the areas that it does grow, mitigations are in place to protect the species from fire-line construction and trail-maintenance activities. Therefore, the species was dismissed from further analysis.

Giant sequoia (Sequoiadendron giganteum) — Although the giant sequoia is not federally listed or state-listed, the tree is renowned for both its massive size and long life span. The protection of giant sequoia groves drove the establishment of Sequoia National Park, and the species remains a cultural icon of international significance. Although other species surpass the giant sequoia in height and some individual trees may have a greater diameter, giant sequoias have the largest volume of any tree species (Cook 1955). The parks contain the largest giant sequoia trees and groves in the world, including the world's largest tree (by volume), the General Sherman tree. Giant sequoias are also long lived, with lifespans of upwards of 3,000 years. Despite their social relevance, physical size, and longevity, giant sequoias represent a relatively small component of the complex ecosystems of the southern Sierra Nevada, and of the parks.

The natural distribution of giant sequoia is restricted to approximately 75 scattered groves, comprising a total area of 35,607 acres along a limited area of the western Sierra Nevada (Habeck 1992). The parks' wilderness contains 65% of the area of sequoia groves in the two parks and roughly 20% of the area of all the sequoia groves in the world. Giant sequoias prefer deep sandy loam soils with low clay content which tend to be wetter, less acidic, higher in calcium, and lower in nitrogen than soils associated with other conifers in the parks (NPS 2013c). Giant sequoia trees characterize rather than dominate the species composition of the groves, which most commonly exist within the more extensive montane mixed coniferous forest. Common tree associates include white fir (*Abies concolor*), sugar pine (*Pinus lambertiana*), incense cedar (*Calocedrus decurrens*), and ponderosa pine (*Pinus ponderosa*) (Barbour et al. 2007).

Fire is an important ecological process which drives giant sequoia population dynamics and shapes the groves. Sequoias have thick, non-resinous bark, thus are well protected from fire. Fire stimulates seed release from cones and also removes the accumulated organic layer from mineral soil; sterilizes the soil, thereby killing seedling pathogens; and opens up the forest canopy to allow in sufficient sunlight for germination and growth. Historically, occasional localized high-intensity/high-severity fire events — in an otherwise low-intensity fire regime — created canopy gaps where giant sequoia seedlings could establish and recruit. As a result, a large number of seedlings tended to germinate after fire.

Fire suppression has led to changes in the age structure and species composition of giant sequoia groves. Loss of the structural diversity usually created by fire, as well as the buildup of duff and litter layers usually removed by fire, has resulted in lower seedling recruitment and thus groves with fewer young sequoias than were present historically. Absence of fire has increased the dominance of fire-intolerant white fir and incense-cedar in many groves, as these species are more able to establish in shaded conditions. For these reasons, the reintroduction of fire into giant sequoia groves is a primary focus of the parks fire management plan.

Air pollutants, especially ozone, can also impact giant sequoias. Although increased ozone levels do not appear to affect mature trees, increased levels can harm the foliage of young seedlings, resulting in increased seedling death rates of giant sequoias as well as other conifer species found in giant sequoia groves (York et al. 2013).

Climate change may alter conditions that sustain giant sequoia growth and regeneration. Snow melt, a major source of soil-water recharge in sequoia groves, is beginning progressively earlier in the spring, prolonging the summer drought characteristic of the Sierra's Mediterranean type climate. Giant sequoia trees are sensitive to changes in temperature and moisture, having reached their current extent over the past 4,500 years in response to climatic cooling and increased moisture. Smaller groves have little room to contract without disappearing. Further, barriers such as shallow or rocky soils on the upper elevation edges of groves may limit any natural expansion uphill as climates continue to warm. If climate model projections are correct, increasing temperature over the next several decades, by inducing earlier snowmelt and prolonging summer droughts, may cause a return to conditions unfavorable to giant sequoias. Studies show that the regeneration phase — dispersal, germination, and early establishment — is the most sensitive to the effects of climate change.

The risk of potential impacts from visitor use is greater in the more accessible groves of giant sequoias, and includes localized soil compaction, loss of topsoil, erosion, and reduced organic matter in soils. Erosion can expose the roots of established trees, while soil compaction can inhibit regeneration, as compacted soils are an unsuitable rooting substrate (York et al. 2013). These types of impacts are seen primarily in non-wilderness areas of the parks, and are mitigated through the establishment of trails, protective fencing, and through visitor education. Potential impacts in wilderness are mitigated by not allowing camping or campfires in giant sequoia groves. Because mitigating the primary stressors to these iconic trees (alteration of the natural fire regime, air pollution, and climate change) lies outside the scope of this plan, and as the WSP alternatives would not result in measurable impacts on giant sequoias, the species was dismissed from further analysis.

Natural Soundscapes — The natural soundscape is the aggregate of all natural sounds that occur in the parks, together with the physical capacity for transmitting natural sounds. Natural sounds occur both within and beyond the range of sounds that humans can perceive, and can be transmitted through air, water, or solid materials. The NPS will restore degraded soundscapes to their natural condition wherever possible, and will protect natural soundscapes from degradation due to noise (NPS 2006a).

Two years of monitoring data were collected from six sites in Sequoia and Kings Canyon National Parks. These data cover acoustic conditions for a variety of vegetation zones and seasons in various locations in the parks. Aircraft overflight noise was a pervasive and dominant sound source. Generally, aircraft activity peaked during daylight hours but, from dusk to dawn, its audibility dropped to almost zero at all sites (Formichella et al. 2006). The most remote site, at Crabtree Meadow, did not have the longest noise-free interval or the smallest percent of time that extrinsic, non-natural sounds were audible. Instead, the longest noise-free interval was found at Buckeye Flat and Redwood Canyon. Nevertheless, the mean percent time during which extrinsic sounds were audible was relatively low at all sites. Therefore, the

natural soundscape of the parks' wilderness is in good condition with infrequent human-made noise intrusions.

There would be a negligible effect on natural soundscapes for alternatives 1, 2, 4, and 5. People hiking, stock groups, and helicopter flights all produce audible extrinsic sounds. In alternative 3, an increase in trailhead quotas would produce no more than a negligible effect on natural soundscapes in localized areas. Therefore, this topic was dismissed as a standalone topic in the WSP/FEIS, but it will be addressed under wilderness character.

Wild and Scenic Rivers — The designated as well as eligible and suitable rivers were evaluated. These include Middle and South forks of the Kings River and North Fork of the Kern River (designated), and the Marble, Middle, East, and South forks of the Kaweah River, and the South Fork San Joaquin River (eligible and suitable). A Comprehensive River Management Plan was an integral part of the GMP, and river-protection measures were developed. Because this plan would incorporate those measures and proposes no changes to river management and because the actions and alternatives in the WSP/FEIS would not result in adverse impacts on Wild and Scenic River resources or changes to the enhancement or protection of outstandingly remarkable values, this topic is dismissed from further analysis.

Indian Trust Resources — Secretarial Order 3175, "Identification, Conservation and Protection of Indian Trust Assets" requires that any anticipated impacts on Indian trust resources from a proposed project or action by Department of the Interior agencies be explicitly addressed in environmental documents. The lands comprising the parks are not held in trust by the Secretary of the Interior for the benefit of Indians or because of their status as Indians; therefore, this topic has been dismissed from further analysis.

Prime Farmland — In 1980, the CEQ (40 CFR 1500) directed federal agencies to assess the effects of their actions on farmland soils classified as prime or unique by the U.S. Department of Agriculture, Natural Resources Conservation Service. Prime farmland soil produces general crops such as common foods, forage, fiber, and oil seed and unique farmland produces specialty crops such as fruits, vegetables, and nuts. There are no prime or unique farmlands within the parks' wilderness; therefore, this topic is dismissed from further analysis.

Biosphere Reserves, Ecologically Critical Areas, and Other Unique Areas — In 1976, Sequoia and Kings Canyon National Parks were designated an international biosphere reserve by the United Nations Educational, Scientific, and Cultural Organization under the direction of the Man and the Biosphere Program. According to NPS *Management Policies 2006*, "Biosphere Reserves are sites that are part of a worldwide network of natural reserves recognized for their roles in conserving genetic resources; facilitating long-term research and monitoring; and encouraging education, training, and the demonstration of sustainable resource use…." The WSP alternatives would not threaten the associated qualities and resources that make the parks significant, nor would it affect the parks' status as an international biosphere reserve. Rather, it would benefit those resources for which the parks became a biosphere reserve. These topics are dismissed from further analysis.

Environmental Justice — Executive Order 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations" was published in the *Federal Register* (59 FR 7629) on February 11, 1994. This order requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on Native American Indian and other minority populations and low-income populations.

The assessment of potential environmental justice impacts is guided by the CEQ's Environmental Justice Guidance under NEPA (CEQ 1997). Determination of environmental justice impacts requires three steps:

1. determining the geographic distribution of low-income and minority populations in the affected area;
2. assessing whether the action under consideration would produce impacts that are high and adverse; and
3. f impacts are high and adverse, a determination as to whether these impacts would disproportionately affect minority and low-income populations.

Sequoia and Kings Canyon National Parks are largely surrounded by other federal lands but there are several communities within close proximity to the southwest portion of Sequoia National Park, and west of Kings Canyon National Park (near Grant Grove). East of the parks there are communities located near the parks that provide important access points to the parks' wilderness.

There are five Indian Reservations near the parks; four in Inyo County and one in Tulare County. In Inyo County, the Big Pine Paiute, Bishop Paiute, Fort Independence, and Lone Pine reservations are situated along U.S. Highway 395, which runs generally north-south through the county, five miles or further from the nearest NPS boundary, and with portions of Inyo National Forest lying between the communities and the parks' boundary. All four reservations are affiliated with the Paiute tribe, with members of the Shoshone also affiliated with the Fort Independence and Lone Pine reservations. According to the 2010 Census, the total population, including some non-Indians, ranged from 93 (Fort Independence) to 1,588 (Bishop Paiute).

The Tule River Indian Reservation is southwest of Sequoia National Park, separated from it by portions of the Sequoia National Forest and with no direct road connection. The 2010 Census reported 1,045 inhabitants on the reservation.

The absence of a permanent resident population within the parks, other than NPS and concessioner staff, distance from Indian Reservations, and lack of proposed actions under the WSP alternatives that would directly or indirectly affect the American Indian, other minority or low-income populations, effectively eliminates the potential for environmental justice concerns. Thus, absent the availability of additional information, no further consideration of environmental justice concerns is deemed necessary for the proposed wilderness-management alternatives. The alternatives analyzed in this document would not result in any identified effects that would be specific to any minority or low-income community. Therefore, environmental justice will not be further analyzed.

Energy Requirements/Depletable Resource Requirements and Conservation Potential — None of the alternatives would affect energy-depletable resource requirements or conservation potential to the extent that detailed analysis would be required. Therefore, this topic will not be analyzed in this WSP/FEIS.

ELEMENTS OR TOPICS OUTSIDE THE SCOPE OF THE PLAN

Many commenters brought forward issues that the WSP/FEIS will not address because the topics are operational in nature; are outside the scope of the plan; are addressed elsewhere in laws, regulations, policies, or previous planning documents; are related to frontcountry uses that do not directly support wilderness use; or the topics will be addressed in other ongoing or future planning documents. Examples of some of the comments brought forward and the justification for ruling out the topics is provided below

in table 3. A complete list can be found in the "Scoping Summary Report" available on the NPS PEPC website at: www.parkplanning.nps/sekiwild.

Table 3: Elements or Topics Outside the Scope of the Wilderness Stewardship Plan

Planning Issue or Topic	Outside the Scope of the Plan Rationale
Commenters recommended changing the parks' fees, had issues with hours of operation for permitting, and with staffing levels and experience of wilderness employees. Commenters also had concerns about funding levels for the parks and wilderness management.	These topics are operational issues not subject to plan-level decisions.
There were numerous comments related to allowing certain activities or uses in wilderness that are currently not allowed, such as goat packing, bicycling, dogs, mechanized/motorized uses, hunting, hang-gliding, etc.	These activities are currently prohibited in wilderness either through laws, regulations, and restrictions. Goats are specifically not allowed in the parks due to their ability to carry diseases that are catastrophic to native endangered Sierra Nevada Bighorn Sheep. This plan will not change the existing laws and restrictions related to these uses/activities and will not be included in the WSP.
A number of commenters brought forward issues related to cave resources, external threats such as pollution and deposition, climate change, and wildlife-management activities.	Many of these topics will be addressed by ongoing or future planning efforts, thus they will not be included in the WSP.
Commenters asked if the existing Wild and Scenic Rivers Management Plan could be amended through the WSP to remove the existing use restrictions on the South Fork of the Kings River.	In the 2007 GMP, the parks previously analyzed the aspect of allowing floatation devices (i.e., non-motorized boating) on the lower reach of the South Fork Kings River (Bubbs Creek confluence with South Fork downstream to the parks' boundary) and decided to not allow this activity. NEPA does not require that decisions contained in valid management plans and Records of Decision be revisited in tiered NEPA documents. The NPS, in the WSP/FEIS, need not revisit the question of whether boating should be allowed on this section of river.
The use of the Ash Mountain pasture for administrative operations was a topic suggested for inclusion in the WSP/FEIS.	The frontcountry facilities discussed in the WSP/FEIS are limited to those facilities vacated by HSHA v. USDOI. The pasture and facilities at Ash Mountain are used solely for administrative purposes, and are not utilized wholly or partially by commercial service providers. Therefore the use of the Ash Mountain facilities was not vacated from the GMP. An evaluation of the frontcountry facilities associated with administrative stock use, including the Ash Mountain pasture, would be a component of a future planning effort. Therefore, this topic will not be included in the WSP.
The use of ranger stations for public occupancy/use was brought forward as a potential planning issue.	In most cases, with the exception of the Pear Lake Ranger Station, which is within a DPWA, the use of ranger stations by the public are contrary to the purposes of wilderness and will not be considered in any of the alternatives.
Instituting a shuttle system for wilderness visitors was suggested.	A shuttle system currently operates in summer within a portion of Sequoia National Park. Expanding the shuttle system to support wilderness visitors is outside the scope of this planning process.

Table 3: Elements or Topics Outside the Scope of the Wilderness Stewardship Plan (continued)

Planning Issue or Topic	Outside the Scope of the Plan Rationale
The parks' wilderness character faces a number of external threats. The most challenging to deal with, and potentially the most damaging, are those outside of NPS control, such as air pollution, atmospheric contaminant deposition, and climate change (NPS 2013c). These external threats "include airborne contaminants such as nitrogen, sulfur, heavy metals, pesticides, and herbicides, which are concentrated along the west side of Sequoia National Park (Panek and Esperanza 2012)." In a study of western national parks, Sequoia and Kings Canyon ranked highest in contamination of air, vegetation, snow, and water by semi-volatile organic compounds. Some fish found in the Kaweah River drainage contained levels of dieldrin, DDT, and mercury high enough to pose health risks to humans and other predators (Landers et al. 2008).	These agents that originate outside the parks degrade natural conditions in wilderness and are difficult or impossible to influence, resist, or mitigate (NPS 2013c) and are therefore outside the scope of the WSP. However, monitoring would continue per the Wilderness Character Monitoring Strategy (appendix C).
Natural and cultural resources management and protection is an important component of wilderness management. Commenters brought forward issues such as the protection and long-term maintenance of historic resources, the protection of archeological resources, and a long-term strategy to protect natural resources in wilderness.	The WSP has taken into account the preservation and protection of natural and cultural resources, but does not outline particular strategies for the long-term management of these resources. However, a Resource Stewardship Strategy (in development) will address these topics.

Chapter 2

Alternatives

ON THE PREVIOUS PAGE
Atop Glacier Pass
Photo Courtesy of Rick Cain

CHAPTER 2: ALTERNATIVES

INTRODUCTION

This chapter describes the range of alternatives considered for the WSP/FEIS. A total of five alternatives, including the no-action alternative, are presented below. The environmentally preferable alternative is identified later in this chapter. Summary tables comparing the key topics between the alternatives are presented at the end of this chapter.

NEPA requires federal agencies to consider and fully evaluate a range of reasonable alternatives that address the purpose of and need for an action. Reasonable action alternatives must be economically and technically feasible and demonstrate common sense. CEQ regulations (40 CFR 1502.14) also require that federal agencies analyze a "no-action" alternative; this alternative evaluates future conditions under existing management plans or practices and allows the public to evaluate what would happen if no new action was implemented.

Alternatives to be considered may originate from the agency proposing an action, from cooperating agencies, or from members of the public. Alternatives may also be developed in response to comments from coordinating or cooperating agencies. With the exception of the no-action alternative, it is important to note that alternatives must meet, to a large degree, the stated purpose and objectives for taking action and should not conflict with federal, state, or local laws, regulations, and policies or constraints identified during public scoping of the WSP.

Alternative 1 (the no-action or status-quo alternative) describes how wilderness is currently managed in the parks. This provides a baseline for comparison with the other alternatives. Alternatives 2, 3, 4, and 5 (alternatives proposing a change in the status quo) describe a range of reasonable and feasible approaches that meet the purpose and need for action and to achieve the WSP objectives.

DEVELOPMENT OF ACTION ALTERNATIVES

The alternatives described in this chapter were developed through a multi-year process that included repeated opportunities for both agency and public input. At the start of this planning process, the NPS solicited input from the public, park staff, government agencies, tribal officials, and other organizations for input on key issues and conditions desired for the parks' wilderness.

An interdisciplinary planning team (IDT) comprised of park staff reviewed and considered the staff and public comments received during the 2011 scoping period, as well as from the 1997 scoping period. From these comments, the IDT identified the key concepts that would be included in the alternatives. From 2009 to 2014, studies were completed regarding a number of important wilderness resources. The conclusions of these studies also helped in developing the alternatives. Using this varied information and input, the IDT identified a dozen key aspects of wilderness management that needed to be addressed in the WSP, including wilderness use levels, access and trails, stock use and grazing, commercial services, and recreational and administrative infrastructure.

The IDT then drafted six alternative approaches for managing the overall character of the parks' wilderness. Each of these draft alternatives emphasizes particular visitor experiences associated with different wilderness qualities. Each one meets applicable laws, as well as the goals, objectives, and desired conditions described in chapter 1. The high standard for natural resource preservation required by the 1964 Wilderness Act means there is little variation across the alternatives in terms of how natural

resources are addressed. The main differences between these alternatives lie in the key elements of wilderness management – use levels, access and trails, stock use and grazing, and infrastructure, both recreational and administrative. These differences are driven by the different approach to management that each alternative offers. Each alternative serves visitor and/or operational needs and commercial services in different ways.

After the IDT developed these preliminary draft alternatives the parks' Leadership Team and the leadership of the NPS Pacific West Regional Office reviewed them. In the fall of 2012, the preliminary draft alternatives were published for public review and comment on the NPS PEPC system. Approximately 200 comment letters were received. These public comments raised significant points that were used in revising the draft alternatives for this WSP/FEIS. The number of action alternatives was reduced from five to four.

The final set of five alternatives outlined in this chapter represent a broad range of ideas designed with maximum input to best achieve the purpose of the plan – to guide the management of visitor use and associated administrative activities in order to preserve wilderness character.

SELECTION OF THE NPS PREFERRED ALTERNATIVE

In summer 2013, the parks held a facilitated decision-making workshop with key staff to identify which alternative in this WSP is preferred by park management. The workshop incorporated a wide range of resource and visitor-use information to give the participants the best available knowledge for making reasoned and informed decisions. Once the preferred alternative was selected, it was presented to leadership staff at the Pacific West Regional Office for concurrence.

Alternative 2 is the NPS preferred alternative (Note: At the time of the 2012 public review period, this alternative was entitled "preliminary draft alternative 3"). It was selected by comparing the relative advantages of each alternative and examining how each alternative met the goals, objectives, and desired conditions for wilderness stewardship. Park managers believe that alternative 2 provides the most balanced, comprehensive approach to protecting wilderness character when compared with any other alternative. Overall, alternative 2 provides the best combination of management strategies, resulting in a practical, common sense approach to wilderness management. It protects the qualities of wilderness, supports a balance of resource preservation and use over the long term, and welcomes visitors to participate in stewardship and use of one of the world's finest wilderness areas. The NPS environmentally preferable alternative is alternative 5 described later in this chapter.

Rae Lakes

ALTERNATIVE 1: NO-ACTION / STATUS QUO

OVERVIEW

The overarching idea behind alternative 1 is that the current documents and actions used by the parks to oversee wilderness would remain the same. That does not mean that nothing could change, but changes would be driven by the same plans currently in use.

Alternative 1 General Concept: Continue Current Management.

Under alternative 1, the management of all wilderness areas would continue to be guided by the *Backcountry Management Plan* (BMP) and *Stock Use and Meadow Management Plan* (SUMMP), each approved in 1986. [Note: the original BMP dealt with "backcountry." Most of what was referred to as "backcountry" is now either designated wilderness, listed as a potential addition to designated wilderness, or proposed (and therefore managed as) wilderness. Consequently, where "backcountry" is used, it refers to wilderness.]

The BMP allows for recreational use in such a manner that the parks' resources are preserved now and into the future. The BMP establishes trailhead quotas, a wilderness permit system, and management objectives for campfires, campsites, sanitation, food storage, special-use limits, area closures, stock use and grazing, education and interpretation, trails and travel, signs, commercial operations, ranger stations, administrative policies, and monitoring (e.g., meadows monitoring). Alternative 1 includes the continuation of management objectives established under the BMP.

These BMP's objectives include ensuring that:

- Maximum-use levels would continue to keep resource impacts within acceptable limits.
- A variety of recreational uses and opportunities would continue to be offered to provide a range of wilderness experiences.
- Regulations would continue to be minimized to allow as much freedom of recreational use as possible.
- Recreational use would continue to accommodate a range of visitor densities, from the relatively social experience that occurs in popular areas to the solitude found in the more rugged and remote areas.
- Visitors would continue to follow procedures that keep impacts on park resources and other visitors to a minimum.
- Information, education, and interpretation would continue to be directed at achieving visitor understanding, support, and compliance.
- Scientific research would continue to be conducted in wilderness to inform management decisions and ensure that natural processes are unimpaired.
- The network of wilderness trails would continue to be maintained.

- A trail signage program would continue to be used and refined, using materials and designs appropriate to the wilderness setting.
- Stock use by visitors and park work crews would continue to be within limits that ensure resource protection and maintain the quality of visitor experience.
- Commercial guide services would continue to be allowed as appropriate. Commercially guided trips would continue to be regulated through the established permit system.
- Structures necessary for the purposes of administration and historic preservation would continue to be allowed. These include existing ranger stations, historic cabins, snow-survey cabins, radio facilities, dams for water storage and electric generation, Bearpaw Meadow High Sierra Camp, snow-course markers and telemetry devices, toilets, and research facilities.
- Administrative activities for maintenance of trails and facilities, visitor protection and information, natural resource management, research, and general management purposes would continue to be conducted.
- The BMP would continue to be updated to protect natural and cultural resources as new information becomes available through research and monitoring.

The 1986 SUMMP establishes the management system and tools for stock use and includes site-specific opening dates for grazing, grazing management, use levels, protection of Sierra Nevada bighorn sheep ewe-lamb ranges, installation of drift fences, stock and camp etiquette, implementation of temporary variances, and other closures. The SUMMP also establishes a monitoring program to inform and modify management as necessary to reduce resource impacts.

Alternative 1 includes the continuation of management objectives established under the 1986 SUMMP. These management objectives include ensuring that:

- Stock, to the extent possible, would continue to be allowed in the wilderness of the parks on the same areas and trails at the same levels and patterns unless information from the monitoring system indicates need for change.
- Management controls would remain in place to protect forage areas from change in plant species composition, cover, and/or vigor, and from adverse effects on soils and associated sod that may lead to deteriorated productivity or unnatural erosion, and to allow recovery where necessary.
- Management controls on use levels, limits on travel on- and off-trail, temporary closures and opening dates, number of stock, number of nights per area variances, education, and monitoring would continue to be used to minimize the effects of pack and saddle stock on trails, camps, drainage patterns, and water quality.
- A series of meadows (or definable parts of meadows), including representatives of all major types within the parks, would continue to be protected from stock use so that they are perpetuated as – or allowed to become – naturally functioning ecosystems. These meadows would continue to provide an opportunity for all visitors to enjoy seeing meadows in their natural state, and provide opportunities for scientific study. This includes comparison with meadows that are grazed, so that the relative effects of climate, plant-succession, and grazing may be better understood.
- A program of education and participative support for minimum-impact stock use and improved understanding and cooperation between stock users and backpackers would continue.
- Rehabilitation projects would continue to be considered in areas where past use has left an impact on park resources.

- The monitoring program established through the 1986 SUMMP would continue to provide information about the effects of pack and saddle stock on the resources of the parks so that guidelines may be modified to protect the parks' values. The monitoring program would continue to take into account variation in annual climate, the characteristics of specific forage areas, and the inherent abilities of different species to withstand grazing and trampling pressure.

KEY ELEMENTS OF ALTERNATIVE 1

During the internal and public scoping, eleven key topics were identified as critical to managing wilderness. These elements are the same for each alternative; however, the management actions vary by alternative.

Element 1: Visitor-use Levels

Permits and Quotas — Under alternative 1, all overnight visitors (with the exception of administrative users) in the parks' wilderness, whether private (i.e., self-supported) or traveling with the support of a commercial service provider, are subject to the trailhead quota system (table 4), and must obtain a wilderness permit from an approved source [e.g., NPS, United States Forest Service (USFS), or Pacific Crest Trail Association]. Daily quotas are established for most trailheads and are based on visitor frequency and distribution patterns, including those of commercially supported visitors. These limits are intended to ensure reasonable use levels, the protection of wilderness character, and thus a high quality wilderness experience for visitors.

For those trailheads managed by the parks on the west-side of the parks, visitors must remain within the established quotas with rare exceptions. The BMP states an exception: "On days that the trailhead quotas are full the commercial pack station operator may override the quota for that day since the quotas are structured with the commercial pack station use included."

Those visitors entering the parks' wilderness via trailheads managed by Inyo National Forest on the east side of the parks are subject to the trailhead quotas of Inyo National Forest (table 4). Most of these quotas are "combined" (i.e., one quota for both private and commercially supported visitors), and some are "split" (i.e., separate quotas for private visitors and commercially supported visitors).

Visitors also enter the parks' wilderness from more distant Yosemite National Park and USFS managed trailheads (e.g., Sierra and Sequoia national forests), of which some have quotas and some do not. These visitors are subject to the entry policies of the agency issuing the permits at the trailhead.

Table 4: Current Trailhead Quotas – North to South

Trail/Area Name (Agency Issuing Permits)[1]	Entry Name/Park[1]	Daily Quota or Use Level[2]	Commercial Quota[3]
JMT/YOSE/Sierra NF	Piute Creek/KICA	VH	
Pine Creek/Inyo NF	Piute Creek/KICA	15	15
North Lake/Piute Pass/Inyo NF	Piute Creek/KICA	30	15
Florence Lake/Sierra NF	Piute Creek/KICA	72	
Sabrina/Inyo NF	Lamarck Col/KICA	10	8
Courtright Reservoir/Sierra NF	Hell-for-Sure Pass/KICA	VL	
Bishop Pass/Inyo NF	Dusy Basin/KICA	36	15
Taboose Pass/Inyo NF	Upper Middle Fork Kings/KICA	10	

Table 4: Current Trailhead Quotas – North to South (continued)

Trail/Area Name (Agency Issuing Permits)[1]	Entry Name/Park[1]	Daily Quota or Use Level[2]	Commercial Quota[3]
Crown Valley/Rancheria/Sierra NF	Blue Canyon/KICA	VL	
Crown Valley/Rancheria/Sierra NF	Tehipite/KICA	L	
Sawmill Pass/Inyo NF	Woods Lake Basin/KICA	10	
Baxter Pass/Inyo NF	Baxter Lake/KICA	8	
Deer Creek/Sierra NF	Monarch Divide/KICA	L	
Lewis and Hotel Creeks/SEKI	Monarch Divide/KICA	25	
Copper Creek/SEKI	Monarch Divide/KICA	20	
Woods Creek/Paradise Valley/SEKI	Rae Lakes Loop/KICA	25	
Bubbs Creek/SEKI	Rae Lakes Loop/KICA	25	
Onion Valley/Kearsarge/Inyo NF	Rae Lakes Loop/KICA	60	15
Don Cecil/KICA	Don Cecil/KICA	VL	
Summit Meadow/Sequoia NF	Don Cecil/KICA	VL	
Sugarloaf/Marvin Pass/Sequoia NF/SEKI	Sugarloaf/KICA	25 (if into SEKI)	
Rowell Meadow/Belle Canyon/Sequoia NF/SEKI	Sugarloaf/Belle Canyon/KICA	25 (if into SEKI)	
J.O. Pass/Big Meadows/Sequoia NF/SEKI	Sugarloaf/Twin Lakes/KICA/SEQU	15 (if into SEKI)	
Redwood Canyon/SEKI	Redwood Canyon/KICA	15	
Shepherd Pass/Inyo NF	Tyndall Creek/SEQU	15	
Twin Lakes/SEKI	Twin Lakes/SEQU	30	
Lakes Trail/SEKI	Emerald/Pear Lakes/SEQU	25[(4)]	
Alta/Wolverton/SEKI	Panther Gap/SEQU	25	
North Fork Lone Pine Creek	Mount Whitney/SEQU	10	8
Whitney Portal/Inyo NF	Mount Whitney/SEQU	60 (+100 day-users)	
North Fork Kaweah/SEKI	Yucca Creek/SEQU	VL	
Colony Mill Road (east)/SEKI	Crystal Cave Road/SEQU	VL	
Colony Mill Road (west)/SEKI	North Fork/SEQU	VL	
HST/SEKI	Bearpaw/SEQU	30	
Middle Fork Kaweah/SEKI	Bearpaw/River Valley/SEQU	25	
Cottonwood Lakes/Inyo NF	New Army Pass/SEQU	60	15
Cottonwood Pass/Inyo NF	Rock Creek/Kern River/SEQU	40	
PCT–South/Multiple	Rock Creek/SEKI	M	
Trail Pass and Mulkey Pass/Inyo NF	JMT/Rock Creek/Kern River/Inyo NF and SEKI	L	
Paradise Ridge/SEKI	Paradise Ridge/SEQU	15	
Atwell/SEKI	Hockett/SEQU	25	
Timber Gap/SEKI	Timber Gap/Cliff Creek/SEQU	25	
Sawtooth/SEKI	Monarch Lakes/Sawtooth Pass/Kern Drainage/SEQU	20	
Tar Gap/SEKI	Hockett/SEQU	25	
Mosquito/SEKI	Mosquito Lakes/SEQU	25	

Table 4: Current Trailhead Quotas – North to South (continued)

Trail/Area Name (Agency Issuing Permits)[1]	Entry Name/Park[1]	Daily Quota or Use Level[2]	Commercial Quota[3]
Eagle/SEKI	Eagle Lake/SEQU	20	
White Chief/SEKI	White Chief/SEQU	25	
Franklin/SEKI	Franklin Lakes and Pass/SEQU	30	
Farewell Gap/SEKI	Farewell Gap/Sequoia NF	L	
Ladybug/SEKI	South Fork/Ladybug/SEQU	15	
Garfield/SEKI	South Fork/Garfield/Hockett/SEQU	15	
Shake Camp/Sequoia NF	Hockett/SEQU	L	
Lewis Camp (Quaking Aspen)/Sequoia NF	Hockett/Kern/SEQU	M	
Jerkey Meadow/Sequoia NF	Kern/SEQU	L	

[1]Agency names are abbreviated as follows: YOSE = Yosemite National Park; SEKI = Sequoia and Kings Canyon National Parks; SEQU = Sequoia National Park; KICA = Kings Canyon National Park; NF = National Forest
[2]In regard to quotas and estimated use into SEKI from the indicated trailhead: VL= very low estimated use (<100 users/yr); L = low estimated use (100–300 users/yr); M = medium estimated use (>300 users/yr) and VH (>3000 users/yr). Note: each user averages ~3–4 use nights/trip. A cell with a use-level letter indicates no quota.
[3]Separate commercial quotas only apply to specific trailheads originating in Inyo NF. Some of the entries, both private and commercial, into wilderness from those trailheads would not enter SEKI, remaining exclusively in Inyo NF.
[4]Lakes Trail is controlled by a destination quota – which limits the number of people in each of the two lake basins at Emerald and Pear lakes with a maximum allowable of 25/night. If hikers are traveling past Pear Lake to Tablelands, the quota is 25.

Destination quotas are applied for Emerald and Pear lakes to limit visitor density.

Access to Mount Whitney from the east side (Whitney Portal Trailhead) is controlled by a special permit system administered by the USFS. This special permit system applies to both day-users and overnight-users.

There are no day-use permits or day-use quotas other than the USFS day-use permit for Mount Whitney.

Visitor Capacities and Encounter Standards — Although the BMP and the SUMMP did not formally establish visitor capacities and encounter standards, current use levels of visitors are controlled through several methods. Primary among these is the use of a quota system on daily entries into the parks' wilderness from individual trailheads. This method is in place at nearly all Sequoia and Kings Canyon National Parks managed trailheads and at most trailheads managed by the USFS (Inyo, Sierra, and Sequoia national forests). Additional methods include requiring the use of designated campsites and areas, group size limits, and night-stay limits in specific areas. Many of these controls were put in place in the 1970s and 1980s (specifically with the 1986 BMP) to control the historically highest use levels, and the subsequent impacts of use, of that time period.

The average number of overnight wilderness visitors for the past three years (2010–2012) is approximately 23,000, accounting for an average of approximately 111,000 visitor-use days (VUD) per year. These figures are compiled from permits issued by Sequoia and Kings Canyon National Parks, and Inyo, Sequoia, and Sierra national forests. This does not include Pacific Crest National Scenic Trail users coming from south of Sequoia National Forest or coming from north of Inyo and Sierra national forests, or John Muir Trail users coming from Yosemite National Park or other points north of Sierra National Forest. It is estimated that these additional 3,500 users account for an additional 28,000 visitor-use days (based on projected numbers of users and days of use – estimates of visitor-use days in these parks per trip per person for Pacific Crest National Scenic Trail and John Muir Trail users is eight). For the purposes of the WSP, only the VUDs calculated from wilderness permits are used. The estimates from

PCT/JMT long-distance use have not been included, though they have been considered in visitor-capacity decision making.

Element 2: Trails

The NPS maintains a network of trails in the parks' wilderness, including the PCT, JMT, HST, and many others. Under alternative 1, these trails are maintained, reconstructed, or rerouted following the general standards established in the NPS Trail Maintenance Handbook (Hooper 1983). Routine trail maintenance includes removing rocks and downed trees, clearing brush, water-bar construction and cleaning, filling washed-out trails, and bridge repairs or reconstruction. All maintenance activities are conducted in a manner that protects park resources and minimizes visitor disturbance. Under alternative 1, new trail construction does not take place in areas that are currently without trails. Figure 6, depicting the current wilderness trail system, can be found on page 83.

The NPS maintains trail signs with directional markers and mileages. Interpretive signs are generally not placed in wilderness, unless special circumstances exist. Marking informal trails with plastic ribbons, cairns, or other markers is prohibited. The only exception is the use of temporary markings for emergency purposes such as search and rescue and fire management. In these cases, markings are removed after emergency activities end.

Element 3: Campfires

Recreational campfires are allowed in the foothill and montane forest areas where adequate wood supplies exist. Recreational campfires are allowed up to:

- 10,000 feet in the San Joaquin River drainage.
- 10,000 feet in the Kings River drainage.
- 9,000 feet in the Kaweah River drainage.
- 10,400 feet in the Kern River drainage. (This elevational limit was established in 2009 to protect downed wood resources, especially foxtail pine resources, and superseded the BMP campfire limit of 11,200 feet in the Kern River drainage.)

In addition, there are site-specific prohibitions in the Kings (Granite Basin and Redwood Canyon), Kaweah (Hamilton Lakes and Mineral King Valley), Kern (above 10,000 feet in Nine Lakes Basin / Big Arroyo, and within ¼ mile of the food-storage box at Lower Crabtree Meadow), Tule River (Summit Lake Basin and Dillonwood area) drainages, and in certain sequoia groves (table 5 on the next page). The restrictions in sequoia groves would apply across all alternatives.

This alternative allows recreational campfires in 398,829 acres of the total 837,806 acres of wilderness (48% of the wilderness). Figure 7 (page 85) depicts campfire restrictions for alternative 1.

Table 5: Camping and Campfire Restrictions in Giant Sequoia Groves in Sequoia and Kings Canyon National Parks – All Alternatives

Grove Name	Wilderness Camping Allowed?	Campfires Allowed?
Atwell	No	No
Big Springs	Yes	No
Big Stump[1]	No	No
Board Camp	Yes	No
Cahoon (Creek)	Yes	Yes
Castle Creek	Yes	Yes
Cedar Flat	Yes	Yes
Clough Cave	No	No
Coffeepot	No	No
Dennison	Yes	Yes
Devils Canyon	Yes	Yes
Dillonwood[1]	No	No
Douglass	Yes	Yes
East Fork	Yes	Yes
Eden Creek	Yes	Yes
Forgotten	No	No
Giant Forest	No	No
Garfield	Yes	Yes
Granite Creek	Yes	Yes
Grant[1]	No	No
Homer's Nose	Yes	No
Horse Creek	Yes	Yes
Little Redwood Meadow	Yes	Yes
Lost[1]	No	No
Muir	No	No
Oriole Lake Grove	Yes	Yes
Pine Ridge	Yes	No
Putnam-Francis	Yes	No
Redwood Canyon	Yes	No
Redwood Creek	Yes	No
Redwood Meadow	Yes	Yes
Redwood Mountain	Yes	No
Sequoia Creek[1]	No	No
Skagway	Yes	No
South Fork	Yes	Yes
Squirrel Creek	Yes	Yes
Surprise	Yes	No
Suwanee	No	No

[1] Not in wilderness

Element 4: Food Storage

There are some 86 food-storage boxes (also called *lockers*) presently in the parks' wilderness (see figure 3, page 67, for a map of current locations, and table 15, pages 106–110, for names of locations). Portable food-storage containers are required in three specific areas on a seasonal basis, per the following regulations implemented after the BMP.

Effective 5/01 to 10/31: Portable, NPS-allowed, food-storage containers (including panniers) with the capacity to store all garbage, food, and scented items are required for all overnight parties entering and or exiting the following areas:

- Rae Lakes Loop and vicinity — all visitors must use NPS-allowed, portable food-storage containers. Long distance through hikers on the PCT and the JMT may use either portable containers or food-storage boxes.
- Dusy and Palisades basins — all visitors must use portable containers.
- Rock Creek area — all visitors must use park-allowed, portable food-storage containers. Long distance hikers on the PCT may use portable containers or food-storage boxes.

The technique of counterbalancing or hanging food is allowed year-round within wilderness, with the exception of Dusy Basin, Rae Lakes, and Rock Creek from May 1 to the end of October. Posting a guard to watch and protect food is a prohibited food-storage technique.

Commercial service providers are required to provide NPS-approved portable containers for trips to any part of wilderness. Use of counterbalancing, food-storage boxes, or food guarding is prohibited.

Element 5: Human-waste Management

Restrooms and privies are located in areas where conditions warrant and where determined to be the minimum necessary for the administration of wilderness (currently there are two restrooms and an estimated 22 privies in wilderness, excluding toilets associated with ranger stations). A cat-hole (a shallow hand-dug hole for burying human waste) or carrying-out of waste is required where no privies or restrooms are provided. Pack-out waste kits are recommended in the Mount Whitney area.

Element 6: Party Size

Party size refers to the number of people and stock in a single group of wilderness visitors. Under alternative 1 the current maximum party size for on- and off-trail hikers is 15 people with area specific exceptions per the BMP and SUMMP. Tables 6 and 7 present party size limits under alternative 1.

Table 6: Party-size Limits for Hikers and Boaters for Alternative 1

Type of Hiking Trip	Maximum Party Size
On-trail (day-use)	25
On-trail (overnight use)	15
Off-trail (overnight and day-use)	15
Area-specific	Redwood Canyon – 10

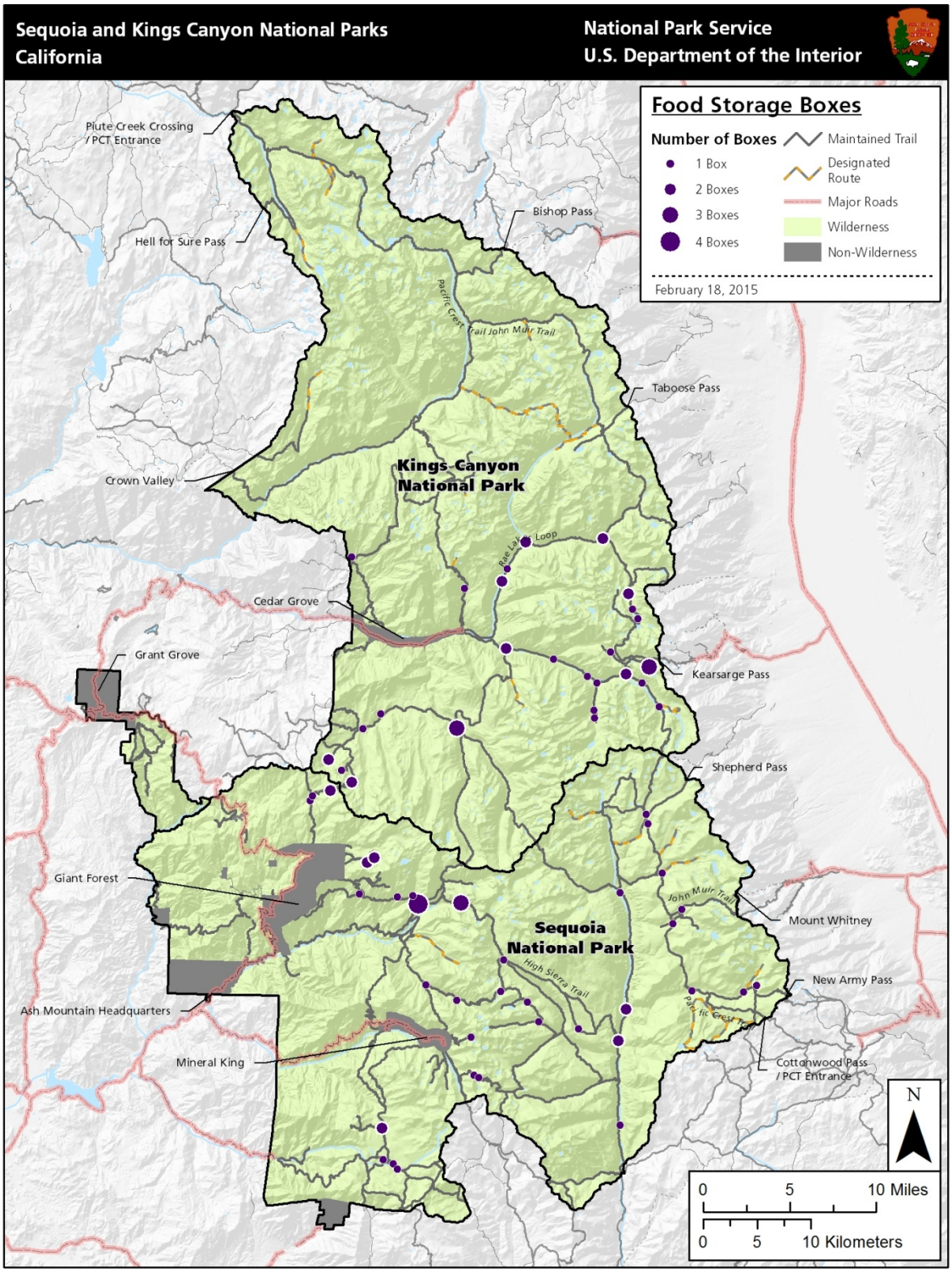


Figure 3: Current Food-storage Box Locations

Table 7: Party-size Limits for Stock Parties for Alternative 1

Type of Stock Trip	Maximum Party Size for People and Stock
Day-use (including spot, dunnage, and day rides)	People: 25 Stock: 20 Combined: 45 (with some lower exceptions per BMP/SUMMP)
On-trail	People: 15 Stock: 20 Combined: 35 (with some lower exceptions per BMP/SUMMP)
Off-trail (in areas specifically designated for off-trail stock use)	People: 15 Stock: 20 Combined: 35
Area-specific	Temporary limits in five specific areas where there is a maximum party size of eight people/stock or combination: Dusy Basin, Sphinx Lakes, Darwin Canyon, Mount Langley, and Sixty Lake Basin. Redwood Canyon maximum of 10 head of stock. Milestone Basin maximum of 8 head of stock.

Element 7: Camping/Campsites and Night Limits

To preserve the unconfined aspect of recreation in the parks' wilderness, there are few restrictions on where overnight visitors can camp. Following Leave No Trace© practices helps to preserve the natural quality.

Camping is prohibited within one mile of any road and generally prohibited within four miles of a developed area or trailhead complex (NPS 1986a). The BMP identifies first allowable campsites for trailheads, and camping along trail corridors is prohibited prior to reaching the first-camp locations (tables 8 and 9). These first-camp limits minimize impacts in heavy day-use areas and protect solitude. In many instances, the first-camp locations are the first suitable site (with water and room to camp) from the trailhead. First-camp policies also prevent frontcountry overflow camping from extending into wilderness, to control impacts at sensitive "close-in" areas, and to protect opportunities for solitude for day-use visitors.

Additional first camps not specified in the BMP are listed in table 9 on the next page. These trails have historically received low use, and the distances reflect the general one-mile restriction or indicate the first available water source and/or the probable camp destination.

Table 8: First Camps Established in 1986 Backcountry Management Plan (BMP)

Trailhead Name	Distance to First Camp	Name of First Camp
Lewis Creek	4 miles	Comb Creek
Copper Creek	3.6 miles	Lower Tent Meadow
Woods Creek/Paradise Valley	7 miles	Lower Paradise Valley (designated sites only)
Bubbs Creek	4 miles	Sphinx Creek
Twin Lakes	3 miles	Cahoon Meadow
Lakes – Emerald/Pear Lakes	5 miles	Emerald Lake (designated sites only)
Alta (Wolverton)	3 miles	Panther Gap (no water)
HST/Crescent Meadow	3 miles	Panther Creek
Atwell/Hockett	6 miles	Clover Creek

Table 8: First Camps Established in 1986 Backcountry Management Plan (continued)

Trailhead Name	**Distance to** First Camp	Name of First Camp
Timber Gap	4 miles	Timber Gap (no water)
Sawtooth-Monarch/Crystal	1 mile	Groundhog Meadow
Franklin	4 miles	Farewell Junction
Farewell Gap	4 miles	Farewell Junction
White Chief	4 miles	White Chief Bowl
Eagle	3.4 miles	Eagle Lake
Mosquito	4 miles	Mosquito Lake #2 (Mosquito Lake #1 closed to camping)
Tar Gap	6 miles	Deer Creek
Ladybug (South Fork)	4 miles	Ladybug Camp
Garfield	4 miles	Garfield Grove / Snowslide Canyon

Table 9: First Camps Established Subsequent to the 1986 Backcountry Management Plan

Trailhead Name	Distance to First Camp	Name of First Camp
Lewis Creek and Hotel Creek	5.4 miles	Comb Creek
Sugarloaf (Marvin Pass Trailhead)	2.3 miles	Rowell Meadow (USFS)
Rowell Meadow (Belle Canyon Trailhead)	2.2 miles	Rowell Meadow (USFS)
J.O. Pass (Big Meadows)	2.2 miles	Rowell Meadow (USFS)
North Fork Kaweah	1 mile	
Colony Mill Road Trail	1 mile (each end)	
Middle Fork Kaweah	3.5 miles	Panther Creek
Paradise Creek	1 mile	
Paradise Ridge	1 mile	

Camping is prohibited along the following trails or in the following areas:

- Big Baldy Trail
- Buena Vista Trail
- Don Cecil Trail
- Giant Forest and Crystal Cave areas
- Little Baldy Trail
- Lost Grove Area Trails
- Marble Falls Trail
- Muir Grove Trail
- Oriole Lake Trail
- Tokopah Falls Trail

No camps are designated for the exclusive use of stock users with the exception of Upper and Lower Funston Meadows, which are designated for stock use only per the 1990 addendum to the SUMMP (NPS 1990). These camps were designated exclusively for stock users to ensure stock could camp in appropriate areas and not be displaced to inappropriate areas by backpackers occupying the stock sites.

The current policies of camping on durable surfaces (not on vegetation) and away from water sources apply. Camping on vegetation or in meadows is prohibited. There are camping restrictions associated with selected sequoia groves (table 5 on page 65) and these would apply across all alternatives. Camping within 25 feet of water is prohibited; 100 feet is the recommended camping distance from water.

Length of Stay/Night Limits — Night limits exist to protect popular areas from crowding and campsite proliferation (i.e., increase in numbers of campsites) and the resulting reduction in solitude. Night limits also prevent extended stays, which keeps popular areas available to more groups by preventing a small number of groups from occupying the area for long periods.

All campers are currently limited to stays of 14 consecutive nights at a single location, 21 total nights per trip, and 63 total nights per year. Exceptions exist for specific areas and are presented in table 10.

Table 10: Site-specific Exceptions to the Night Limits under Alternative 1

Location	Night Limits Exceptions (Consecutive Nights in One Location)
Charlotte Lake, Hamilton Lake, Kearsarge Lakes, Paradise Valley, Redwood Canyon	2-night limit
Rae Lakes	1-night limit per lake

Designated Campsites — The BMP identified 12 areas where designated campsites could be established and include the following:

- Bearpaw Meadow
- Eagle Lake
- Emerald Lake
- Evelyn Lake
- Hockett Meadow
- Kern Hot Spring
- Lower Funston
- Lower Mosquito Lake
- Paradise Valley
- Pear Lake
- Summit Lake
- Upper Funston

Designated campsites are established to control physical and social impacts at the most frequently visited areas. To date, designated campsites have been established only at Paradise Valley (accommodating approximately 100 people in three sections), Emerald and Pear lakes (25 people per night per lake), and Bearpaw Meadow Camp area (approximately 30 people). Camping is prohibited outside the designated campsites or areas in these four locations under alternative 1 (Note: in 2013, designated camp limits were changed to apply only in Lower Paradise Valley).

The parks promote the use of established camps through ranger contacts with visitors and the publication of informational materials.

Campsite Condition Standards — There is currently no campsite condition standard established under alternative 1. (For information on campsite conditions and standards, see appendix A, page A-15 and A-24.)

Element 8: Stock Use

Figures 8a and 8b depict stock access and grazing restrictions for alternative 1. Figure 8a shows stock access and grazing restrictions in Kings Canyon National Park and can be found on pages 86/87. Figure 8b shows stock access and grazing restrictions in Sequoia National Park and can be found on pages 90/91.

Stock Access and Travel

On-trail — Stock travel is generally allowed on wilderness trails. Stock parties are allowed to travel up to 0.5 mile from trails to reach campsites.

Most maintained trails are open to stock travel (637 of 653 miles), as are 77 miles of "designated unmaintained routes" (mostly informal and abandoned trails). Some trails and routes are open to stock parties for travel only (no overnight camping), some are open to camping and grazing for walking parties with burros and llamas, but limited to travel only for parties with horses or mules, and some are closed to stock travel entirely. Approximately 598 miles of maintained and unmaintained trails would be open to camping with stock. Trails are closed to stock to provide for visitor safety, to protect areas with resource concerns, and due to popular use by day hikers. Trails or routes with restricted stock access under alternative 1 are described below.

Trails and routes open for travel only (115 miles – includes mileages to first camps):

- Alta Trails
- Baxter Pass Trail
- Big Baldy Trail
- Buena Vista Trail
- Cataract Creek Route
- Center Basin Trail (to Golden Bear Lake)
- Don Cecil Trail
- JMT along Timberline Lake
- Kearsarge Lakes Trail to Kearsarge Lakes
- Kern Canyon Overlooks

- Lake 11,092 Route (shown as Lake 11,106 on older maps)
- Lakes Trail
- Little Baldy Trail
- Martha Lake Route from 1 mile above Hell-for-Sure Junction
- Miter Basin Trail above Primrose Lake outlet stream
- Muir Grove Trail
- Redwood Canyon area trails
- Upper Sixty Lake Basin Trail
- Tokopah Falls Trail
- Wallace Creek Route to Wallace Lake above 11,200 feet in elevation
- Wright Creek Route to Wright Lakes above 11,200 feet in elevation

Trails open to travel only for parties with horses or mules; camping for walking parties with burros and llamas allowed (15 miles):

- All Mineral King Basin Trails (Monarch Lakes, Crystal Lake, Franklin Pass, Farewell Gap, White Chief, Eagle Lake, Mosquito Lakes, and Mineral Lakes Trails)

Trails open to camping by special permit (2 miles):

- Milestone Basin (closed to stock travel above 10,800 feet in elevation, with free-roaming/grazing stock allowed up to 11,200 feet in elevation)

Trails closed to all stock travel (16 miles):

- Bullfrog Lake Trail west of Kearsarge Lakes Trail
- HST from Crescent Meadow to Wolverton Cutoff
- Lower Sixty Lake Basin Trail (currently a temporary restriction)
- Marble Falls Trail
- Mount Whitney Trail – base of switchbacks to the summit
- Sawtooth Pass Trail from Monarch Lake to Columbine Lake

Off-trail — Stock parties are allowed to travel up to 0.5 mile from trails to reach camps. Travel more than 0.5 mile from maintained trails is allowed in four areas of the parks: on the Hockett Plateau, on the Monarch Divide including Hotel Creek, in the Roaring River drainage, and along the western side of the Kern River watershed south from the Chagoopa Plateau.

Per the 1986 SUMMP, exceptions to access limits are allowed. The 1986 SUMMP states that "trips to areas not open to off-trail travel may be allowed. Such trips may be proposed to the superintendent and would be considered on a case-by-case basis."

Stock Grazing — One goal of wilderness management in the parks is to allow recreational use of stock within guidelines that will protect natural resources and values, the processes that shape them, and the

quality of experience distinctive to them. Stock grazing can affect park resources by removing vegetation, trampling small animals, vegetation and underlying soils, and depositing stock urine and feces on trails, in streams, and near camps. Therefore, grazing is managed and regulated by the SUMMP, BMP, and through the Superintendent's Compendium.

Under alternative 1, grazing is managed in accordance with the 1986 SUMMP and is informed by the results of the meadow-monitoring program. Traditional methods of adjusting use levels and patterns are employed when necessary, including:

- adjusting the number of nights a given party may graze an area;
- adjusting the number of stock per party that may graze an area;
- adjusting opening dates to reflect moisture conditions, which are designed to prevent unacceptable mechanical disturbance to surface soil and vegetation; and
- temporarily closing an area to stock access or grazing.

Estimated grazing capacities for wilderness meadows have been developed using a model of biomass production and forage consumption that takes into account the elevation, soil moisture, and condition of the meadow. These capacities are used to inform grazing management, and are refined as additional information is acquired. The capacity of individual meadows and uplands to sustain grazing is informed by each meadow's vulnerability to erosion or change in hydrologic function, susceptibility to invasion by nonnative plants, habitat requirements of sensitive plants and animals, productivity and the ability to sustain herbage removal, and the requirements of unique ecological communities such as peat-accumulating wetlands.

Administrative grazing is held below the estimated capacity of park meadows and, in most areas, managed to give visitors traveling with stock priority over administrative users.

In areas that are closed to grazing but open to overnight stock use, camping is allowed. The use of certified weed-free supplemental feed is not required; however, the NPS recommends that commercial pack stations use certified weed-free feed and the NPS uses weed-free feed in its administrative operations.

The current monitoring system established by the 1986 SUMMP is employed to track use, document conditions, and provide information for preventing and mitigating impacts. The monitoring program takes into account variation in annual climate, the characteristics of specific forage areas, and the inherent abilities of different species to withstand grazing and trampling pressure. Monitoring of species composition occurs in five pairs of grazed and ungrazed meadows on a five-year rotation, and repeat-photography points are updated as time and resources allow. Monitoring of residual biomass and bare ground, initiated in 1993, occurs and the results are used to inform decisions regarding grazing management.

The following meadows are closed by the 1986 SUMMP to grazing for scientific and social value: Big Pete Meadow forested portion, Crabtree Ranger Station Meadow, Dragon Lake Meadow, Ellis Meadow, Goddard Creek Meadows, Guyot Creek Meadows west of trail, Lake South America Col Meadow, Mitchell Meadow, Rock Creek #2 Meadow, Wallace Creek Closed Meadow, Woods Lake Shoreline Meadow, and Wright Creek Closed Meadow.

The following meadows are closed by the 1986 SUMMP to grazing due to high levels of visitation and resource concerns: Charlotte Lake Upper and Lower Meadows, Dusy Basin and Rainbow Lakes, East

Lake Shoreline Meadows, Granite Lake, Hamilton Lake Basin, Kearsarge and Bullfrog Lakes Basins, Paradise Valley, Rae Lakes Basin, Seville Lake, Timberline Lake, Tom Sears Meadow, Vidette Meadow, and Woods Creek Crossing South Side Meadows.

The following meadows are closed to grazing under the superintendent's authority to enact visitor-use restrictions: Crabtree Lakes (closed to stock access and grazing above existing camp west of lowest lake), Darwin Meadow proper, Forester Lake Meadow, Kern Hot Spring Meadow, meadows within five miles of Giant Forest Museum, Milestone Creek above 11,200 feet in elevation, Sixty Lake Basin, Summit Lake Meadow, and Upper LeConte Canyon above 10,000 feet in elevation.

The following are restrictions on grazing in areas otherwise open to grazing:

- Open to grazing by walking parties with burros or llamas, closed to grazing by parties with horses or mules: Bubbs Creek below Junction Meadow, Evolution Lake to Muir Pass, Guitar Lake, and Mineral King lakes' basins
- Open to administrative use and grazing only: Hockett Pasture, JR Pasture (Roaring River), Kern Ranger Station pastures, Lackey Pasture (Roaring River), and Upper Redwood Meadow

Table 11 presents the site-specific night and/or head grazing limits on meadows in the parks.

Table 11: Site-specific Night and/or Head Grazing Limits under Alterantive 1

Location	Stock Head Limit	Night Limit
Bubbs Creek	20	1
Castle Domes Meadow	15	1
Cement Table Meadow	15	2
Charlotte Creek (below drift fence)	20	2
Crabtree Meadow	15 (larger parties consult ranger)	14
Junction Meadow (Bubbs)	15	1
Junction Meadow (Kern)	15	1
Lower Funston Meadow	20	2
Milestone Basin	8*	2*
Redwood Meadow	15	2*
Scaffold Meadow	15	2
Shorty's Meadow	20	2
Upper Evolution Valley (above Evolution Meadow)	20	1
Upper Funston Meadow	20	2
Upper Rock Creek (Nathan's Meadow and above)	20	2
Wallace Creek Waterfall Meadow	6*	1*

*****Added or modified post SUMMP

Stock-use Structures — The parks' wilderness contains structures that facilitate stock use and protect resources. There are 52 existing hitch rails and 54 existing drift fences, pasture fences, and gates (see tables 51a and 51b starting on page 272 at the end of this chapter). Several fences listed in the 1986 SUMMP, constructed after 1986, or proposed for installation, were never built or have been removed; managers determined that these fences would not be built due to changes in visitation and management

needs. These were at Aspen Meadow, Bearpaw Meadow, Cartridge Creek, Charlotte Lake, Colby Lake, Dollar Lake, East/Middle Vidette, Franklin-Montgomery, Lower Junction Meadow, Lower Rock Creek, Lower Simpson, Lower Vidette, Pinto Lake, Screwball Camp, Sphinx Creek Junction, Upper Paradise, Upper Simpson, and Williams Meadow.

Element 9: Administrative Structures

Administrative facilities such as ranger stations, administrative pastures, crew camps, and research facilities are important for the administration of wilderness. Currently there are 15 ranger stations, 3 patrol cabins, 4 pastures, and approximately 25 administrative camps located in wilderness.

Ranger Stations — Under alternative 1, ranger stations at the following locations are maintained and staffed as funding is available (figure 4 on page 76):

- Bearpaw Meadow
- Bench Lake (platform and tent)
- Charlotte Lake
- Crabtree
- Hockett Meadow
- Kern Canyon
- LeConte Canyon
- Little Five Lakes (platform and yurt)
- McClure Meadow
- Monarch (platform and tent)
- Pear Lake
- Rae Lakes
- Roaring River
- Rock Creek
- Tyndall Creek

Other Administrative Structures — Three patrol cabins and a research facility are maintained at the following locations:

- Quinn (patrol cabin)
- Redwood Meadow Ranger Station (patrol cabin)
- Simpson Meadow (patrol cabin)
- Redwood Canyon Cabin (research facility)

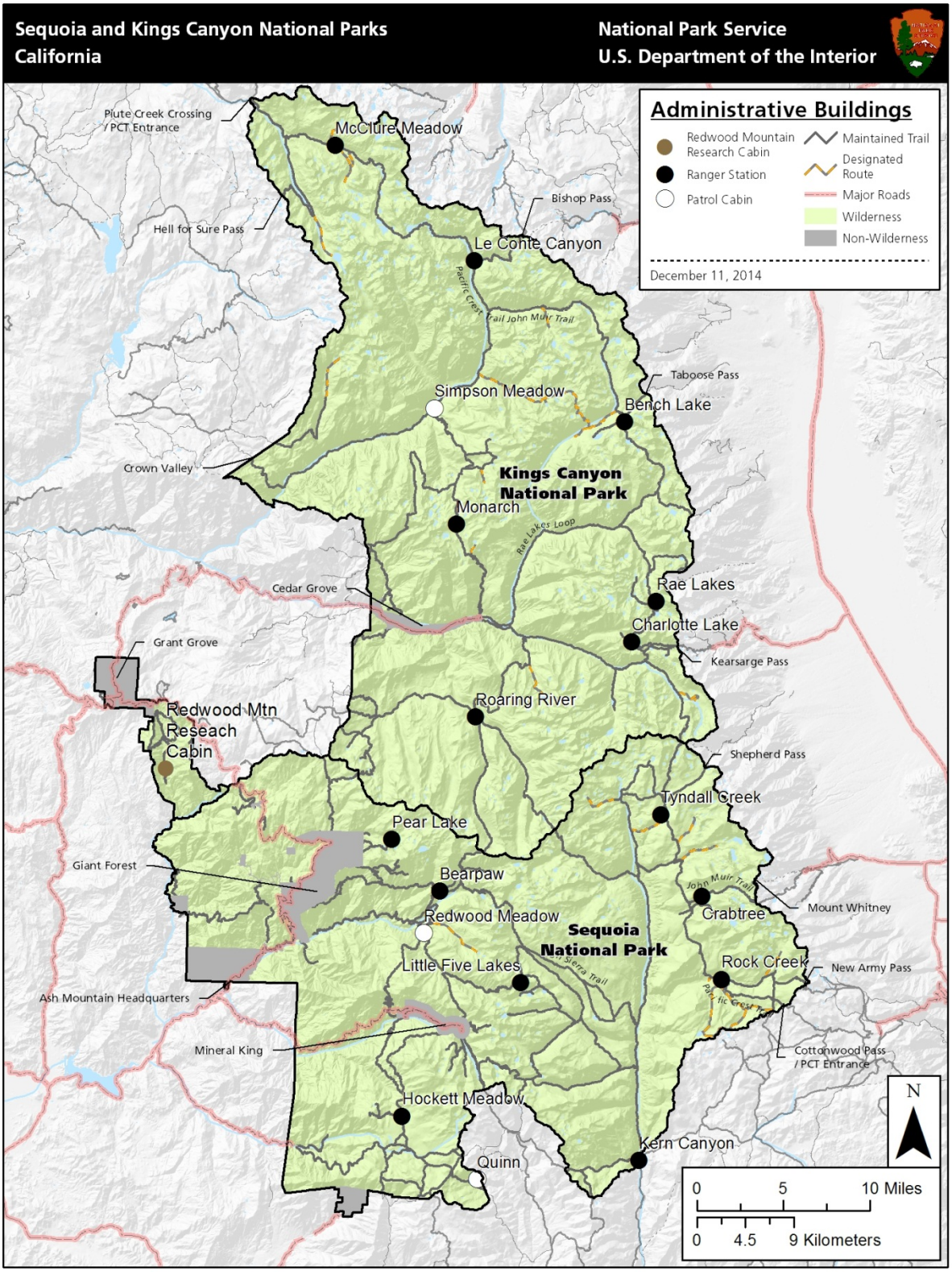


Figure 4: Administrative Buildings in Sequoia and Kings Canyon National Parks' Wilderness

Pastures — Some areas of the parks' wilderness are patrolled by mounted rangers. To maintain stock close to the patrol cabins for quick emergency response, and to reserve some grazing for the parks' stock, some of these locations have fenced pastures. Stock pastures associated with ranger stations are located at Hockett Meadow, Kern, Redwood Meadow, and Roaring River. Additional facilities include hitching rails and storage structures associated with the Hockett Meadow Ranger Station and the Quinn Patrol Cabin, and Redwood Meadow Ranger Station.

Crew Camps — Crew camps can be established for short- or long-term administrative purposes (e.g., enforcement/patrols, resource management/research, and trail maintenance/project activities). There are 15 established and long-term trail crew camps within Kings Canyon National Park, located at major junctions or hubs, and 10 established and long-term trail crew camps within Sequoia National Park. These camps have up to three food-storage boxes, a fire pit, and may have small tool caches.

Element 10: Frontcountry Facilities to Support Wilderness Access and Use

Although outside wilderness, facilities in the frontcountry that support visitor use of wilderness are considered in each alternative. Frontcountry facility locations are presented in figure 5 on the next page. These facilities include:

Permitting Stations — Permitting stations exist in the parks' frontcountry to provide wilderness use permits required of all visitors (on foot or with stock) remaining overnight in areas managed as wilderness. Permits are issued by the NPS or by the USFS during the quota season (Friday of Memorial Day weekend to late September) and generally self-issued during the non-quota season (late September to late May). The current permitting stations would remain in place across all alternatives.

Kings Canyon National Park

Cedar Grove Pack Station — This pack station operates under concession authority based on a contractual relationship with the parks. Private stock parties can informally arrange with Cedar Grove Pack Station to use existing facilities for holding animals and parking.

Trailheads/Stations

The alternatives do not consider changes to the permitting stations at Road's End (Kings Canyon); Kings Canyon Visitor Center (Grant Grove); Lodgepole Visitor Center; Ash Mountain/Park Headquarters; and Mineral King Ranger Station. There would be no changes proposed in the WSP for the Redwood Saddle /Redwood Canyon trailhead, Dorst, and Dillonwood areas. Therefore, these facilities are not discussed further in this document.

Kings Canyon Visitor Center in Grant Grove — This visitor center provides information on wilderness resources and to issue permits for the Redwood Canyon and Roaring River.

Redwood Saddle/Redwood Canyon Trailhead — Redwood Saddle/Canyon Trailhead includes parking and turnaround space, and a vault toilet. There is no camping at the trailhead for stock users or backpackers, and no use of the trailhead by commercial service providers.

Road's End Permit Station and Trailheads — This permit station for trailheads within Kings Canyon National Park operate seasonally (Note: Vehicle access to Kings Canyon proper is allowed generally between mid-April through mid-October).

Sequoia National Park

Ash Mountain/Park Headquarters Area — The Wilderness Office and Foothills Visitor Center provide information on wilderness resources and issue permits for area trailheads (Middle, North, and South Fork Kaweah areas, and Mineral King in winter).

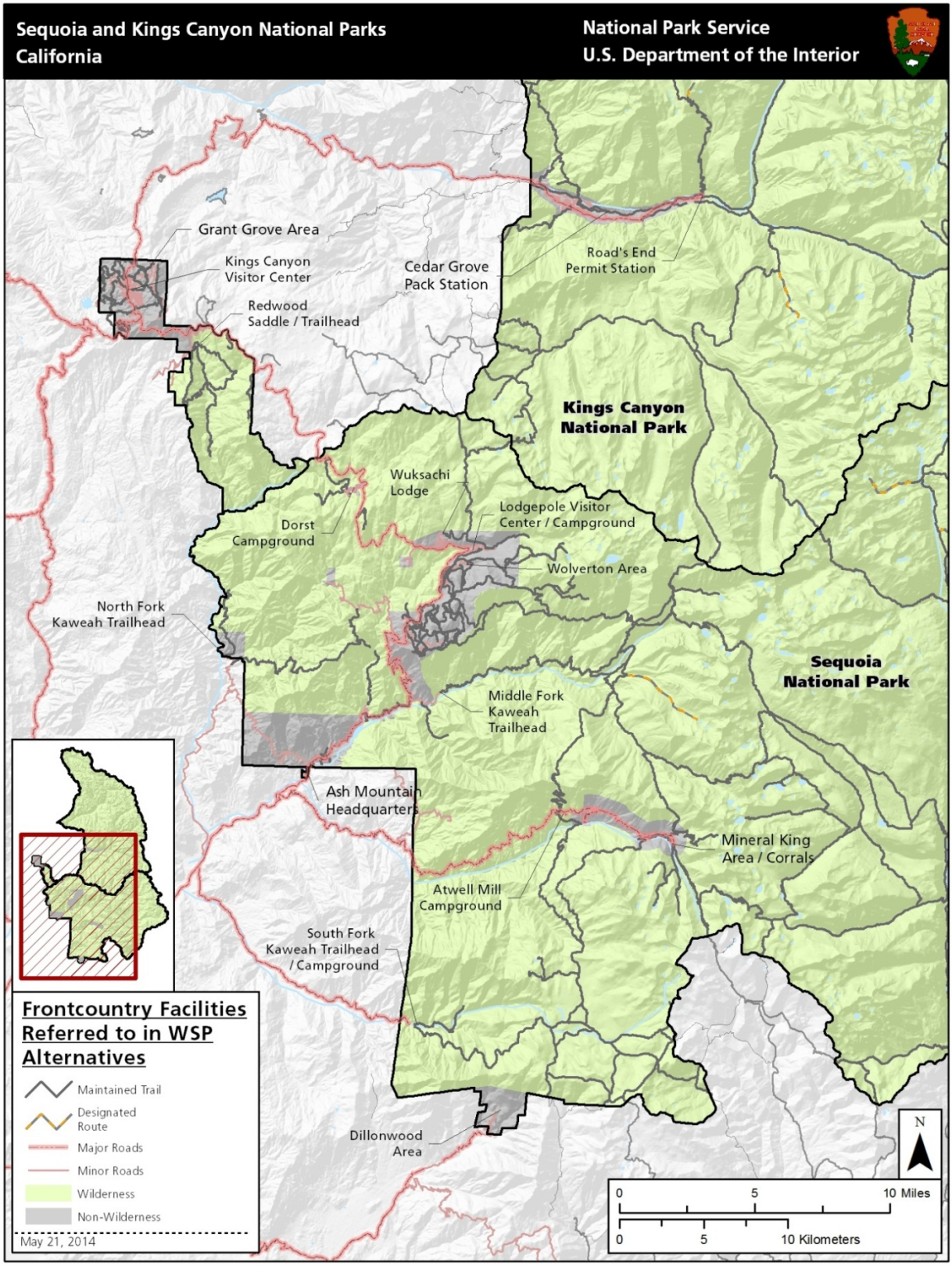


Figure 5: Map of Frontcountry Facilities Referred to in WSP Alternatives

Dillonwood Area — Road conditions in the Dillonwood area, which was added to the parks in 2001, limit vehicular access. Access is by foot or stock from the parks' boundary. It is anticipated that when funding is available, a management plan specific to Dillonwood would be developed.

Dorst Area — Dorst includes a campground and trailhead, but is not a starting point for overnight wilderness travel. Dorst, and nearby Halstead and Cabin Creek, are not considered for alternative locations for a pack station due to budget limitations and the lack of trails going into wilderness from these locations.

Lodgepole Visitor Center (Permit Station) and Area Trailheads — Lodgepole facilities include a large parking lot with a turnaround for stock users accessing Twin Lakes Trail and Old Lodgepole Road Trail to Wolverton. Backpacker campsites could be added to the area, per the GMP. The Lodgepole Visitor Center issues wilderness permits for Lodgepole, Wolverton, and Giant Forest Trailheads. The summer shuttle system operates in the area and provides access to some wilderness trailheads.

Middle Fork Kaweah Trailhead — This trailhead on the Middle Fork of the Kaweah River is near Potwisha and Buckeye Flat campgrounds, neither of which provides overnight camping for stock. There is a small dirt parking area with food-storage boxes.

Mineral King Area (Atwell Mill and Cold Springs campgrounds, Mineral King Ranger Station, administrative corrals, and trailheads) — Mineral King has public campgrounds at Atwell Mill and Cold Springs. There is a large dirt parking lot with signs and food-storage boxes at the Atwell-Hockett Trailhead for stock users and backpackers. There are currently no amenities for camping with stock at either campground. The GMP authorizes closing the Atwell Mill Campground and the establishment of trailhead campsites for backpackers.

The Mineral King administrative corrals, in east Mineral King Valley, include buildings, corrals, and stock-support equipment. Existing facilities are used for park administrative purposes, and occasionally by holders of commercial use authorizations (CUAs) and private users to stage trips.

North Fork Kaweah Trailhead — The area includes a small dirt parking lot at the North Fork Kaweah Trailhead. A primitive campground authorized by the GMP may be added.

South Fork Kaweah Campground and Trailhead — The South Fork Kaweah Trailhead facilities include a small parking area at the trailhead and a small rustic campground (10 sites, nonpotable water, vault toilets, and food-storage boxes).

Wolverton Area (Trailheads and Administrative Corrals) — The Wolverton area facilities include a parking lot, trailhead, and administrative stock facilities. Existing facilities are used by commercial service providers to stage resupply trips for the Bearpaw Meadow High Sierra Camp.

Element 11: Commercial Services in Wilderness

Commercial services are a means for the NPS to provide opportunities for visitors to engage in activities that are consistent with the parks' objectives for visitor use. For the purposes of the WSP/FEIS, a commercial service is one that relates to or is connected with commerce wherein a service is performed for another person or entity, and where the primary purpose is the experience of wilderness through support and where the primary effect is that the wilderness experience is guided and shaped through the use of support services provided for a fee or charge. It may be operated by for-profit or non-profit entities. Commercial services must meet standards expressed in the Wilderness Act (1964) and the Concessions

Management Improvement Act (1998). The Wilderness Act limits commercial services to the type and amount of services that are necessary for activities that are proper for realizing the public purposes of wilderness (i.e. recreational, scenic, scientific, educational, conservation, and historic use per the Wilderness Act §4(b)). The Concessions Management Improvement Act limits commercial activity in parks to those that are necessary and appropriate for public use and enjoyment.

Commercial service levels and types are managed to provide high quality visitor experiences while protecting natural, cultural, and scenic resources. Commercial services may be authorized through concession contracts, CUAs, cooperative agreements, and special use permits.

Under the no-action alternative, CUAs are issued to the extent necessary to support hiking and backpacking services, stock services, mountaineering, ski mountaineering, snowshoe and cross-country ski tours, and photography. To date no CUAs have been issued specifically for climbing, fishing, porters, or river running. Table 12 describes the existing levels of commercial services. See also appendix B.

Table 12: Existing Amounts of Visitor Use and Commercial Services (2010–2013)

Activities	Current Visitor Use Levels Supported by Commercial Services	
Total Visitor-use Days – private and supported by commercial services (this does not take into account use by PCT and JMT visitors that are not recorded by the parks' wilderness permit system, or day-use visitors).	Current visitor-use days from overnight use: 109,815 high 108,167 average	Visitor-use days – All Use 7,474 high 6,550 average
Non-stock Activities Backpacking and hiking trips Overnight camping – gear support Mountaineering (summer and winter) Oversnow travel (ski and snowshoe touring and winter camping – winter only, Nov 15–Apr 15.	Wilderness-wide: activities that are supported by non-stock based commercial services.	Visitor-use days – Non Stock 4,675 high 4,063 average
	Mount Whitney Management Area: activities that are supported by non-stock-based commercial services.	Visitor-use days – Non Stock: 1,346 high 1,062 average
Stock-based Activities Stock trips – riding, packing, day rides, and overnight camping with stock. Overnight Camping – gear support, including stock spot and dunnage	Wilderness-wide: activities that are supported by stock-based commercial services.	Visitor-use days – Stock-based: 3,110 high 2,487 average
	Mount Whitney Management Area: activities that are supported by stock-based commercial services.	Visitor-use days – Stock-based: 635 high 521 average

The Bearpaw Meadow High Sierra Camp was established shortly after the completion of the adjacent HST in the mid-1930s. Currently the camp consists of canvas tents on wooden platforms (six for guest lodging, one for kitchen/dining, three for restroom/showers, and five for employee quarters), a log storage building (historic former ranger station), and utility infrastructure (water and wastewater systems). It has been in almost continuous summertime operation as a rustic lodging and dining facility since its inception. This concession-operated facility is operated as a commercial enterprise by a contracted concession within a designated potential wilderness addition (DPWA) per the California Wilderness Act (1984) and its accompanying *House of Representatives Committee Report* 98-40 (1983).

Current Commercial Service Days for the Bearpaw Meadow High Sierra Camp
(from 7 years of data – 2006 through 2012)
High – 1,650
Average – 1,497

Pear Lake Ski Hut was constructed between 1939 and 1941 by the Civilian Conservation Corps as a remote base for winter recreation, e.g., cross-country skiing. The structure has been staffed as a summertime ranger station since the early 1970s, and is on the National Register of Historic Places (National Register). The Pear Lake Ski Hut is operated as a winter overnight lodging facility by a cooperating association; despite the association's status as a nonprofit organization, the service provided is considered commercial due to a fee being charged for the service. The California Wilderness Act of 1984 and its accompanying House of Representatives Committee Report 98-40 (1983) provide for the continued winter operation of the Pear Lake Ski Hut, unless this non-conforming use is deemed to have unacceptable wilderness impacts. The area is categorized as a DPWA based on the non-conforming use of a commercial enterprise (winter ski hut operation) in wilderness.

Current Commercial Service Days for the Pear Lake Ski Hut
(From 5 years of data – 2008/09 through 2012/13)
High – 1,286
Average – 1,220

On the following pages, figure 6 depicts the current wilderness trail system, figure 7 depicts campfire regulations for alternative 1, and figures 8a and 8b depict stock access and grazing regulations for alternative 1.

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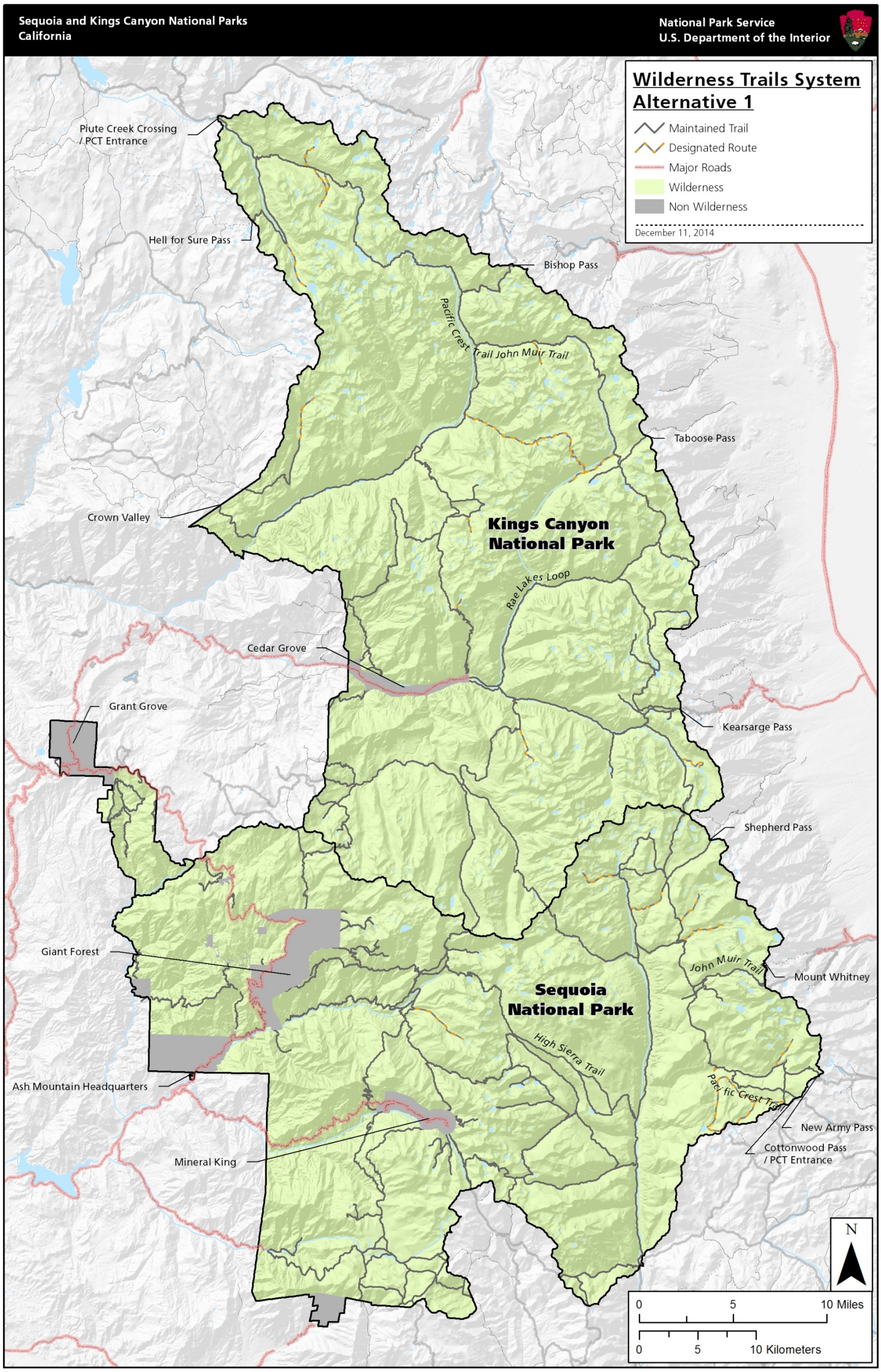

Figure 6: Wilderness Trails System – Alternative 1 (No-action / Status Quo)

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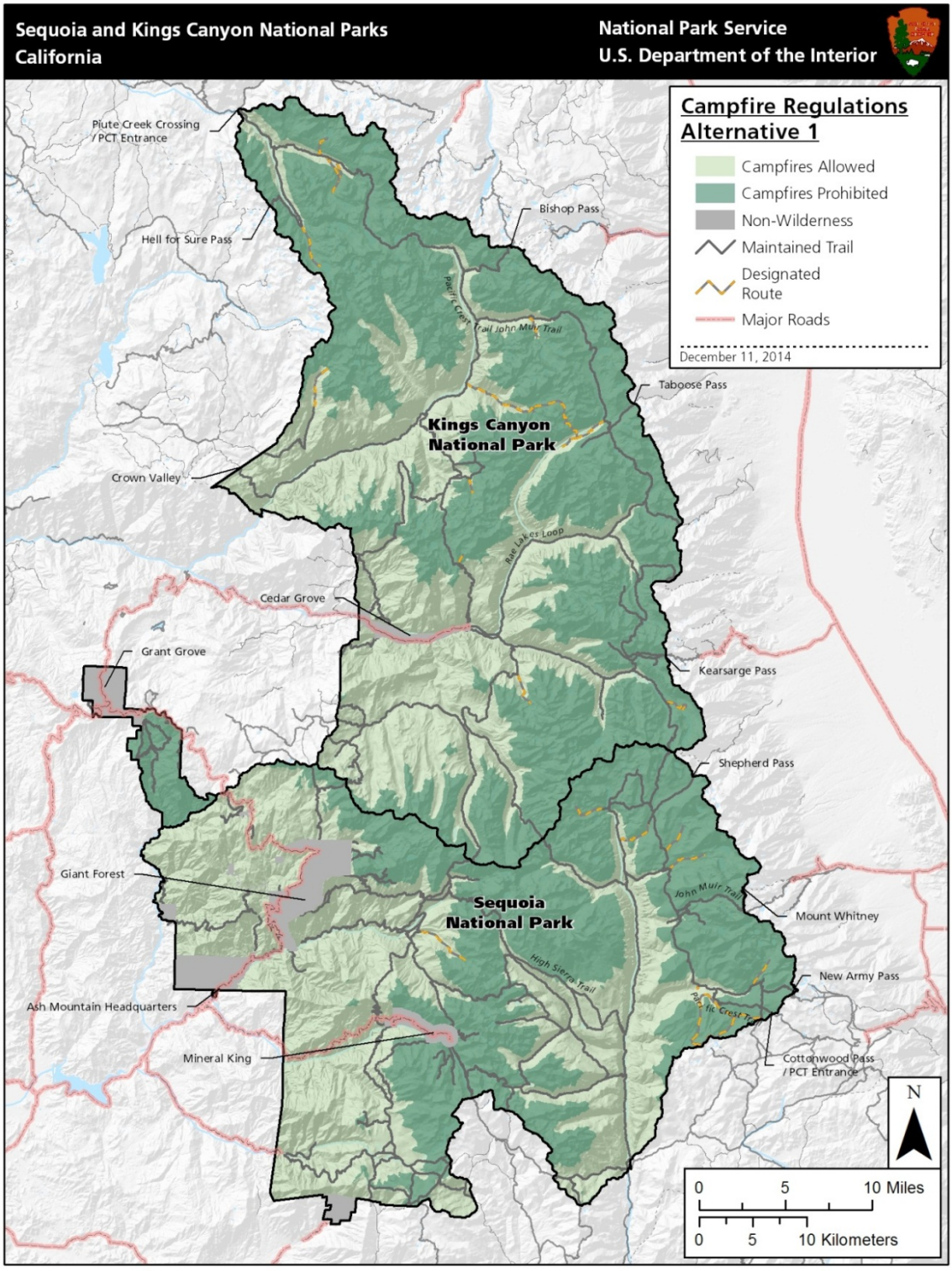
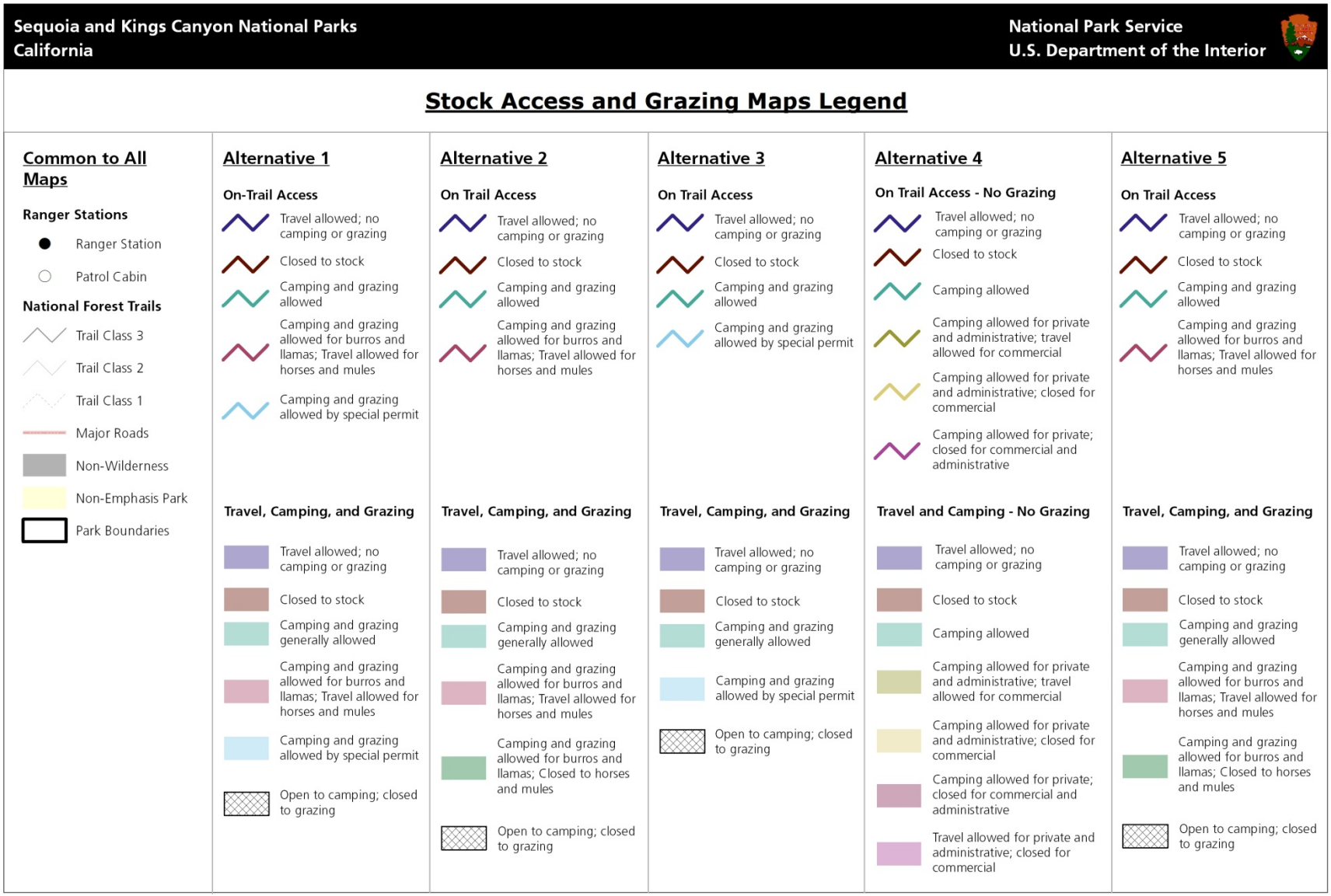


Figure 7: Campfire Regulations – Alternative 1 (No-action / Status Quo)

No campfires above 10,000 feet in Kings Canyon National Park,
above 10,400 feet in the Kern River drainage, and 9,000 feet in the Kaweah River drainage.
(see figure 23, page 297, for drainages)



Legend to Accompany Figure 8a: Stock Access and Grazing – Alternative 1 (No-action / Status Quo), Kings Canyon National Park

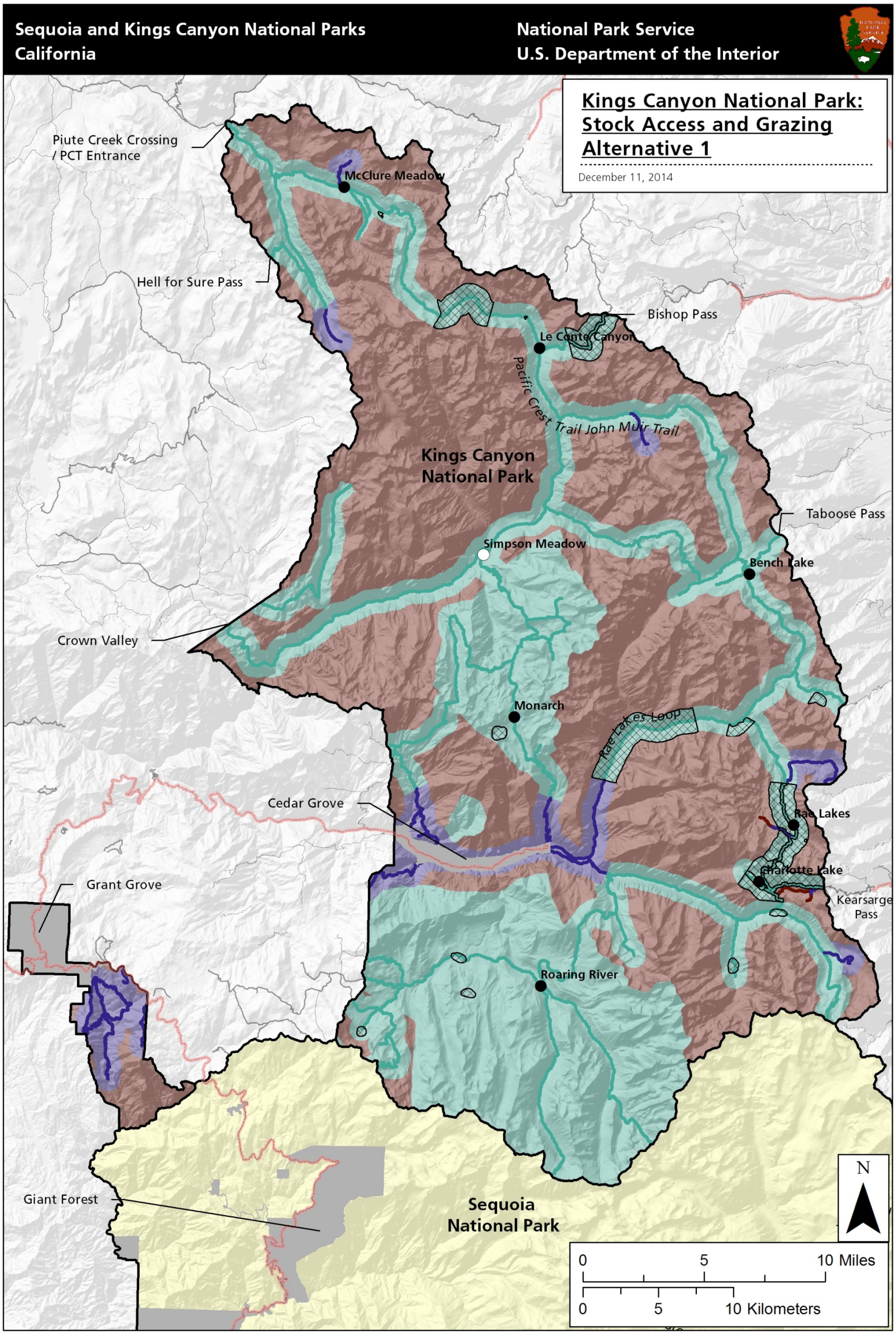


Figure 8a: Stock Access and Grazing – Alternative 1 (No-action / Status Quo), Kings Canyon National Park

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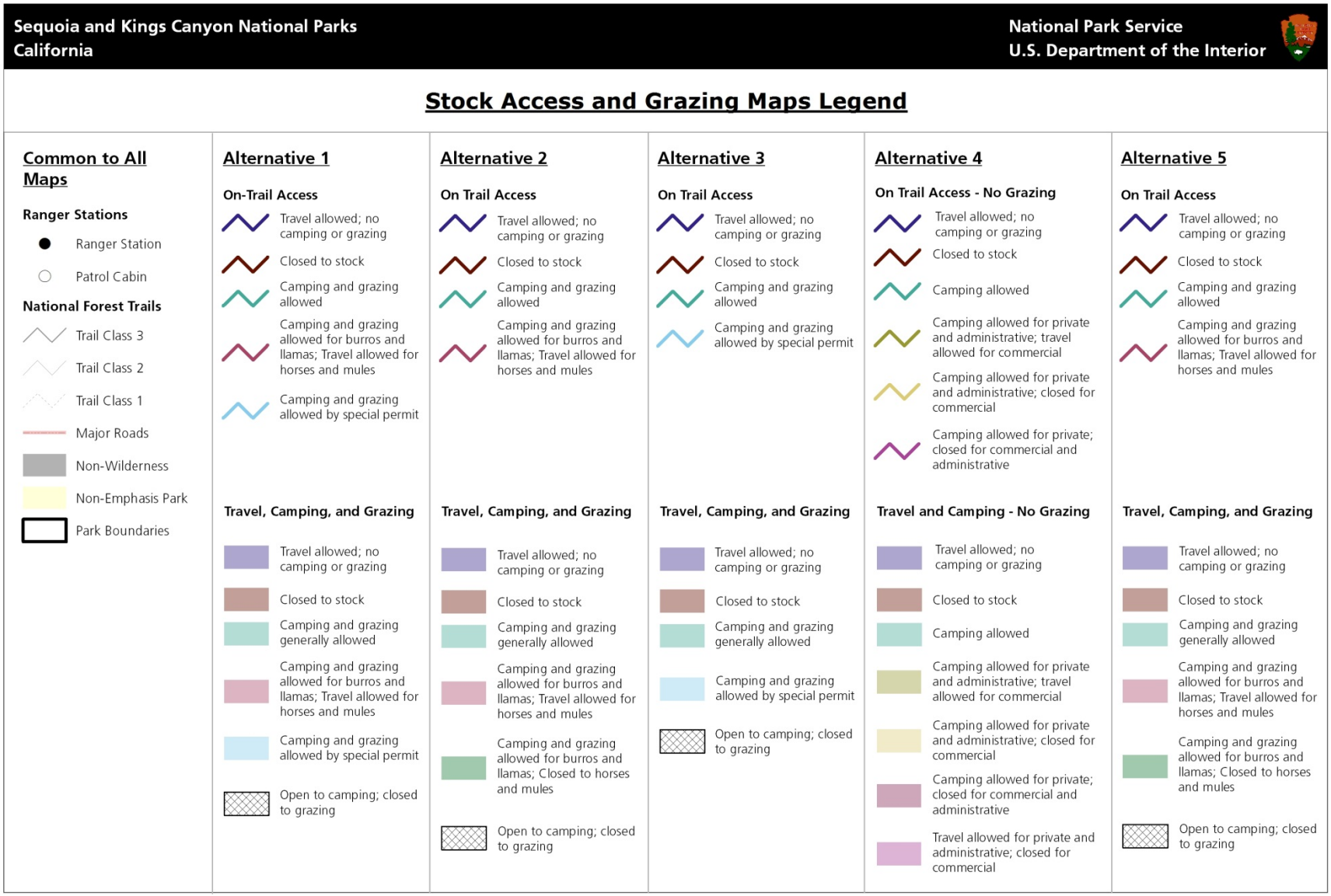

Legend to Accompany Figure 8b: Stock Access and Grazing – Alternative 1 (No-action / Status Quo), Sequoia National Park

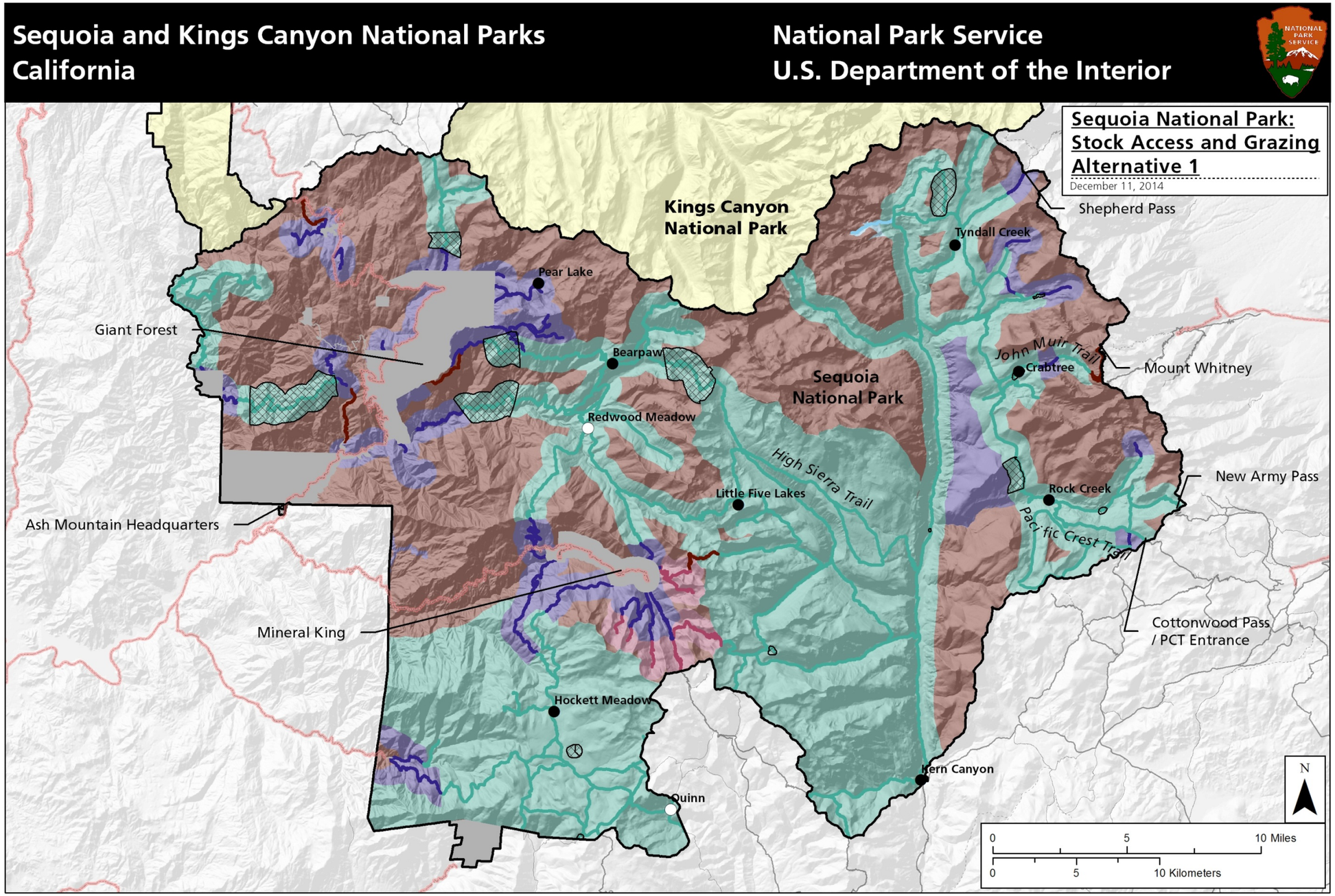

Figure 8b: Stock Access and Grazing – Alternative 1 (No-action / Status Quo), Sequoia National Park

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ELEMENTS COMMON TO ALL ACTION ALTERNATIVES

This section identifies actions that would be implemented through the WSP regardless of which alternative is selected.

WILDERNESS EDUCATION AND INFORMATION

The parks would implement a strategy to educate wilderness visitors, park staff, and the general public in order to:

- protect wilderness lands and characteristics;
- enhance public and employee understanding of and commitment to wilderness stewardship;
- increase understanding of the range of legally appropriate uses of wilderness;
- reduce conflicts between wilderness visitors;
- increase the visitors' ability to manage risk as an expected aspect of wilderness use; and
- encourage connection to and appreciation of wilderness.

To achieve these goals, all divisions of the parks would take the following actions:

- Identify the audiences they serve who are in need of wilderness information, including: internal staff, wilderness visitors, commercial wilderness users, researchers, neighboring agencies, partners, and the general public.
- Identify the messages their audiences need.
- Develop tools including training sessions, reference materials, and public information needed to ensure that complete, correct, welcoming information is shared with visitors.
- Build staff awareness of and commitment to the wilderness mission as part of the parks' mission.
- Develop trip-planning information for wilderness visitors to help generate realistic expectations regarding the range of uses, users, and conditions that may be encountered during a trip.
- Develop educational information about minimum impact standards for wilderness visitors, researchers, commercial users, partners, and others.
- Make information available online, in visitor centers, at park permit stations, and to neighboring agencies involved in issuing permits.
- Develop age appropriate interpretive and educational outreach materials regarding wilderness.
- Review and update all existing materials to reflect changes made by the WSP/FEIS and to explain new guidelines and systems, e.g., trail classes and wilderness signage.

AVIATION (COMMERCIAL, MILITARY, AND PRIVATE)

The parks have attempted, by multiple means over time, to determine if commercial air tours are occurring over the parks, and have found no evidence of their existence. Under the National Parks Air Tour Management Act (NPATMA) of 2000, an Air Tour Management Plan needs to be established "for any national park or tribal land for which such a plan is not in effect whenever a person applies for authority to conduct commercial air tour operation over the park." With the passage of the NPATMA, two potential operators submitted their names for future consideration. At that time, the Federal Aviation

Administration (FAA) established an Interim Operating Authority for a maximum of 18 tours per year over the parks.

The FAA Modernization and Reform Act of 2012 (Pub. L. 112-95) amended various provisions of NPATMA. One provision exempted national park units with 50 or fewer annual commercial air tour operations from the requirements of NPATMA. Since there are fewer than 50 annual commercial air tour operations being conducted over the parks, and the NPS is not withdrawing the exemption, the parks are exempt from NPATMA. As a result of these changes, and because air tours are disruptive to the national park and wilderness experience of the visiting public, the parks are seeking to be permanently removed from the FAA list of national park units where air tours are allowed. The desired condition for the parks' wilderness is to be free of commercial air tours due to the disruption of the wilderness experience of park visitors caused by aircraft. NPS Director's Order 41: *Wilderness Stewardship*, section 7.3 states "Commercial air tours are inconsistent with preservation of wilderness character." The Pacific West Region of the NPS is finalizing a guiding policy on this issue through a Wilderness Air Tour Noise Assessment Strategy. The goal of the Noise Assessment Strategy is to "develop a consistent approach for protecting wilderness areas from air tour noise impacts" in the Pacific West Region. The Noise Assessment Strategy directs parks to apply the principle of nondegradation to wilderness management, and to measure each wilderness area's condition "against its own unimpaired standard." By virtue of having no air tours, currently or in the recent past, the parks are classified in the Noise Assessment Strategy as a Tier 1 NPS unit. Subsequently, as an outcome of this WSP/FEIS, air tours over the parks are determined to be counter to the preservation of wilderness character, and the parks will continue to pursue means for their exclusion.

Approximately 95% of the airspace over the parks is in Military Operations Areas or part of the R-2508 Military Special Use Airspace Complex. This large expanse of restricted airspace is of extremely high value to the armed forces for testing and training purposes. Because so much of the parks are overlain with military airspace and thus subject to its restrictions, the ability of general and commercial aviation to operate in the area is constrained. The parks have successfully worked with the military to reduce wilderness impacts, and will continue to work cooperatively with regional and national military leadership to ensure that military aviation operations are minimally disruptive to the experience of wilderness visitors.

Taking a core sample from a wilderness meadow for a soil survey

Private aircraft use would continue to be managed by the FAA, but the NPS will continue to work cooperatively with the FAA to resolve problems. No airstrips will be constructed in the parks under this plan.

RESEARCH

Sequoia and Kings Canyon National Parks are recognized for being at the forefront of advancing scientific research and the integration of knowledge gained from scientific inquiry into the management of wilderness resources. Research in the parks includes studies, inventories, and monitoring

conducted by NPS staff as well as permitted research performed by external scientists from other federal agencies, state and local governments, universities, and non-profit organizations. Over the past three years, 73% of the parks' permitted research included activities in wilderness. This research covers a wide range of disciplines. The most frequent topics for research in wilderness in the past three years were vascular plants/plant communities, herpetology (amphibians and reptiles), geology, cave/karst, invertebrates, and fire (behavior, ecology, and effects).

NPS Management Policies 2006 includes many references to research and permitted research in particular. Some of these policies describe the need for current scientific understanding for stewardship that underlies the rationale for research in the parks, while other references describe the policy for reviewing proposals to conduct research in the parks and parks' wilderness. For a listing of the related policies, see "Appendix P: Permitted Research Program and Process."

The WSP would support the continuation of relevant scientific research in wilderness, using methods that preserve wilderness character. Scientific investigations would continue to be conducted in wilderness to enable the NPS to meet its mission requirements and the ecological, geological, scientific, conservation, and historic purposes of the Wilderness Act. Minimum requirements analyses will be conducted to determine whether each proposed project is administratively necessary and, if it is, to select the minimum tools.

ADMINISTRATIVE COMMUNICATIONS IN WILDERNESS

To administer the large wilderness areas of the parks and provide for employee and public safety, radio repeaters exist in strategic and remote locations and need to be maintained. It is necessary to provide scheduled maintenance and upgrades to these facilities, and due to their remote and difficult to access locations this is often done with the assistance of a helicopter. The NPS would review the continued use and maintenance of the existing communication system (e.g., radio repeaters) in wilderness for the purposes of administering wilderness through the minimum requirements analysis (MRA) process. The parks' wilderness staff requires effective radio communication systems to provide resource protection actions, respond to emergency services, communicate updated information to the frontcountry about trail and other wilderness conditions for the purpose of educating wilderness visitors, and promote the safety of wilderness staff. As future technologies are developed, the existing structures would be considered for replacement, with replacement outside of wilderness preferred. If structures are able to be removed, the installation sites would be restored to natural conditions.

ADMINISTRATIVE ACTIVITIES IN WILDERNESS

Activities necessary for the administration of wilderness (e.g., ranger patrols and operations, stock-supported activities, maintenance, and resource management activities, etc.) would continue to occur in wilderness. If actions propose a 4(c) prohibited use or have the potential to adversely affect wilderness resources, the actions would be evaluated through a MRA process (appendix I).

Administrative use of helicopters would continue to be authorized as needed for the purposes of emergency operations involving the health or safety of persons in wilderness, such as search and rescue operations.

TREE HAZARD MANAGEMENT

Removing hazard trees in wilderness is not a normal or desirable activity, but may be allowed under certain circumstances after a MRA to determine that the actions are appropriate in wilderness.

TRAILS MANAGEMENT PLAN

A network of trails would continue to be maintained in parks' wilderness. A Trail Management and Classification System (appendix K), based on adaptation of elements of the USFS Trail Management Handbook, has been developed as a component of the WSP. The main principles borrowed from the USFS Trail Management Handbook are trail class and designed use. Trail class describes the level of development and expected recreational experience for a trail segment, and designed use describes the modes of travel for which the trail is designed and maintained (see summary tables 47a through 47f starting on page 246 at the end of this chapter). The Trail Management Plan explains the guiding principles of trail management at Sequoia and Kings Canyon National Parks, describes current and desired conditions for the trail system, describes some programmatic methods used in trail management at the parks, and lists some significant actions that will need to be taken to achieve the desired conditions of the WSP. Notably, the no-action alternative includes a category of designated unmaintained routes open to stock travel. Under all action alternatives, each of these routes would be adopted into the trail system as Class 1 or Class 2 trails open to stock use, or they would be abandoned and landscape restoration would be considered for the remaining traces of abandoned trails. The Trail Management Plan includes a list of the trail class and designed use for each trail segment in wilderness for the preferred alternative.

Definition of Key Terms – Trail Classes

Class 3 *– Developed. These trails require the least self-reliance, and provide opportunities for primitive recreation to people needing or seeking less challenging travel in wilderness.*

Class 2 *– Moderately developed. These trails are typically more challenging to travel and provide access to less-visited areas of the park, providing opportunities for primitive recreation to people who are seeking more challenge and/or solitude.*

Class 1 *– Minimally developed. These trails provide for the highest level of on-trail challenge, the greatest opportunities for solitude, and the most self-reliant type of trail-based recreation.*

Trail signs provide important information regarding navigation, allowable use, and other information to wilderness visitors. Under all action alternatives the amount and type of trail signs would be appropriate to the trail class, and the NPS would evaluate options for sign design to ensure consistency with wilderness character and sustainability. Regulatory and informational signs would be appropriate to the trail class and no new memorials or associated signs would be allowed, pursuant to 36 CFR 2.62. Existing memorials and signs would be evaluated on a case-by-case basis to determine if they should be removed.

WINTER USE

Opportunities for winter travel and recreation abound in the parks. The winter use season extends from November through mid-May. A wide range of activities, from one-day snowshoe touring to technical and difficult ski-mountaineering and ice climbing can be experienced. Due to the high-elevation, demanding terrain and potentially extreme weather of the parks' wilderness, winter activities can be challenging and hazardous for the inexperienced user. However, users of the winter environment will find the quiet, solitude, and beauty of the parks' wilderness extraordinary and inspiring.

Winter activities include hiking in snow free areas (generally below 5,000 feet), cross-country skiing, snowshoeing, snowboarding, ice climbing, mountaineering, and under certain conditions, ice-skating. Use of mechanical or motorized over-snow transport (e.g., snowmobiles and bicycles) and dog sledding are prohibited, but human-drawn sleds are permitted.

Winter weather and trail/route conditions can change rapidly in the upper elevations of the parks. Sudden storms with extended and heavy snowfall, high winds, cold temperatures, and avalanche potential are common major threats. Users should be prepared for extreme conditions at any time. Park staff will provide the best available information on known conditions and winter safety.

Travel can occur along trails or routes in snow-free areas or as less-restricted point-to-point travel in snow-covered areas. Trails are generally not maintained during the winter months, even in snow-free areas. Many routes that have been historically traversed may lead into high avalanche danger areas and should only be attempted by experienced and properly equipped winter users.

An interpretive ranger and visitors on a snowshoe walk

Regardless of which alternative is selected for the WSP, the following conditions will apply to winter use:

- Winter travel and camping would be allowed in wilderness and would require a self-issue wilderness permit. These are obtained at various ranger stations/public contact centers nearest the trailhead being used. Due to the low levels of winter use, no trailhead quotas would be applied in the winter.
- Party size for overnight winter use would be 15, whether traveling on-trail (snow free areas) or off-trail.
- As in summer, camping would only be permitted if parties travel more than one mile from roads or developed areas. Summer first-camp limitations would apply in snow-free areas (see tables 8 and 9 on pages 68 and 69).
- Overnight camping limits would be those of the adopted alternative. Site specific area night limits would apply year-round.
- Campfires would be permitted in winter (unless alternative 4 is adopted), with only dead and down wood to be burned. Restrictions on campfires would be the same in winter as in summer.
- Proper food storage would be required, though there would be no portable container requirements in winter.
- Pack out solid human waste. In lieu of packing it out, cover and disguise human waste deep in snow away from travel routes and at least 200 feet (70 adult steps) from water sources.
- Pack out toilet paper.
- Overall trip camping/night limits would be those of the adopted alternative. There would be no exceptions to night limits for specific areas in winter.
- Stock use would be allowed in those areas that are passable to stock. Summer restrictions on use would apply.
- Commercial services would be allowed for those activities and to the limits as defined in "Appendix B: Extent Necessary Determination: An Analysis to Determine the Proper Types and Levels of Commercial Services in the Wilderness of Sequoia and Kings Canyon National Parks" for the adopted alternative.

CLIMBING

The NPS recognizes climbing as a legitimate and appropriate activity for realizing unconfined and self-reliant recreational opportunities in wilderness. Aspects of climbing may affect wilderness character, including the qualities of natural, undeveloped, and opportunities for solitude. Climbing management in National Park wilderness is directly guided by relevant NPS Management Policies, Director's Orders, and reference manuals. The U.S. Code of Federal Regulations and the parks' Superintendent's Compendium also provide indirect and direct management control of climbing and related activities. Director's Order #41: Wilderness Stewardship provides specific guidance on the management of climbing in wilderness. A Climbing Management Strategy has been developed as part of this WSP and is included as appendix J.

The following objectives will apply under all alternatives for climbing management in the parks' wilderness:

- Provide opportunities for the pursuit of the traditional activity of climbing in the park's wilderness.
- Ensure that climbing activities do not unacceptably impact wilderness character or resources.
- Emphasize clean climbing as the proper method to realize the benefits of climbing in wilderness.
- Promote strategies that "will address ways to control, and in some cases reduce, the number of fixed anchors to protect the parks' wilderness resources or to preserve the 'untrammeled,' 'undeveloped,' and 'outstanding opportunities for solitude' qualities of the park's wilderness character."
- Work cooperatively with climbers and the climbing community to advance the practices of responsible climbing in wilderness.
- Provide education to the public on responsible climbing practices in wilderness.

Summit Registers

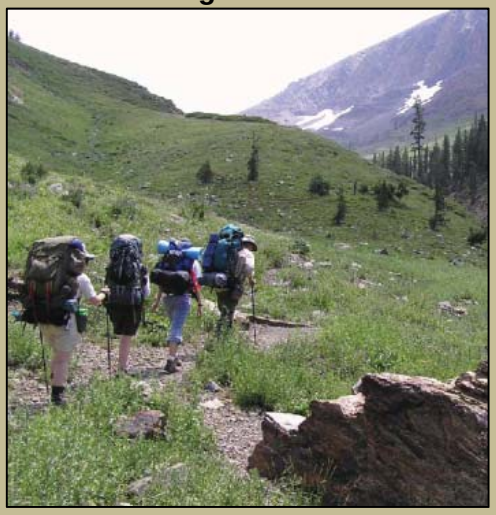
More than 170 summit (or peak) registers exist in these parks. They generally consist of a sealable weather-resistant container (e.g., metal, plastic, or glass) holding a small notebook in which people record dates and details of their climbs. Most registers were placed many years ago; these have served on occasion as a historical record of climbing in the Sierra Nevada, and have even aided in search and rescue efforts. The Sierra Peaks Section of the Sierra Club has inventoried and maintained these registers for many years and has worked with the Bancroft Library at University of California, Berkeley to document and preserve information from the registers.

Some summit registers have historical value; the registers are also viewed as intrusions on the undeveloped quality of wilderness by some visitors. These parks recognize that a limited number of registers is compatible with wilderness character, provided they are in appropriate locations, of appropriate size and construction, and are well maintained. It is a desired condition of this WSP/FEIS to reduce developments and installations in wilderness, therefore, these parks will work toward reducing the number of registers and will not permit placement of new registers. In the near future, the parks will pursue the development of a general agreement (e.g., Memorandum of Understanding) between the NPS and the Sierra Peaks Section of the Sierra Club, which would determine locations, maintenance standards, and other conditions under which registers could remain.

ALTERNATIVE 2: PROTECT WILDERNESS CHARACTER BY IMPLEMENTING SITE-SPECIFIC ACTIONS (NPS PREFERRED ALTERNATIVE)

OVERVIEW

Alternative 2 General Concept: Focus on preserving wilderness character by adjusting management in targeted areas.



The overarching idea behind alternative 2 is that the WSP would incorporate much of the current management strategies and tools used by the parks to protect wilderness. Rather than imposing restrictions on a broad scale, this alternative would evaluate conditions in specific areas and mitigate impacts through targeted actions. The goal is to encourage wilderness use and minimize restrictions while preserving wilderness character.

This alternative recognizes that there is variation in visitor-use levels throughout the wilderness: day use (close to frontcountry), popular overnight areas (e.g., HST, PCT, and Rae Lakes Loop), and less-visited areas (e.g., the Middle Fork of the Kings, the Hockett Plateau, and off-trail areas). It further recognizes that, under current management, prevailing projected visitor-use levels pose few threats to wilderness character in the less-popular or less-visited areas.

Alternative 2 acknowledges, however, that there are some challenges in the most popular areas and in areas with sensitive resources that can be mitigated through targeted improvements in management.

As with current management, this alternative would protect wilderness character and resource values while providing for a range of visitor opportunities but would add some limits in specific popular and sensitive resource areas to improve wilderness character.

For example, overall use would be allowed up to the current trailhead quotas; however, quotas could be reduced on specific busy trails and/or destination quotas could be applied. This alternative allows for future reductions in quotas if conditions warrant.

Some popular areas would have additional restrictions (e.g., closing additional meadows along the JMT and HST to grazing), but less popular areas would have some restrictions eased (e.g., allowing campfires in specific areas, increased night limits, etc.). Education would be essential to inform visitors of where they could expect fewer encounters and how to practice Leave No Trace© travel and camping techniques in wilderness.

The most popular areas where concerns regarding visitation levels exist include Bishop Pass (Dusy Basin), Bubbs Creek (Rae Lakes Loop), Cottonwood Lakes / New Army Pass (Mount Whitney and Mount Langley), Cottonwood Pass (Mount Whitney), HST (from Crescent Meadow and Wolverton), Lakes Trail (Emerald and Pear lakes), Sawtooth Trail (Monarch Lakes), and Woods Creek (Rae Lakes Loop). Lamarck Col (Darwin Canyon), while not busy compared to the major trails, may have increasing use and is a sensitive area. Table 23 on page 130 summarizes the site-specific management actions proposed for these areas under alternative 2.

Visitors traveling with stock would continue to have access to most trails in the parks, with some trails reserved for hiking use only. The combined length of trails open to hiking or backpacking traffic only (i.e., closed to stock) would increase by approximately 25 miles over current conditions. Stock access and grazing would be constrained primarily by ecological parameters, with a limited number of new restrictions adopted to provide for visitor safety and to accommodate social values (e.g., scenic and aesthetic values). Grazing would be managed to optimize protection of natural and cultural resources while allowing visitors traveling with stock access to forage for their animals. Recognizing that the opportunity to observe and experience ungrazed meadows is of value to many park visitors, a selection of meadows along popular travel routes would be closed to grazing.

To meet the objectives of this alternative, commercial services would be retained at levels similar to alternative 1 (no-action / status quo) in most locations. Commercial services would be reduced in the most frequently visited area of the parks' wilderness, and could be reduced in some areas with particularly sensitive resources. More types of commercial services could be permitted to support a range of recreational opportunities consistent with the objectives of this alternative. Commercial services would be allowed to the extent necessary to provide opportunities for visitors of diverse abilities and interests to engage in a variety of wilderness activities that are proper for realizing the public purposes of wilderness.

KEY ELEMENTS OF ALTERNATIVE 2

This alternative addresses the key elements as described below.

Element 1: Visitor-use Levels

Planning Objective: Visitor use and enjoyment of wilderness would be promoted while ensuring the preservation of wilderness character. In this alternative, visitor use levels would be reduced in some popular areas to preserve opportunities for solitude or other wilderness-character qualities.

Permits and Quotas — Under this alternative, all overnight visitors in the parks' wilderness, whether self-supported or traveling with the support of a commercial service provider, would be subject to the trailhead quota system (table 4 on pages 61-63), and must obtain a wilderness permit from an approved source (e.g., NPS, USFS, or Pacific Crest Trail Association). This would also apply for alternatives 3, 4 and 5.

Daily trailhead quotas would remain as per alternative 1, with the possibility of some future quota reductions in specific targeted areas. Areas to be monitored for continued acceptable levels of use that may require a future trailhead quota change include Bishop Pass (Dusy Basin), Bubbs Creek (Rae Lakes Loop), Cottonwood Lakes / New Army Pass (Mount Whitney and Mount Langley), Cottonwood Pass (Mount Whitney), Lamarck Col (Darwin Canyon), HST (from Crescent Meadow and Wolverton), Lakes Trail (Emerald and Pear lakes), Sawtooth Trail (Monarch Lakes), and Woods Creek (Rae Lakes Loop).

Four of the five trailheads administered by these parks with no current quotas (and shown as having VL [very low] use on table 4, pages 61-63) would each adopt a daily quota of eight: Don Cecil; Summit Meadow; Colony Mill Road (east); and Colony Mill Road (west). The fifth trailhead, North Fork Kaweah, would adopt a daily quota of 15 (table 46, page 246).

Visitors entering the parks' wilderness via trailheads managed by Sequoia and Kings Canyon National Parks on the west side of the parks would be subject to established quotas regardless of whether they were traveling as private individuals or groups, or with support from commercial service providers. Quotas

could only be exceeded on rare occasions through a formal request to, and approval by, the superintendent. This would also apply for alternatives 3, 4 and 5.

Definitions of Key Terms

Destination Quota *– A limit on the number of visitors, groups, or campsites in a specific wilderness location. Destination quotas help to protect wilderness quality and visitor experience in given areas. Quotas are based on resource information, desired conditions, and professional judgment by an interdisciplinary team of specialists and decision makers.*

Those visitors entering the parks' wilderness via trailheads managed by the USFS on the east side of the parks are subject to the trailhead quotas of Inyo National Forest (table 4 on pages 61-63). Most of these quotas are "combined" (i.e., one quota for both private and commercially supported users), and some are "split" (i.e., separate quotas for private users and commercially supported users). Visitors also enter the parks' wilderness from more distant Yosemite National Park and USFS managed trailheads (e.g., Sierra and Sequoia national forests), some of which have quotas and some of which do not. These visitors are subject to the entry policies of the agency issuing the permits at the trailhead. This would also apply for alternatives 3, 4 and 5.

Current destination quotas at Emerald and Pear lakes would continue to apply. Additional destination quotas may be added to protect wilderness character at specific locations such as Bearpaw Meadow, Dusy Basin, Guitar Lake, Hamilton Lake, Monarch Lakes, Rae Lakes, and other areas.

No day-use permits or quotas would be implemented at this time but they may be considered in the future in popular areas to achieve desired conditions.

The NPS would continue to work with the USFS to manage and improve the quota and permitting systems (e.g., adjust the Mount Whitney exit quota), to add trailheads currently not included in the quota system (e.g., Tehipite Valley and Kern River), and on other relevant cooperative cross-boundary wilderness-management issues.

Visitor Capacities and Encounter Standards — Alternative 2 would retain existing types and levels of use that would be allowed in wilderness in an attempt to provide opportunities and access for appropriate wilderness experiences. Limited and targeted controls would be applied only in those areas where levels and types of use may be leading to some localized impacts on wilderness character. Based on the objectives for this alternative, the overnight estimated visitor capacity would be set at 134,000 VUDs. Ten-year average overnight use would be limited to 108,000–114,000 VUDs/year. While use levels would be allowed to reach the established capacities for this alternative, there are social, economic, and other factors that may lead to actual use being below capacity. Each year, total annual VUDs would be discussed and analyzed by an interdisciplinary group at an annual meeting on wilderness management. If determined to be out of standard, management actions to bring the measure back into standard would be adopted. Appendix A contains a detailed description of the methods used to develop the visitor capacity framework for this WSP.

To ensure that there are opportunities for solitude, the parks would adopt a measure of the number of people encountered per hour (EPH) on trails and would take action based on established standards. The standards would vary depending on the desired condition of solitude in a given area. For this measure, each trail would be assigned to one of four encounter-rate standards: very high use (primarily Mount Whitney and day-use areas), high use (generally Class 3 trails, with some exceptions), moderate use (generally Class 2 trails, with some exceptions), and low use (generally Class 1 trails, with some exceptions). Each has a specified EPH that serves as a standard. The standards for alternative 2 are shown in table 13. Figure 9 on the next page contains encounter standards for the four encounter classes (very high, high, moderate, and low).

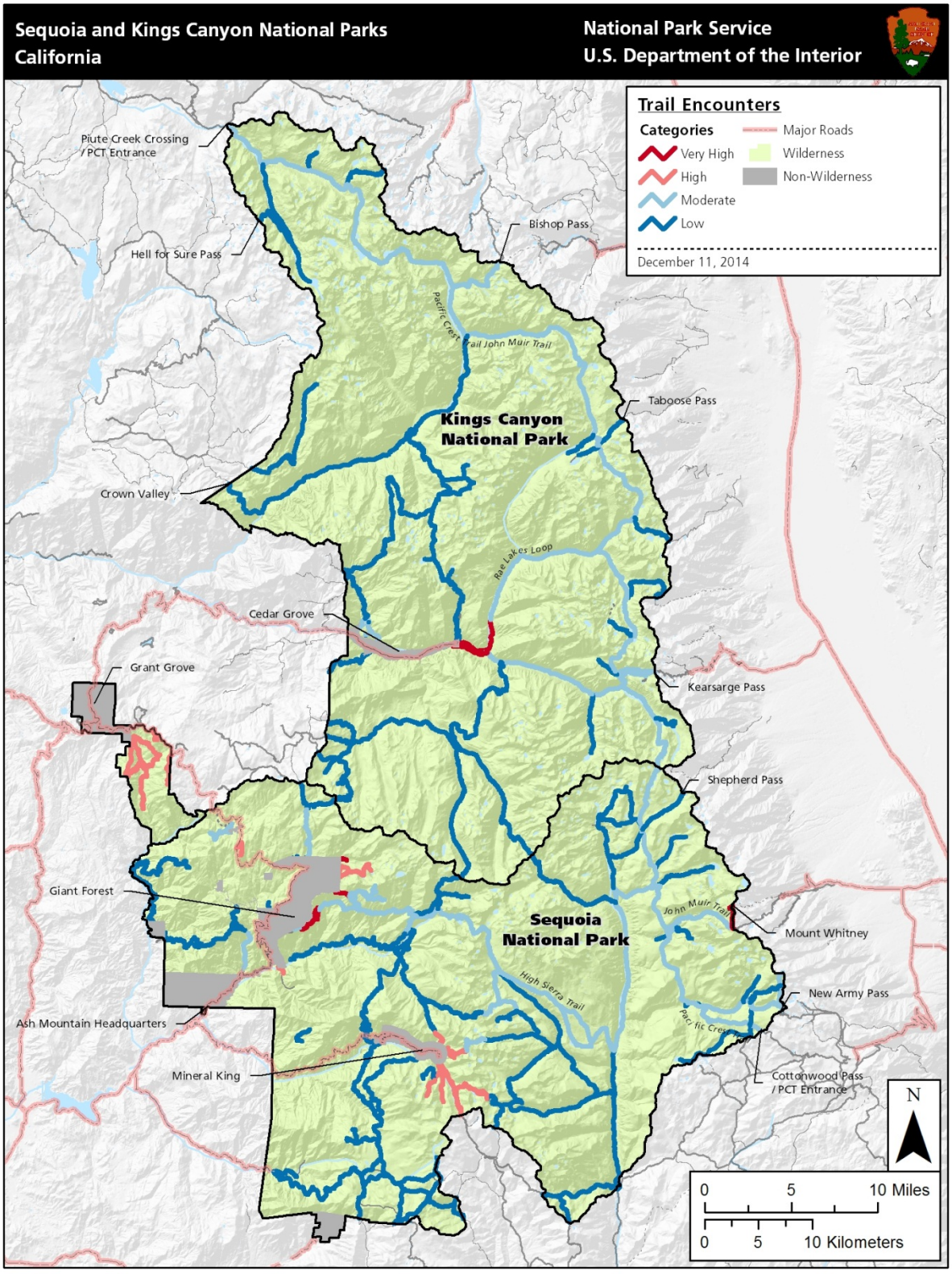


Figure 9: Map of Trail Encounter Categories (Alternatives 2 through 5)

Table 13: Encounters per Hour Standards for Alternative 2

Measure	Standard[1]			
	Very High	High	Moderate	Low
Trail Encounters – People Encountered Per Hour – by area	45	25	15	6

[1] Interpreted as the maximum number of people encountered per hour on 90% of days within the quota season (generally from the Friday before Memorial Day through the last Saturday in September) for selected monitored trail segments.

Currently, visitors may experience encounter rates higher than the proposed standard in the areas detailed below. The actions described under this alternative, along with the management actions described in the "Mitigation Common to All Alternatives" section in this chapter and in appendix A, would be taken to return the areas to within standards (table 14). [Note: Trail encounter data from 2012-2014 was collected opportunistically by park staff and volunteers. As a result, a larger proportion of samples occurred on weekend days and mid-day times than would be expected from a random or structured sample. A standardized sampling protocol will be developed upon completion of the WSP, and areas that are shown as out-of-standard and near standard in table 14 would be prioritized for re-sampling.]

Table 14: Trail Encounter Categories, Standards, and Proposed Management Actions for Alternative 2

Encounter Category	Encounter Standard[1]	Analysis Area	Status	Proposed Management Action
Very High	45	Mount Whitney	Near standard	Lower limits on commercial use; reduction in area camping overnight limits; change grazing restrictions in nearby meadows; obtain better data to confirm observations; consult with USFS regarding area use levels
		Road's End	Near standard	Obtain better data to confirm observations; reduction in area camping overnight limits; implement area-specific restrictions.
		High Sierra Trail (Crescent Meadow to Wolverton Cutoff Junction)	In standard	
High	25	Lakes Trail	Near standard	Obtain better data to confirm observations. A lower day-use party size may be implemented.
		Mineral King Valley	In standard	
		Little Baldy Trail	In standard	
		Paradise Creek Trail	In standard	
		Redwood Canyon	In standard	

Table 14: Trail Encounter Categories, Standards, and Proposed Management Actions for Alternative 2 (continued)

Encounter Category	Encounter Standard[1]	Analysis Area	Status	Proposed Management Action
Moderate	15	Evolution Basin & Valley (JMT/PCT)	Out of standard	Obtain better data to confirm observations; consult with USFS on quota reductions; establish overnight stay limit; implement area specific restrictions.
		Rae Lakes/JMT	Near standard	Obtain better data to confirm observations; reduction in area camping overnight limits; consult with USFS on quota reductions; implement area specific restrictions.
		Mount Langley approach	Near standard	Establish a Class 1 trail to the summit of Mount Langley; lower limits on commercial use; obtain better data to confirm observations; consult with USFS on quota reductions; implement area specific restrictions.
		Crabtree Ranger Station to Trail Crest	Near standard	Obtain better data to confirm observations; lower limits on commercial use; consult with USFS on quota reductions: implement area specific restrictions.
		Rae Lakes Loop — Lower Portion	In standard	
		West side of Kearsarge Pass	Near standard	Obtain better data to confirm observations; reduction in area camping overnight limits; consult with USFS on quota reductions; implement area specific restrictions.
		Dusy Basin	In standard	
		Twin Lakes Trailhead to Silliman Creek	In standard	
		High Sierra Trail (Wolverton Cutoff Junction to JMT Junction)	Near standard	Obtain better data to confirm observations; lower limits on commercial use; reduction in area camping overnight limits; implement area specific restrictions
		Rock Creek	In standard	
		Little Five	In standard	
Low	6	Sixty Lake Basin Trail (Rae Lakes 3) and Crabtree Lakes (Crabtree 1)	Near standard	Obtain better data to confirm observations; lower limits on commercial use; reduction in area camping overnight limits; implement area specific restrictions.
		All other trails not identified above	In standard[2]	

[1] Interpreted as the maximum number of people encountered per hour on 90% of days within the quota season (generally from the Friday before Memorial Day through the last Saturday in September).
[2] Inferred from a very small number of samples.

Element 2: Trails

Planning Objective: The trail system would facilitate access for visitor use and enjoyment of the wilderness. Trails would be well suited to the types and levels of visitor use (levels of visitor use would be slightly decreased from current levels in targeted areas under this alternative).

Most park trails are already designed and constructed to provide for appropriate access while preserving wilderness character. A few existing trail segments are inadequately constructed to support projected use patterns under this alternative and would be targeted for further development. Some trails are more developed than projected use patterns require, and they would be maintained to a lower development class. A few trails would be designated hiking only where there are threats to sensitive resources or visitor safety issues. Where the designated unmaintained routes listed in the 1986 SUMMP are still passable to stock, and where stock travel does not pose undue threats to natural and cultural resources, they would be designated as Class 1 trails and targeted for appropriate construction and maintenance. Other designated unmaintained routes would be abandoned and landscape restoration considered. Tables comparing each of the alternatives by trail class and use are presented at the end of this chapter. Figure 12 depicts the wilderness trail system for alternative 2 and can be found on page 135. More details on the trail management and classification system and trail management can be found in appendix K.

With additional site-specific planning and compliance, new Class 1 trails could be established to protect resources when visitor use may cause undue impacts. For example, establishing Class 1 trails on Lamarck Col and Mount Langley would provide resource protection in areas with relatively high or increasing visitation.

Element 3: Campfires

Planning Objective: Visitors would have the opportunity to enjoy campfires where campfires are compatible with the protection of vegetation and downed wood resources. In this alternative, targeted areas would be opened or closed to campfires, depending on availability of wood and resource sensitivity.

Recreational campfires would be allowed in the foothill and montane forest areas where adequate wood supplies exist. To protect downed wood resources, campfires would be prohibited in most of the high-elevation forests and woodlands. Recreational campfires would be allowed up to the following elevations:

- 10,000 feet in the San Joaquin River drainage
- 10,000 feet in the Kings River drainage
- 10,000 feet in the Kern River drainage
- 9,000 feet in the Kaweah River drainage
- 9,000 feet in the Tule River drainage

In areas where available wood could be burned without unduly depleting ground fuels or consuming paleo resources, variances could be established for specific areas above these elevations in the future. In addition, site-specific prohibitions would be implemented where downed wood resources cannot sustain campfires, including: Hamilton Lakes, Mineral King Valley, Pinto Lake, and Redwood Canyon.

This alternative allows recreational campfires in 395,710 acres of the 837,806 acres of wilderness in the parks (47% of the wilderness). Figure 13 depicts campfire restrictions for alternative 2 and can be found on page 137.

Element 4: Food Storage

Planning Objective: Native wildlife would subsist only on naturally obtained food, uninfluenced by the presence of human food. In this alternative, food-storage boxes would be provided in areas where the risk of affecting native wildlife is high.

Portable containers would be required for overnight use at North Dome, Dusy Basin, Rae Lakes Loop, and Rock Creek areas, and may be required in other areas in the future in response to increased incidents. In areas where portable containers are not required, counterbalance hanging would be allowed.

Some 86 food-storage boxes (the exact number varies with functionality and/or placement) are currently located in the parks' wilderness (see figure 3, page 67, for a map of current food-storage box locations). Boxes would be retained at the most popular areas and new ones would be considered for areas meeting criteria for placement (e.g., Rae Lakes Loop and HST). Criteria for retention or placement include proximity to trailheads, area visitation levels, quality of bear habitat, and frequency and severity of historic incidents. Where criteria are not met, the undeveloped quality of wilderness character would be improved by removing food-storage boxes. In the future, additional food-storage boxes may be installed in response to site-specific issues or incidents, after completion of a MRA.

Under this alternative, 48 of the existing 86 food-storage boxes would be retained, and 25 would be removed. An additional 13 food-storage boxes would be considered for removal. Prior to removal of the additional 13, the parks would test the areas by temporarily locking food-storage boxes and/or by establishing a container requirement for visitors. If the testing is successful, the food-storage boxes would be removed. Table 15 provides a list of the food-storage boxes to be retained and removed and the justification for action.

Table 15: Food-storage Boxes to be Retained or Removed under Alternative 2

[Note: Number of food-storage boxes is indicated in parentheses when more than one box exists in the area.]

Food-storage Box Location Listed Approximately North to South	Alternative 2 Actions			Discussion and Justification
	Remove	Retain	Retain but Test for Potential Removal	
NORTH OF THE KINGS CANYON				
Frypan Meadow	Remove box			Low use levels. Opportunities for counterbalancing. No recent history of bear issues.
Lower Tent Meadow			Test closure of box.	Moderate use levels. Opportunities for counterbalancing. No recent history of bear issues.
RAE LAKES LOOP AREA				
Paradise (5 – 2 in Lower, one in Middle, two in Upper)	Remove one box from Lower Paradise	Retain three boxes – one each in Lower, Middle and Upper Paradise Valley.	Test closure of one box in Upper Paradise for possible removal.	Use levels resulting from reduced number of campsites in Lower Paradise would be supported by one box. Moderate use levels would continue at Middle Paradise; Upper Paradise would still be very popular. History of bear issues necessitates retention of three boxes. Container-required area.

Table 15: Food-storage Boxes to be Retained or Removed under Alternative 2 (continued)

[Note: Number of food-storage boxes is indicated in parentheses when more than one box exists in the area.]

Food-storage Box Location Listed Approximately North to South	Alternative 2 Actions			Discussion and Justification
	Remove	Retain	Retain but Test for Potential Removal	
Woods Creek Crossing (2)		Retain both boxes.		Popular area with good bear habitat and history of bear issues. Container-required area.
Arrowhead Lake (2)		Retain one box.	Test closure of one box for possible removal.	Popular area with good bear habitat. Popular use by through hikers (JMT, PCT). Container-required area; two boxes are unnecessary. Container-required area.
Rae Lakes area (2)		Retain both boxes		Popular area with good bear habitat and history of bear issues. Container-required area.
Charlotte Lake		Retain box		Popular area with history of bear issues. Container-required area.
Vidette Meadow (2)		Retain one box.	Test closure of one box for possible removal.	This is a popular area with bear issues; however, one box may suffice since most users have portable food containers. Container-required area.
Kings Junction / Lower Junction Meadow area (2)		Retain both boxes		Popular area with history of bear issues. Container-required area.
East Lake outlet/inlet area (2)	Remove box at inlet	Retain box at outlet		Most visitors camp at the outlet. Popular area with history of bear issues. Some commercial stock users camp at inlet but have their own food-storage panniers. Container-required area.
Charlotte Creek (at junction with Bubbs)		Retain		Popular area with history of bear issues. Container-required area.
Sphinx Junction (2)	Remove one box	Retain one box		Low use of box across the river; two boxes are unnecessary. Container-required area.
ROARING RIVER TO SILLIMAN AREA				
Roaring River (3 – one each at Sliding Top, Stewart E. White Camp, and Hilltop Camp)		Retain two: Sliding Top box and Stewart E. White box.	Test closure of Hilltop Camp box.	Sliding Top box has both administrative and visitor use. Stewart E. White box is in a popular area. The Hilltop Camp has moderate use, mostly by stock parties using panniers. Good counterbalance hanging options. Good bear habitat and increasing bear issues.
Sugarloaf		Retain		Primarily a stock-use area, particularly by private stock users who may not have food-storage panniers. Good bear habitat.
Comanche Meadow	Remove			Use levels do not justify the need for a box at this location.
Seville Lake (2)	Remove one box		Test container requirement for possible removal of one box.	Use levels do not justify the need for 2 boxes at this location. Good bear habitat. Implement container requirements for eventual removal of all boxes in area.

Table 15: Food-storage Boxes to be Retained or Removed under Alternative 2 (continued)

[Note: Number of food-storage boxes is indicated in parentheses when more than one box exists in the area.]

Food-storage Box Location Listed Approximately North to South	Alternative 2 Actions			Discussion and Justification
	Remove	Retain	Retain but Test for Potential Removal	
Lost Lake			Test container requirement for possible removal.	Good bear habitat. Implement container requirements for eventual removal of all boxes in area.
Ranger Lake (2)	Remove one box		Test container requirement for possible removal of one box.	Use levels do not justify the need for two boxes at this location. Good bear habitat. Implement container requirements for eventual removal of all boxes in area.
Twin Lakes (2)	Remove one box		Test container requirement for possible removal of one box.	Use levels do not justify the need for two boxes. Good bear habitat. Implement container requirements for eventual removal of all boxes in area.
Cahoon Meadow/East Fork Clover Creek crossing (2)	Remove one box		Test container requirement for possible removal of one box.	Low-use area with good bear habitat. Close to Lodgepole which has history of bear issues. Container requirements would likely be successful in this area. Implement container requirements for eventual removal of all boxes in area.
SOUTHERN JMT/PCT				
Kearsarge (3)	Remove two boxes	Retain one box		All three boxes currently locked as a test. Conclusion of the two-year test is that not all three boxes are needed. Container-required area.
9,900 feet elevation/ JMT/Bubbs Creek	Remove			Other opportunities for camping and food-storage nearby. Container-required area.
Center Basin/JMT junction		Retain		This is a popular area with bear issues. Container-required area.
Tyndall Frog Ponds (2)	Remove southerly box	Retain one box		Low use at southerly camp. Northerly area receives more use and is good bear habitat.
Tyndall Meadow	Remove			Low-use commercial stock camp. One nearby box for public is available. Good options for counterbalancing.
Wallace Creek/ JMT/ Junction Meadow		Retain		Popular area with good bear habitat and history of bear issues.
Upper and Lower Crabtree (2)	Remove box at Lower Crabtree	Retain box at Upper Crabtree		Low use at Lower Crabtree and a box is available at the upper meadow. No recent history of bear issues.

Table 15: Food-storage Boxes to be Retained or Removed under Alternative 2 (continued)

[Note: Number of food-storage boxes is indicated in parentheses when more than one box exists in the area.]

Food-storage Box Location Listed Approximately North to South	Alternative 2 Actions			Discussion and Justification
	Remove	Retain	Retain but Test for Potential Removal	
Rock Creek (3 – Rock Creek Crossing, Rock Creek Lake, and Soldier Lake)		Retain all three boxes.	(consider locking one or more boxes as a test prior to closure at some time in the future)	Popular area with history of bear issues. Close to trailheads so hikers may have more food. Container-required area.
KERN TO MINERAL KING AREAS				
Kern – Junction Meadow/Colby Pass		Retain		Popular area with history of bear issues.
Kern Hot Spring (2)	Remove one box	Retain one box		One box would accomplish bear protection.
Upper Funston (2)	Remove one box	Retain one box		One box would accomplish bear protection.
Lower Funston (2)	Remove one box	Retain one box		One box would accomplish bear protection.
Moraine Lake		Retain		Popular area with bear issues.
Lost Canyon		Retain but relocate in general locale		Popular area with bear issues.
Big Five Lakes	Remove			Low-to-moderate visitation. Many trees for counterbalancing.
Little Five Lakes		Retain		Popular area with history of bear issues.
Big Arroyo		Retain		Popular area with history of bear issues.
LAKES TRAIL TO HIGH SIERRA TRAIL TO HOCKETT AREAS				
Pear Lake (2)	Remove one box		Test container requirement for possible removal of one box.	Implement container requirements for eventual removal of all boxes in area.
Emerald Lake (2)	Remove one box		Test container requirement for possible removal of one box.	Implement container requirements for eventual removal of all boxes in area.
Mehrten Creek/HST		Retain		Popular area with history of bear issues.
Seven Mile Creek/HST		Retain		Popular area with history of bear issues.
Buck Creek/HST		Retain		Popular area with history of bear issues.
Bearpaw Meadow (3)	Remove one box	Retain two boxes		Popular area with history of bear issues.

Table 15: Food-storage Boxes to be Retained or Removed under Alternative 2 (continued)

[Note: Number of food-storage boxes is indicated in parentheses when more than one box exists in the area.]

Food-storage Box Location Listed Approximately North to South	Alternative 2 Actions			Discussion and Justification
	Remove	Retain	Retain but Test for Potential Removal	
Hamilton Lakes (3)	Remove one box	Retain two, but replace with new boxes		Popular area with history of bear issues.
Pinto Lake		Retain		Popular area in good bear habitat. Close to trailheads so hikers may have more food.
Cliff Creek			Test closure for possible removal.	Low-moderate visitation. First camp for less-experienced visitors. Trees available for counterbalancing.
Monarch Lake		Retain		Popular area with no place to counterbalance. Good bear habitat with history of bear issues.
Franklin Lake (2)	Remove lower box	Retain upper box		Most people camp above the dam and the lower box is not needed. Popular area with history of bear issues.
Hockett Ranger Station (2)	Remove one box	Retain one box		One box is sufficient to handle use levels.
Hidden Camp, Rock Camp, and Upper Camp (3; one at each location)		Retain all three boxes		Moderate private stock use levels. History of bear issues.

This list of food-storage boxes is based on the best available information. There may be additional food-storage boxes located in wilderness that have not been documented. If any food-storage boxes are present in wilderness and not on this list, they would be removed under this alternative.

This list also does not include food-storage boxes at administrative crew camps in Sequoia and Kings Canyon National Parks that are sometimes available to the public (i.e., when crews are not working out of those camps). These food-storage boxes would either be removed and replaced with collapsible boxes on a temporary basis while crews are working or locked for exclusive administrative use.

Element 5: Human-waste Management

Planning Objective: Human waste would not contaminate water or create unsanitary or unsightly conditions. In this alternative, restrooms and privies would be provided in targeted areas where the risk of contamination is high.

Cat-holes would be required where there are no privies or toilets. Requirements to pack out used toilet paper would be retained. Pack-out waste kits would be recommended for use in popular areas or where privies or restrooms are not feasible (e.g., lack of suitable soils, archeological concerns, or other resource concerns). Pack-out waste kits may be required in specific areas to minimize the need for privies and restrooms.

Existing privies and restrooms would be evaluated and when they are beyond reasonable repair, or if they are located in unsuitable locations (low-use, close-in areas, where soils allow for cat-holes), they would

be removed. The remaining privies would be retained and maintained. New privies would be considered for a few popular day-use areas where other methods have proved unsuccessful.

Ten public-use privies would be retained, including Bearpaw Meadow (2), Crabtree, Franklin Lake, Kern Hot Spring, Monarch Lake, Paradise Valley (2), Roaring River, and Woods Creek Crossing. Seven public-use privies would be removed including privies in the Bearpaw Meadow area, Hockett, Middle Paradise, Sphinx, Roaring River (2) and Upper Funston areas. One public-use privy would be added at Rock Creek Crossing.

Three additional public-use privies could be removed at Eagle Lake, Mosquito Lake, and Twin Lakes, but only after pack-out waste kits prove successful in the test areas. The public-use restroom buildings at Emerald and Pear lakes could be removed in the future if maintenance of the facility becomes cost prohibitive or if repairs or renovations are not cost efficient. Table 16 on the next page provides a list of public privies and restrooms and the justification for retaining or removing.

A typical privy

Table 16: Public-use Privies and Restrooms Retained or Removed under Alternative 2

[Note: Number of privies/restrooms is indicated in parentheses when more than one privy/restroom exists.]

Privy/Restroom Name/Location Listed North to South	Alternative 2 Actions	Discussion and Justification
Woods Creek Crossing	Retain	Popular and concentrated use and primary stopping point for multiple trip itineraries. A privy is necessary to protect the natural quality of wilderness and protect solitude (from litter associated with human waste).
Paradise Valley (3 – 1 each in Upper, Middle, and Lower)	Retain two privies (Upper and Lower). Remove privy at Middle Paradise.	Less use in Middle Paradise Valley than Upper and Lower Paradise Valley. Removal of designated campsites in Middle Paradise under this alternative makes it more appropriate to disperse use by not having a privy available. Soils are suitable for cat-holes.
Sphinx	Remove	Low use and soils are appropriate for cat-holes.
Roaring River area (3)	Remove privy at Sliding Box Camp; retain privy at Stewart E. White Camp (near ranger station). Remove privy at Knoll Camp (if it still exists).	Less use at Sliding Box Camp. Large area with suitable soils for cat-holes at Sliding Box Camp. Stewart E. White Camp location has long-established and concentrated use. A privy is necessary to protect the natural quality of wilderness and protect solitude (from litter associated with human waste).
Twin Lakes	If carry-out waste requirements are successful at Emerald and Pear lakes, implement at Twin Lakes by removing privy. Provide carry-out bags for human waste for both day and overnight users.	Popular area close to busy trailhead. Taking out the privy without an alternative would result in impacts because of concentrated use.
Heather Lake	Removed recently – do not replace. Provide carry-out bags for human waste for both day and overnight users. Increase education on proper behavior.	Sensitive area with concentrated day-use (no overnight use at Heather Lake). It is near the trailhead so use of carry-out bags for human waste would be appropriate.
Pear Lake (1 restroom)	Prior to major repairs or renovations, and after successful implementation of carry-out waste kits in other locations, this area would be tested for the use of carry-out waste kits. If carry-out waste kits prove successful, remove restroom building.	Existing restroom is a large development in wilderness and requires high levels of maintenance. When the restroom is no longer usable, or is no longer functioning properly, it will be evaluated for removal. This is a popular area where rocky shallow soils do not support use of cat-holes. There are designated sites in the area so education on use of carry-out waste bags can be provided through the permitting process.
Emerald Lake (1 restroom)	Prior to major repairs or renovations, and after successful implementation of carry-out waste kits in other locations, this area would be tested for the use of carry-out waste kits. If carry-out waste kits prove successful, remove restroom building.	Existing restroom is a large development in wilderness and requires high levels of maintenance. When the restroom is no longer usable, or is no longer functioning properly, it will be evaluated for removal. This is a popular area where rocky shallow soils do not support use of cat-holes. There are designated sites in the area so education on use of carry-out waste bags can be provided through the permitting process.

Table 16: Public-use Privies and Restrooms Retained or Removed under Alternative 2 (continued)

[Note: Number of privies/restrooms is indicated in parentheses when more than one privy/restroom exists.]

Privy/Restroom Name/Location Listed North to South	Alternative 2 Actions	Discussion and Justification
Bearpaw Area (3)	Remove one privy. Retain two privies (one at backpacker camp area and one near Bearpaw Meadow High Sierra Camp).	This is a popular area with well-established designated camp area. A privy is necessary near the camp to protect natural quality of wilderness and protect solitude (from litter associated with human waste). A public privy is necessary near the Bearpaw Meadow High Sierra Camp to protect resources of the camp area from human waste and litter.
Hamilton Lakes	Retain	Popular area with rocky shallow soils not suitable for digging cat-holes.
Crabtree area	Retain	Popular area where a privy is necessary to protect the natural quality of wilderness and protect solitude (from litter associated with human waste).
Rock Creek area (0)	Add one privy at Rock Creek crossing area.	This area is popular and has concentrated use. A privy is necessary to protect the natural quality of wilderness and protect solitude (from litter associated with human waste).
Kern Hot Spring	Retain	This area is popular and has concentrated use. A privy is necessary to protect the natural quality of wilderness and protect solitude (from litter associated with human waste).
Upper Funston	Remove	Low-moderate use. Large area with suitable soils for cat-holes.
Monarch Lakes	Retain	This area is popular and has concentrated use. Rocky shallow soils do not support use of cat-holes. This is a launching point for longer trips. A privy is necessary to protect the natural quality of wilderness and protect solitude (from litter associated with human waste).
Eagle Lake and Mosquito Lakes (2 – 1 privy at each location)	If carry-out waste requirements are successful at Emerald and Pear lakes, implement in these areas by removing the two privies. Provide carry-out bags for human waste for both day and overnight users going to Eagle Lake, Mosquito Lakes, and White Chief area.	This area is popular and has concentrated use. Generally visitors are day hikers or stay for one to two nights. Not a launching point for longer trips. Close to the trailhead and suitable for testing carry-out bags.
Franklin Lakes	Retain	This area is popular and has concentrated use. Rocky shallow soils do not support use of cat-holes. This is a launching point for longer trips. A privy is necessary to protect the natural quality of wilderness and protect solitude (from litter associated with human waste).
Hockett Meadow	Remove	Low use and soil type is appropriate for cat-holes.

The NPS would consider future implementation of new technologies for human-waste management as they are developed. The use of new technologies may require site-specific planning and compliance. Some technologies may require visitors to be more self-sufficient.

Element 6: Party Size

Planning Objective: Party size would be set at levels high enough to allow for a variety of experiences, but low enough to protect wilderness character from impacts associated with large groups. In this alternative, changes to party-size limits would occur for stock groups and in targeted popular and off-trail areas.

All of the action alternatives include party-size limits for people and stock. These limits are based on three numbers: the total number of people, the total number of stock, and the combined total of people and stock. The party-size limits differ for on-trail and off-trail travel. The total number of people allowed per party will be the same for hikers and stock users and is limited primarily to protect opportunities for solitude. The total number of stock allowed per party is limited primarily to protect the natural quality of wilderness in campsites, stock tie areas, and off-trail travel areas. The combined total of people and stock allowed in a party may be lower than the sum of the maximum allowed numbers of people and stock; it is limited primarily to protect opportunities for solitude and to control impacts from very large groups on the natural quality at camps.

Alternative 2 keeps the current maximum numbers of people and stock for on-trail travel, but reduces the combined party size. Lower party-size limits are set for off-trail travel to preserve opportunities for solitude and to discourage development of informal trails. The combined party size for stock plus people is reduced to prevent impacts on solitude by the largest stock parties. Party-size limits for hikers would apply to boaters under all alternatives. Tables 17 and 18 present party size limits under alternative 2.

Table 17: Party-size Limits for Hikers and Boaters for Alternative 2

Type of Trip	Maximum Party Size
On-trail (day use)	25, consider future more restrictive party size for day-use in specific areas (e.g., Mist Falls, Watchtower, and Monarch Lakes).
On-trail (overnight use)	15*
Off-trail (day and overnight use)	12, except in areas with specific lower limits (see below).
Area-specific	Existing off-trail temporary party-size limits of 8 would be adopted permanently at Darwin Canyon / Lamarck Col (includes Class 1 trail area), Dusy Basin, Mount Whitney Management Area / Mount Langley (includes Class 1 trail area), Sixty Lake Basin, and Sphinx Lakes. Existing party size of 10 would be retained at Redwood Canyon. A party-size limit of 8 is established for the Don Cecil Trail and the Colony Mill Road Trail.

*Consistent with neighboring USFS areas.

Table 18: Party-size Limits for Stock Parties for Alternative 2

Type of Stock Trip	Maximum Party Size for People and Stock
Day Rides (not including spot and dunnage)	People: 20 Stock: 20 Combined: 40
On-trail (including spot and dunnage trips that support overnight use for those trails where stock is allowed, except where area-specific exceptions apply)	People: 15 Stock: 20 Combined: 28
Off-trail (in areas specifically designated for off-trail stock use, except where area-specific exceptions apply)	People: 12 Stock: 12 Combined: 14
Area-specific	Upper Goddard Canyon/Martha Lake would have a party-size limit consistent with the off-trail party size (12 people, 12 stock, combined maximum of 14). Combined party size of 8 (people and stock) for day rides into Sixty Lake Basin. Trail closed to stock beyond a point 1.8 miles from the junction of the JMT and the Sixty Lake Basin Trail. Combined party size of 8 (people and stock) for day rides above Penned Up Meadow on the Class 1 trail into Miter Basin. Existing limit of 10 people and 10 stock at Redwood Canyon would be retained (combined maximum of 20).

Element 7: Camping/Campsites and Night Limits

Planning Objective: Visitors would have the opportunity to choose camping locations, except in areas where camping would result in unacceptable impacts. In this alternative, camping restrictions would be adjusted in targeted areas.

Camping would be allowed in specific areas close to the frontcountry (e.g., Colony Mill Trail, Don Cecil Trail, and North Dome) to allow a greater diversity of recreational opportunities where risks to resources are low. One or more universally accessible campsites could be constructed closer to a trailhead (e.g., near the confluence of Bubbs Creek and the South Fork Kings River), designed to meet wilderness standards.

The locations of established stock camps would be identified and the NPS would recommend their use. In specific popular areas, stock users may be required to camp in designated stock camps. These areas may include Woods Creek Crossing, Rock Creek Crossing, and Big Pete Meadow. If an area is designated as a required stock camping site/area, backpacker camping would be prohibited. Criteria used for establishing stock-only campsites would include the areas' historic visitation by both backpackers and stock users.

First Allowable Campsite — The first allowable camps by trailhead under alternative 2 are presented in table 19. Camping is prohibited on these trails prior to the listed first-camp locations. These prohibitions would also apply to alternatives 3, 4, and 5.

Table 19: First Allowable Camps by Trailhead under Alternative 2

Trailhead Name Listed North to South Generally	Distance to First Allowable Camp	Name of First Camp or Description of Area
Lewis Creek	4 miles	Comb Creek
Hotel Creek	5.4 miles	Comb Creek
Copper Creek	4.4	Lower Tent Meadow
Woods Creek/Paradise Valley	6.5 miles	Lower Paradise Valley (designated sites only)
Bubbs Creek	4 miles	Sphinx Creek
Don Cecil Trail	2 miles	Unnamed Creek
Buena Vista	No overnight use	
Big Baldy	No overnight use	
Redwood Canyon	On-trail into canyon bottom: 1 mile	Redwood Creek
	On-trail to Hart Tree: 1.25 miles	Hart Meadow/Buena Vista Creek
Sugarloaf (Marvin Pass trailhead)	Parks' Boundary with NPS Permit	Parks' Boundary
Rowell Meadow (Belle Canyon Trailhead)	Parks' Boundary with NPS Permit	Parks' Boundary
J.O. Pass (Big Meadows)	Parks' Boundary with NPS Permit	Parks' Boundary
Lost Grove	No overnight use	
Muir Grove	No overnight use	
Little Baldy	No overnight use	
Twin Lakes	3 miles	Cahoon Meadow
Tokopah	No overnight use	
Lakes Trail (Emerald/Pear Lakes)	5.2 miles	Emerald Lake (designated sites only)
Alta	2.9 miles	Panther Gap (no water)
Giant Forest and Crystal Cave areas	No overnight use	
HST/Crescent Meadow	2.8 miles	Panther Creek
North Fork Kaweah	1 mile from trailhead	Note: First water at 4.2 miles
Colony Mill Road Trail	(West) from Crystal Cave Road Trailhead: ~2.5 miles	Colony Mill Ranger Station site (no water)
	(East) from North Fork Trailhead: ~2 miles	Maple Creek
Marble Falls	No overnight use	
Middle Fork Kaweah	3.5 miles	Panther Creek
Oriole Lake Road	1 mile	Oriole Grove, >1 mile from all roads
Paradise Creek	2 miles above Middle Fork Bridge	Poison Oak Flat
Paradise Ridge	3.3 miles	Paradise Ridge (no water)
Atwell/Hockett	6 miles	Clover Creek
Timber Gap	2.3 miles	Timber Gap (no water)

Table 19: First Allowable Camps by Trailhead under Alternative 2 (continued)

Trailhead Name Listed North to South Generally	Distance to First Allowable Camp	Name of First Camp or Description of Area
Sawtooth-Monarch/Crystal	4.2 miles	Lower Monarch Lake
	4.9 miles	Crystal Lake
Tar Gap	6 miles	Deer Creek
Mosquito	4.1 miles	Mosquito Lake #2 (Mosquito #1 closed to camping)
Eagle	3.4 miles	Eagle Lake
White Chief	4.1 miles	Unnamed lake (trail end), or White Chief Lake
Franklin	4 miles	Franklin/Farewell Junction
Farewell Gap	4 miles	Farewell Junction
Ladybug	1.7 miles	Ladybug Camp
Garfield	4 miles	Garfield Grove / Snowslide Canyon

Length of Stay/Night Limits for All Campers (stock-supported and backpackers) — Under this alternative, campers would be limited to stays of 14 consecutive nights at a single location, 25 total nights per trip, and 75 total nights per year. Exceptions would exist for specific areas and are presented in table 20.

Table 20: Site-specific Exceptions to the Night Limits under Alternative 2

Location	Night Limits Exceptions (Consecutive Nights in One Location)
Night limits would be implemented at Emerald and Pear lakes (combined), and Lower and Upper Soldier lakes (combined).	3-night limit
Current site-specific night limits would continue to apply at Charlotte Lake, Kearsarge Lakes Basin (basin-wide), Paradise Valley (valley-wide), and Redwood Canyon (area-wide). New night limits would be applied at Colony Mill Trail, Crabtree / Whitney Creek area, Don Cecil Trail, Dusy Basin (basin-wide), Guitar Lake, North Dome, and along the JMT from Woods Creek Crossing to Vidette Meadow (any one location).	2-night limit
Current limit at Rae Lakes (per lake) would be retained. Hamilton Lake camping limit would be reduced.	1-night limit
Continue current situation of no area specific night-limits in Evolution Valley and Evolution Basin. If encounter rate standard is exceeded after additional monitoring, establish an appropriate night limit for the area. This could apply to either or both Evolution Valley or Evolution Basin.	To be determined based on site/area conditions.

Designated Campsites — The use of designated campsites/camp areas would be mandatory in areas where past visitation has impacted resources, including Emerald and Pear lakes, Lower Paradise Valley, and Bearpaw Meadow. There would no longer be designated campsites in Middle and Upper Paradise Valley. Additional designated camp areas may be established in areas where concentrated use and limited campsites could create a risk of rapidly increasing physical or social campsite impacts. Areas to be monitored for a potential future change include Dusy Basin, Guitar Lake, Kearsarge Lakes Basin, Middle and Upper Rae Lakes, and Woods Creek Crossing. Designation of campsites or areas would require site-specific analysis to address issues such as hazard trees and archeological resources. The campsites at Upper and Lower Funston Meadows would no longer be designated for use by stock users only.

Definitions of Key Terms

Weighted Value per Campable Mile *– A metric that considers three factors within a travel subzone: length of shoreline of watercourses and lakes; the number of campsites; and the condition class of the campsites. The final weighted-value-per-campable-mile number is calculated using these three factors (Parsons and Stohlgren 1987; Cole and Parsons 2013). For a more detailed definition of WVCM, see appendix A.*

Wilderness Travel Zones *– In the early 1970s, park managers divided the parks into 52 wilderness travel zones to assist in organizing management actions. Wilderness travel zones are generally based on geographic features (watersheds) and overlay the wilderness in Sequoia and Kings Canyon National Parks. Each of the 52 travel zones are then sub-divided into multiple sub-zones, 273 in total. The parks use wilderness travel zones as a way of monitoring and analyzing wilderness conditions and use, and to address a variety of wilderness stewardship issues*

Campsite Condition Standards — The measure of campsite condition would be adopted under all alternatives to ensure that the number of campsites and their condition does not exceed standards. The metric of aggregate campsite impacts (Weighted Value per Campable Mile [WVCM]), derived from Parsons and Stohlgren (1987), would be used to measure campsite condition. Each area of the parks would be assigned to one of three levels of a campsite condition standard based on desired conditions: high use, moderate use, or low use. These areas, or subzones, are based on long-established wilderness travel zones, each of which is comprised of several subzones. The metric would be calculated at the subzone level. Each subzone has a specified WVCM that serves as a standard. Under alternative 2, the standard would be: 1000 for high use subzones, 500 for moderate use subzones, and 250 for low use subzones (figure 10 on the next page). A monitoring plan would be developed to establish protocols and schedule monitoring frequencies to ensure that subzones remain within their applied standard (see campsite condition figure 10 on the next page; for information on determining campsite condition and standards, see appendix A, page A-15 and A-24).

Under the standards developed for alternative 2, two subzones (83-1 Guitar Lake and 86-1 Kern Hot Spring) would be out of standard in the higher use category, and one subzone (80-3 Shepherd Pass Lake) would be out of standard in the moderate category. All other subzones would be within standard. Management actions to return the subzones to within standards are included in the "Mitigation Common to All Alternatives" section in this chapter. See appendix A for more detailed information.

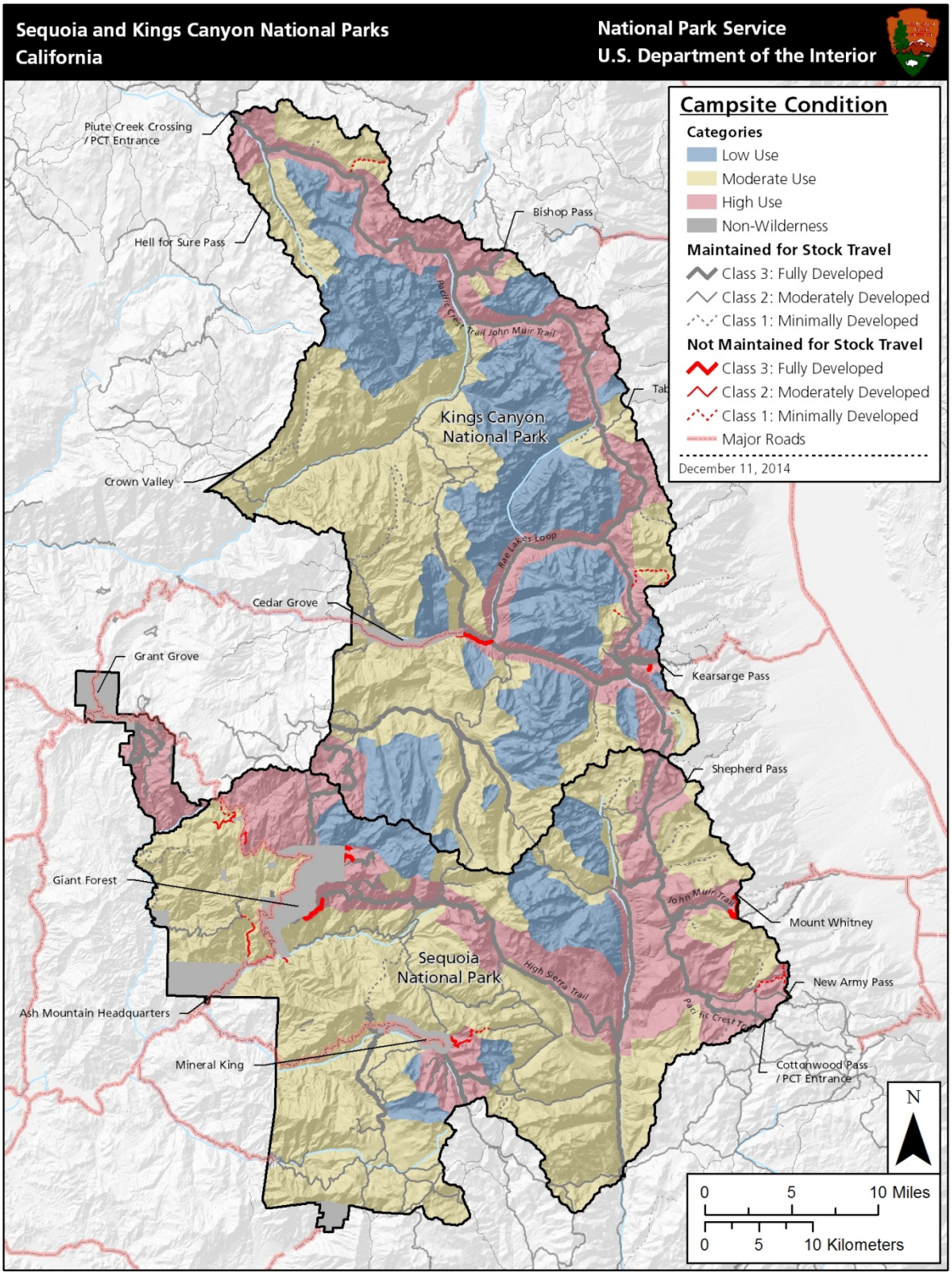


Figure 10: Campsite Condition Categories by Wilderness Travel Subzone (Alternatives 2 through 5)

Element 8: Stock Use

Planning Objective: Visitors would have opportunities to travel with stock, from day rides to multi-day trips, in a manner that ensures the protection of wilderness character. Access and grazing would be managed to protect resources, provide other types of primitive recreation, and reduce conflict of user groups. Under this alternative, the number of meadows available to grazing would be reduced.

Figures 14a and 14b depict stock access and grazing restrictions for alternative 2. Figure 14a shows stock access and grazing restrictions in Kings Canyon National Park and can be found on pages 138/139. Figure 14b shows stock access and grazing restrictions in Sequoia National Park and can be found on pages 142/143.

Stock Access and Travel

On-trail — Visitors traveling with stock would continue to have access to most maintained trails in the parks (650 of 691 miles). Stock parties would be allowed to travel up to 0.5 mile from trails in areas where they are allowed to camp. In areas open to day-use only, stock parties would be allowed to travel up to 100 yards from trails.

Approximately 530 miles of maintained trails would be open to camping with stock. Some trails would be open to stock parties for travel only, some would be open to camping for walking parties with burros and llamas but limited to travel only for parties with horses or mules, and some would be closed to stock travel entirely for reasons including visitor safety, resource protection, and/or popular day-use by hikers. Trails with restricted stock access under alternative 2 would include:

Trails open for travel only (120 miles; includes mileages to first camps from trailhead):

- Alta Trails
- Big Baldy Trail
- Buena Vista Trail
- Center Basin Trail (to Golden Bear Lake)
- Charlotte Lakes Trail from JMT to Charlotte Creek drift fence
- Dusy Basin Trail (to 10,600 feet)
- JMT from Dollar Lake to Vidette Meadow
- Kearsarge Lakes, Kearsarge Pass, and Bullfrog Lake trails
- Ladybug Trail
- Lake 11,092 Trail (shown as Lake 11,106 on older maps)
- Lake Reflection Trail above the abandoned Harrison Pass trail junction
- Lakes Trail (Hump Trail only)
- Martha Lake Trail from 1 mile above Hell-for-Sure Junction
- Miter Basin Trail above Penned-Up Meadow to 11,300 feet in elevation below Sky Blue Lake
- Oriole Lake Trail

- Redwood Canyon area trails
- Upper Blue Canyon Trail (no travel above 10,000 feet in elevation)
- Upper Sixty Lake Basin Trail
- Wallace Lake Trail above 11,200 feet in elevation
- Whiskey Log Trail
- Wright Creek Trail above 11,200 feet in elevation

Trails open to travel only for parties with horses or mules; camping for walking parties with burros and llamas allowed (4 miles):

- Eagle Lake Trail
- JMT from above the Crabtree Ranger Station to the base of the Mount Whitney switchbacks (except Timberline Lake, day-use only)
- Mosquito Lakes trails
- White Chief Trail

Trails closed to stock travel (41 miles):

- Admiration Point
- Baxter Pass Trail
- Crabtree Lakes Trail (no travel above camp at 11,000 feet in elevation)
- HST from Crescent Meadow to Wolverton Cutoff
- Lamarck Col Trail
- Little Baldy Trail
- Lower Big Arroyo Trail
- Lower Sixty Lake Basin Trail
- Marble Falls Trail
- Monarch Lake Trail
- Mount Langley Trail
- Mount Whitney Trail – base of switchbacks to Trail Crest and summit
- Muir Grove Trail
- Paradise Creek Trail
- South Side Cedar Grove Sand Flats Trail
- Upper Soldier Lakes Trail
- Tokopah Falls Trail
- Watchtower Trail

Off-trail — Stock parties would continue to be allowed to travel up to 0.5 mile from trails to reach camps. Travel more than 0.5 mile from maintained trails would continue to be allowed in four areas of the parks: on the Hockett Plateau, on the Monarch Divide, in the Roaring River drainage, and along the western side of the Kern River watershed south from the Chagoopa Plateau.

Stock Grazing — Grazing would be managed to maximize protection of resources while allowing visitors traveling with stock continued access to forage. Grazing would generally be allowed in areas open to camping with stock (within 0.5 mile of maintained trails open to overnight stock use or in off-trail travel areas). Grazing would not be allowed in those areas open to stock travel only.

Grazing would continue to be managed and informed by the results of the Stock Use and Meadow Monitoring and Management Strategy (see appendix D). Traditional methods of adjusting use levels and patterns would continue to be employed when necessary, including:

- adjusting the number of nights a given party may graze an area;
- adjusting the number of stock per party that may graze an area;
- adjusting opening dates to reflect moisture conditions, which are designed to prevent unacceptable mechanical disturbance to surface soil and vegetation; and
- temporarily closing an area to stock access or grazing.

Estimated grazing capacities for wilderness meadows have been developed using a model of biomass production and forage consumption that takes into account the elevation, soil moisture, and condition of the meadow. These capacities would continue to be used to inform grazing management, and would be refined as additional information is acquired. The capacity of individual meadows and uplands to sustain grazing would continue to be informed by each meadow's vulnerability to erosion or change in hydrologic function, susceptibility to invasion by nonnative plants, habitat requirements of sensitive plants and animals, productivity and the ability to sustain herbage removal, and the requirements of unique ecological communities such as peat-accumulating wetlands. Site-specific grazing capacities would be refined on an ongoing basis to protect resource integrity and to protect the natural quality of wilderness in the face of a changing climate.

These capacities also reflect the logistical importance of key meadows and forage areas for stock travel in popular areas. The methodology for developing grazing capacities for all park meadows open for grazing, including those identified as important for those traveling with stock, is provided in appendix D.

Areas closed to grazing would remain open to camping by visitors traveling with stock, but visitors would be required to hold and feed their animals. Administrative grazing would be managed to limit impacts on public grazing (Note: with rare exceptions, visitors are given preference for limited grazing resources).

California or Nevada certified weed-free forage (baled or loose hay, hay cubes, or straw bedding) would be required when using hay products as supplemental forage or bedding in frontcountry zones. Feed carried into wilderness would be limited to commercially processed pellets, rolled grains, or fermented hay (e.g., Chaffhaye™). These products have a high level of mechanical milling, heat treatment, and/or anaerobic fermentation that result in much lower seed viability. Baled or loose hay and compressed hay cubes, which have little to no processing, would not be allowed in wilderness. This requirement would carry across all action alternatives.

The monitoring system described in appendix D would be employed to track use, document conditions, and provide information for preventing and mitigating impacts. This monitoring program takes into

account variation in annual climate, the characteristics of specific forage areas, and the inherent abilities of different species to withstand grazing and trampling pressure. Monitoring of species composition would continue in five pairs of grazed and ungrazed meadows on a five-year rotation, and repeat photography points would be updated as time and resources allow. Monitoring of residual biomass and bare ground, initiated in 1993, would continue to be implemented and the results used to inform decisions regarding grazing management. The NPS would continue to support research to further understand the effects of grazing on Sierran ecosystems, and to modify management of grazing and monitoring protocols as new information becomes available.

The meadows closed to grazing for scientific and social value by the SUMMP would remain closed to grazing. The meadows closed to grazing due to high levels of visitation and resource concerns by the SUMMP would remain closed with the following exception: Tom Sears Meadow would be reopened to grazing.

The following additional locations which are otherwise open to overnight use would be closed to grazing due to high levels of visitation and resource concerns: Crabtree Lakes (closed to stock access and grazing above existing camp west of lowest lake), Darwin Meadow proper, Forester Lake Meadow, Guyot Creek Meadows (expanding the existing closure to the meadows east of the trail), Kern Hot Spring Meadow, Kettle Dome (Randle Corral) Meadows, Mineral King basin, Summit Lake Meadow, Upper LeConte Canyon above 10,000 feet in elevation, and Whitney Creek drainage above the Crabtree Ranger Station.

Meadows associated with areas or trails closed to stock under this alternative would also be closed to grazing.

Recognizing that the opportunity to observe and experience ungrazed meadows is of value to many park visitors, the following meadows along popular travel routes which are otherwise open to camping by stock would be closed to grazing: Bighorn Plateau and the meadow 0.6 mile south of Bighorn Plateau; Chagoopa Plateau #3 Meadow; Darwin Meadow; Grouse Meadow; Lower Crabtree Meadow; and Taboose Pass Meadow. These meadow closures would make it possible for visitors traveling along the JMT and HST to experience at least one ungrazed meadow in each drainage through which the trails pass.

The following restrictions in areas otherwise open to grazing would be adopted:

- Closed to grazing until Evolution and Colby meadows reach capacity: McClure Meadow
- Open to grazing by walking parties with burros or llamas, closed to grazing by parties with horses or mules: Bubbs Creek below Junction Meadow, Evolution Lake to Muir Pass, Kern Headwaters, Evolution Lake to Muir Pass, and Woods Lake Basin
- Open to grazing by private parties only: Lower Soldier Lake Meadow, Lower Whitney Creek (Strawberry) Meadow, and Upper Vidette Meadow
- Open to administrative use and grazing only: Hockett Pasture, JR Pasture, Kern Ranger Station Pastures, Lackey Pasture, and Upper Redwood Meadow

Table 21 on the next page presents the site-specific night and/or head grazing limits on meadows in the parks.

Stock Use Structures — Under this alternative, 29 hitch rails would be retained, and 23 hitch rails would be removed. Also, 42 fences/gates would be retained; 12 would be removed (see tables 51a and 51b starting on page 272 at the end this chapter).

Table 21: Site-specific Night and/or Head Limits on Grazing under Alternative 2

Location	Stock Head Limit	Night Limit
Bubbs Creek (below Junction Meadow)	20	1
Castle Domes Meadow	15	1
Charlotte Creek (below drift fence)	20	2
East Lake	12	2
Junction Meadow (Bubbs)	15	1
Redwood Meadow	15	14
Scaffold Meadow	15	2
Shorty's Meadow	20	2
Upper Crabtree and Sandy Meadows	10	14
Upper Evolution Valley (above Evolution Meadow)	20	1
Upper Rock Creek (Rock Creek Lake and above)	20	2
Wallace Creek Waterfall Meadow	6	1

Element 9: Administrative Structures

Planning Objective: Administrative structures and developments would be the minimum necessary for the administration of wilderness, similar to current conditions.

Ranger Stations — Ranger stations that would be retained in their current locations:

- Charlotte Lake
- Crabtree
- Hockett Meadow
- Kern Canyon
- LeConte Canyon
- Little Five Lakes (yurt)
- McClure Meadow
- Pear Lake
- Rae Lakes
- Roaring River
- Rock Creek
- Tyndall Creek

The patrol cabins at Quinn, Redwood Meadow, and Simpson Meadow would be retained.

Three ranger stations could be relocated, modified, considered for conversion, or replaced:

- Bench Lake tent platform could be moved to a more suitable location for patrol functions.
- Bearpaw Meadow Ranger Station would be removed and reconstructed to better meet the area's historic character.
- The Monarch tent platform would be converted to an administrative camp and the footprint would be reduced.

Each of the above actions would be subject to separate site-specific planning, design and compliance.

Other Administrative Structures — Use of the Redwood Canyon Cabin would be authorized by permit for activities appropriate for the administration of wilderness. The footprint of the facility would be reduced and the external installations (e.g., privy, equipment storage boxes, woodshed, water system) would be removed. If future use of the structure is determined by the parks to not sufficiently support wilderness purposes, the cabin would be removed, and the area restored. The action of removal would be subject to additional planning and compliance tiered to the WSP/EIS.

Administrative Pastures — Existing administrative pastures and associated structures would be retained (Hockett Meadow, Kern, Redwood Meadow, and Roaring River) in their current locale and within their current footprint.

Crew Camps — Existing trail crew camps would be retained, but the number of long-term (v. portable) food-storage boxes in each camp would be reduced to one. Other project crew camps (for administration of wilderness) would be established as needed on a case-by-case basis with no equipment left on-site after project completion.

Element 10: Frontcountry Facilities to Support Wilderness Access and Use

Planning Objective: Frontcountry facilities that support activities in wilderness would encourage and/or facilitate visitor use and enjoyment of wilderness.

The types and levels of commercial services that may be performed in wilderness are discussed in detail in the END (appendix B).

Kings Canyon National Park

Cedar Grove Pack Station — The Cedar Grove Pack Station would continue to be operated under concession authority based on a contractual relationship with NPS with approved use types and levels. Stock camping sites would be developed at the Cedar Grove Pack Station primarily for private users. Holding pen/corral space, hitch rail(s), adequate parking and turnaround space for stock trailers, campfire pit, picnic tables, restrooms, food-storage boxes, and water supply would be installed.

Sequoia National Park

Middle Fork Kaweah Trailhead — At the Middle Fork Kaweah Trailhead the NPS would provide improved parking and turnaround space for stock trailers and a hitch rail; no other stock amenities would be provided. Commercial service providers would be allowed to use this trailhead. No camping for stock or backpackers would be allowed.

Mineral King Area — Selected sites within the Atwell Mill Campground would be adapted to accommodate stock camping in two or three sites. Site specific planning and design would occur prior to developing stock sites, and considerations would include distance from non-stock sites, drainage, and natural and cultural resource concerns. Facilities may include a holding pen, hitch rail(s), table, campfire pit, picnic table, and stock trailer parking. The sites would be maintained through an agreement between the NPS and a cooperating partner. Commercial service providers would be allowed to use the Atwell/Hockett trailhead.

There would be no concessions operations at the Mineral King Pack Station. Existing facilities at Mineral King administrative corrals in east Mineral King Valley would continue to be used for park administrative purposes at the existing location or at a new location to reduce and minimize environmental impacts on wetlands and water quality. Existing stock facilities could be modified to allow for short-term public camping or staging and/or short-term camping by CUA holders. Modifications to the site to provide for use by private individuals and/or CUA holders would include adequate parking and turnaround space for stock trailers, a small corral, water, a picnic table, and a vault toilet or restroom. These facilities would provide for stock camping for private parties (1 to 2 sites, one- or two-night limit). The site would be maintained through an agreement between the NPS and a cooperating partner.

North Fork Kaweah Trailhead — At the North Fork Kaweah Trailhead improved parking and turnaround space for stock trailers and additional hitch rail(s) would be provided. Commercial service providers would be allowed to use this trailhead and controlled through conditions of a permit. The area would be maintained through an agreement between the NPS and a cooperating partner. No camping for stock or backpackers would be allowed.

South Fork Kaweah Campground and Trailhead — Stock use would continue to be allowed at the South Fork Kaweah Trailhead. The South Fork Kaweah Trailhead would be slightly modified to improve the existing parking and turnaround space for stock trailers at the trailhead, and a hitching post would be provided. Site specific planning and design would occur prior to any modifications, with the intent to minimize impacts on the natural resources in the area. Use would be primarily for private users, with limited commercial use by CUA holders (managed via permit conditions) and administrative users. The site would be maintained through an agreement between the NPS and a cooperating partner.

Wolverton Area (trailheads and administrative corrals) — The facilities in the Wolverton area would continue to be used for park administrative purposes. The Wolverton facilities could be modified to provide for short-term use for private parties and commercial service providers. There would be no permanent occupancy of the Wolverton corrals by a commercial service provider to operate wilderness stock trips. The site could be maintained through an agreement between the NPS and a cooperating partner.

The above modifications to frontcountry facilities and trailheads would require site-specific planning, design, and compliance.

Element 11: Commercial Services in Wilderness

Planning Objective: Commercial services would be performed to the extent necessary for activities which are proper for realizing the recreational or other wilderness purposes of the areas. Commercial services would support visitor use and enjoyment of wilderness in a variety of appropriate ways. Visitors with diverse backgrounds and skill levels would be encouraged to experience wilderness and to explore primitive recreation activities such as hiking, backpacking, stock trips, fishing, over-snow travel, or mountaineering, or to build skills in these activities. In order to protect wilderness

character, commercial services would be reduced in the very popular Mount Whitney Management Area.

Specific wilderness activities that have been determined to necessitate support from commercial services consist of backpacking and hiking, stock trips (riding, packing, day rides, and overnight camping with stock), overnight camping with gear hauling support (stock spot, and stock and porter dunnage), oversnow travel (ski and snowshoe touring and winter overnight camping), climbing and mountaineering (summer and winter), fishing, river running, and photography (appendix B).

Mount Whitney, approaching from the west

Under this alternative, based on the commercial services evaluation and determination for wilderness (appendix B), and consistent with the overall desired conditions of this alternative, the levels and types of commercial services to be performed would be similar to current conditions. However, the levels and types of commercial services allowed would be specifically limited in the Mount Whitney Management Area (figure 11 on the next page), an approximately 37,200 acre area around Mount Whitney within Sequoia National Park, roughly defined as bordered on the north by the Wallace Creek watershed, on the east by the Sierra Crest, and on the west by the lip of the Kern Canyon, and on the south by the PCT. Table 22 on page 129 presents the levels and types of commercial services.

Also, under this alternative, all overnight visitors in the parks' wilderness, whether self-supported or traveling with the support of a commercial service provider, would be subject to the trailhead quota system (table 4 on page 61-63), and must obtain a wilderness permit from an approved source (e.g., NPS, USFS, Pacific Crest Trail Association). This would also apply for alternatives 3, 4 and 5.

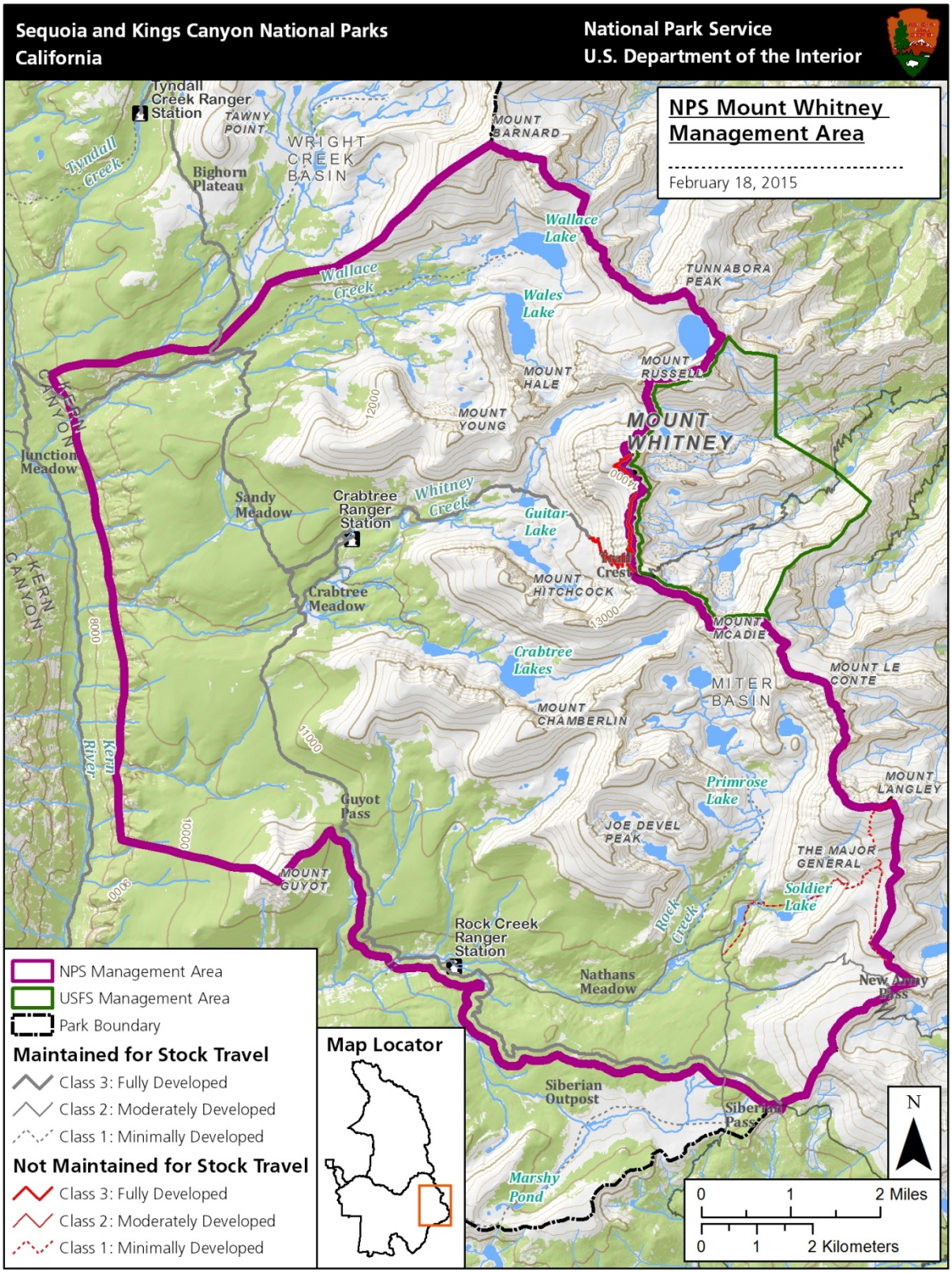


Figure 11: NPS Mount Whitney Management Area

Table 22: Levels and Types of Commercial Services under Alternative 2

Activity		Proposed Allocation of Commercial Service Days
Total Visitor-use Days – private and supported by commercial services (this does not take into account use by PCT and JMT visitors that are not recorded by the parks' wilderness permit system).	**Proposed Visitor Capacity under Alternative 2** 111,000 average 134,000 maximum	For all, day and overnight, non-stock and stock-based: 8,400
Non-stock Activities Backpacking and Hiking Trips. Overnight Camping – gear support by human porters Climbing and Mountaineering (summer and winter). Oversnow Travel (ski and snowshoe touring and winter camping – winter only [Nov. 15 to Apr 15]).	Wilderness-wide: activities that are supported by non-stock based commercial services.	For all, day and overnight, non-stock based services: 5,040 (60% of all commercial services)
	Mount Whitney Management Area: activities that are supported by non-stock based commercial services.	Of the above total allocation, the level which can occur in the Mount Whitney Management Area between late-May and late-September: 930
Stock-based Activities Stock trips – riding, packing, day rides and overnight camping with stock. Overnight Camping – gear support, including stock spot and dunnage	Wilderness-wide: activities that are supported by stock-based commercial services.	For all, day and overnight stock-based: 3,360 (40% of all commercial services)
	Mount Whitney Management Area: activities that are supported by stock-based commercial services.	Of the above total allocation, the level which can occur in the Mount Whitney Management Area between late-May and late-September: 500

The Bearpaw Meadow High Sierra Camp and the Pear Lake Ski Hut are allowable non-conforming commercial enterprises that may continue operation within potential wilderness as authorized by Congress. The Bearpaw Meadow High Sierra Camp would continue to be operated at near its current level of 1,700 use days by a park concessioner.

The Pear Lake Ski Hut would continue to be operated at near its current level of 1,500 use days during the winter months as a ski hut (lodging facility) by a cooperating association under a cooperative agreement.

SUMMARY OF SITE-SPECIFIC ACTIONS

Under alternative 2, management would be modified in specific areas to protect wilderness character. The locations, concerns and issues, and potential management actions that may be necessary to reach or maintain desired conditions are listed in table 23 on the following pages.

Table 23: Area-specific Management Actions under Alternative 2

Location	Issue	Potential Management Actions
Pacific Crest Trail / John Muir Trail	These popular trails receive consistent use throughout the snow free months, with the JMT getting its heaviest use from mid-July into early September. The goal of summiting Mount Whitney is the primary driver with many people hiking the full 212 miles of the JMT (starting in Yosemite National Park), or taking the shorter route over Cottonwood Pass and north on the PCT to the JMT. Indications are that use is increasing on the JMT, decreasing opportunities for solitude.	The NPS would coordinate with Yosemite National Park and the USFS to improve the quota system for the JMT and PCT. Quotas may be reduced at certain trailheads. In specific, popular locations, stock users may be required to camp in designated stock camps. These areas may include Woods Creek Crossing, Rock Creek Crossing, and Big Pete Meadow. If designated as required stock camping site/area, hiker camping would be prohibited. A camping night-limit may be established in the Evolution Valley and/or Evolution Basin areas along the JMT if conditions warrant. A 2-night limit would apply along the JMT from Woods Creek Crossing to Vidette Meadow (at any one location), at Charlotte Lake, and Guitar Lake. There would be a 1-night limit at Rae Lakes (per lake). Selected meadows would be closed to grazing because of sensitive resource conditions and/or to provide opportunities to view ungrazed meadows along the JMT: Bighorn Plateau and Meadow 0.6 mile south of Bighorn Plateau, Darwin Meadow, Grouse Meadow, Guitar Lake Meadow, Guyot Creek Meadow, Lower Crabtree Meadow, Taboose Pass Meadow, and Upper LeConte Canyon.
Lamarck Col/Darwin Canyon	This relatively difficult off-trail route is popular to reach the Sierra Crest and spectacular alpine scenery in a short period of time. Inyo National Forest allows up to 15 people per day up this route from the trailhead, and many other backpackers hike the loop between South Lake and North Lake, entering the parks via Bishop Pass and exiting via Lamarck Col (or vice versa). This level of use is increasing and has the potential to create impacts on solitude and the sensitive alpine environment.	A Class 1 trail would be established to manage impacts from foot traffic in this area (stock would continue to be prohibited). A maximum hiker party size of eight people for day and overnight users would be adopted for the entire area (this includes the Class 1 trail area). Destination quotas may be applied for this area.
Bishop Pass into Dusy Basin	Bishop Pass is a popular access route into the high Sierra, and to a scenic alpine basin. Inyo National Forest allows up to 36 people per day up this trail from the trailhead, with up to 15 additional people affiliated with commercial service providers. Potential exists for more than 100 people at a time camping in the basin during high season. High visitor use reduces opportunities for solitude and camping proliferation of campsites may be impacting the sensitive alpine environment.	The NPS would work with Inyo National Forest to manage the quota from the east side over Bishop Pass. Pack-out waste kits would be recommended in this area. A maximum off-trail party size of eight would be adopted for this area. Designated sites or designated camp areas may be established in Dusy Basin. A 2-night limit would apply in Dusy Basin (basin-wide). Stock would be allowed for day-use/pass through travel only (no grazing or camping with stock).

Table 23: Area-specific Management Actions under Alternative 2 (continued)

Location	Issue	Potential Management Actions
Rae Lakes Loop	The Rae Lakes Loop is one of the most popular loop hikes in Kings Canyon National Park. It is accessed from two west-side trailheads, Paradise Valley and Bubbs Creek – each with a quota of 25 people per day. The quotas fill regularly on weekends and in late August. This 42-mile loop (of which the east leg is also the PCT/JMT) is also accessed by Kearsarge Pass to the east (from Inyo National Forest with a trailhead quota of 60 people and up to an additional 15 people with commercial service providers). Potential exists for more than 200 people to be camping in a 12-mile long stretch from Woods Creek Crossing to Lower Vidette Meadow (the east leg of loop). High visitor use reduces opportunities for solitude and leads to camping impacts along this loop trail.	Trailhead quotas may be reduced. Additional destination quotas may be added for select locations along the Rae Lakes Loop. The NPS would work with Inyo National Forest to manage the quota from the east side over Kearsarge Pass. Existing designated campsites at Lower Paradise Valley would be retained. Additional designated campsites or camp areas may be established at Middle and Upper Rae Lakes, and Woods Creek Crossing. A 2-night limit would continue to be applied at Charlotte Lake, Paradise Valley (valley wide), and along the JMT from Woods Creek Crossing to Vidette Meadow (at any one location). A 1-night limit would continue to be applied at Rae Lakes (per lake). The Rae Lakes Basin would be open to stock for travel only (no camping or grazing). Sixty Lake Basin would be open to stock travel to a point approximately 1.8 miles from the JMT. Stock parties in Sixty Lake Basin would be limited to a combined party size (stock and people) of 8.
Mount Whitney Management Area	Mount Whitney is the highest point in the lower 49 states. There is trail access all the way to the summit. In addition to those hiking to it from the west via the PCT and JMT (see above) and the HST (see below), there is also access from the east side regulated by Inyo National Forest. Inyo National Forest allows up to 100 day-hikers and 60 overnight campers to leave from the Whitney Portal Trailhead to attempt the 11 miles and 5,900' elevation gain to reach the summit. In addition, 10 private individuals and 8 people supported by commercial service providers are allowed up the North Fork Lone Pine Creek per day (this leads to the summit of Mount Whitney via the technical Mountaineers' Route). It is not uncommon for there to be 50 to 75 people on the summit at any one time in early-to-late afternoon and to encounter well more than 100 people on the trail while headed up or down the mountain in a day. Inyo National Forest fills its quota capacities from Whitney Portal 95% of the time during the early June to mid-October period. Inyo National Forest also has an exit quota on the Trail Crest / Whitney Portal Trail that allows only 25 people, in addition to those coming up the trail, to exit at Whitney Portal. This has the effect of distributing use to points west of Mount Whitney in Sequoia National Park. Opportunities for solitude and campsite conditions are being impacted in the Mount Whitney area.	The NPS would work with the USFS (Inyo National Forest) to assess and potentially reduce both day-use and overnight trailhead and exit quotas for Mount Whitney and to more effectively coordinate the quota system. Destination quotas may be implemented at Guitar Lake. Pack-out waste kits may be required in the Mount Whitney area to minimize the need for privies and/or restrooms. A maximum off-trail party size of eight would be adopted for this area. Designated sites or designated camp areas may be established at Guitar Lake. A 2-night limit would be applied at Crabtree (area-wide) and at Guitar Lake. The portion of the JMT from the Crabtree Ranger Station to the base of Mount Whitney switchbacks would be open to overnight use by walking parties with burros or llamas, or day-use only for parties with horses or mules. No stock use would be allowed above the base of the switchbacks. Lower Crabtree Meadow and all areas above the Crabtree Ranger station would be closed to grazing. A 10-head limit for administrative and commercial parties would be applied at Upper Crabtree and Sandy Meadows. Lower Whitney Creek (Strawberry) Meadow would be open to grazing by private parties only. The levels of commercial services allowed in the Mount Whitney management area would be reduced.

Table 23: Area-specific Management Actions under Alternative 2 (continued)

Location	Issue	Potential Management Actions
High Sierra Trail	This 60-mile west-to-east route is accessed from the Giant Forest of Sequoia National Park and eventually reaches the summit of Mount Whitney. Its daily quota of 30 fills regularly and is supplemented by others leaving to do a very similar route from nearby Wolverton (over Panther Gap). It is one of the primary "feeders" of the Mount Whitney area. Opportunities for solitude and campsite conditions on this trail are being impacted by high levels of visitor use.	Trailhead quotas from Crescent Meadow and Wolverton (Alta) as they relate to Mount Whitney access may be reduced. Pack-out waste kits may be required at certain areas. The existing designated camp area at Bearpaw Meadow would be retained. A 1-night camp limit would apply at Hamilton Lake. Selected meadows would be closed to grazing because of sensitive resource conditions and/or to provide opportunities to view ungrazed meadows along the HST: Chagoopa Plateau #3 Meadow, Guitar Lake Meadow, Kern Hot Spring Meadow, and Lower Crabtree Meadow.
Lakes Trail (from Wolverton) Emerald and Pear lakes	The Lakes Trail provides a relatively easy access to the subalpine Emerald and Pear lakes, and to the Tablelands. Current limits allow 25 people per night per lake basin to ensure some level of solitude in these areas. This area also has a large number of day-hikers accessing the Watchtower (rock cliff formation), and Heather Lake, as well as Emerald and Pear lakes. There are also significant day-hikers heading out the same trailhead and then branching off onto the Alta Peak Trail.	Existing destination quotas and designated campsites would be retained. In the future, if conditions warrant, day-use quotas could be implemented to ensure an acceptable level of solitude. The existing privies would be evaluated and those beyond reasonable repair or in unsuitable locations would be removed. The existing restrooms may be removed in the future if maintenance and repairs are not cost effective. Pack-out waste kits would be tested and may be required in the future. A lower day-use party size may be implemented. A 3-night stay limit would apply (combined stay limit at both lakes). The Watchtower Trail would be closed to stock travel.
Mineral King Area	This area has multiple trailheads for day-hiking and to reach overnight destinations. The most used trails are Sawtooth/Monarch (Trailhead quota of 20), Franklin Lakes/Pass (Trailhead quota of 30), and Eagle Lake (Trailhead quota of 25), with quotas filling occasionally. Most "first" camps are 3 to 5 miles in and are very popular to camp at and to hike to as a day-hike opportunity. Encounters on close-in trails such as Sawtooth, Franklin and Eagle Lake, will exceed 100/day on an occasional basis during the summer. Opportunities for solitude on these trails can be limited during summer weekends.	Trailhead quotas may be reduced on the highest use trails. In the future, if conditions warrant, day-use quotas may be implemented. Existing privies would be evaluated and those beyond reasonable repair would be removed. Pack-out waste kit requirements would be considered for implementation in areas where other methods are infeasible. A lower day-use party size may be implemented for this area. The first allowable camps on the Sawtooth/Monarch Trail would be located at Lower Monarch Lake (4.2 miles) and Crystal Lake (4.9 miles). Stock access and grazing would be restricted on some of the highest use trails. The Monarch Lake Trail would be closed to stock travel. The White Chief, Eagle, and Mosquito Lakes Trails would be open to camping by walking parties with burros or llamas, or travel only for parties with horses or mules. Areas open to stock use in the Mineral King basin would be closed to grazing.

Table 23: Area-specific Management Actions under Alternative 2 (continued)

Location	Issue	Potential Management Actions
Mount Langley/ Rock Creek Area	Use of this area is increasing due to hikers seeking a 14,000-foot peak who could not get permits for Mount Whitney. Much of the pressure, and notable resultant impacts, on Mount Langley is from wilderness campers who day-hike to its summit from the John Muir and Golden Trout wildernesses of Inyo National Forest (out of Cottonwood Lakes Basin). Inyo National Forest has trailhead quotas of 60 for the Cottonwood Lakes Trail, with an additional 15 people allowed with commercial service providers (John Muir Wilderness and New Army Pass), and 40 total for the Cottonwood Pass Trail (Golden Trout Wilderness). The Mount Langley area is being impacted from social trailing and opportunities for solitude in this area are decreasing.	The NPS would work with Inyo National Forest to manage the quota from USFS access points. Trailhead quotas may be reduced for trailheads providing access to this area. A destination quota may be added for Mount Langley. To address the social trailing and resulting resource damage, Class 1 trails would be constructed to the summit of Mount Langley from Army Pass, and from Soldier Lakes to the Mount Langley Trail. Informal trails would be rehabilitated. A two-night stay limit would be applied at Upper and Lower Soldier lakes (combined). A maximum party size of eight would be adopted for this area (this also applies to the Class 1 trail area – for day and overnight use). Grazing at Lower Soldier Lake would be limited to private parties only.

The Sierra Nevada – John Muir called it the "range of light"

On the following pages, figure 12 depicts the wilderness trail system for alternative 2, figure 13 depicts campfire restrictions for alternative 2, and figures 14a and 14b depict stock access and grazing restrictions for alternative 2.

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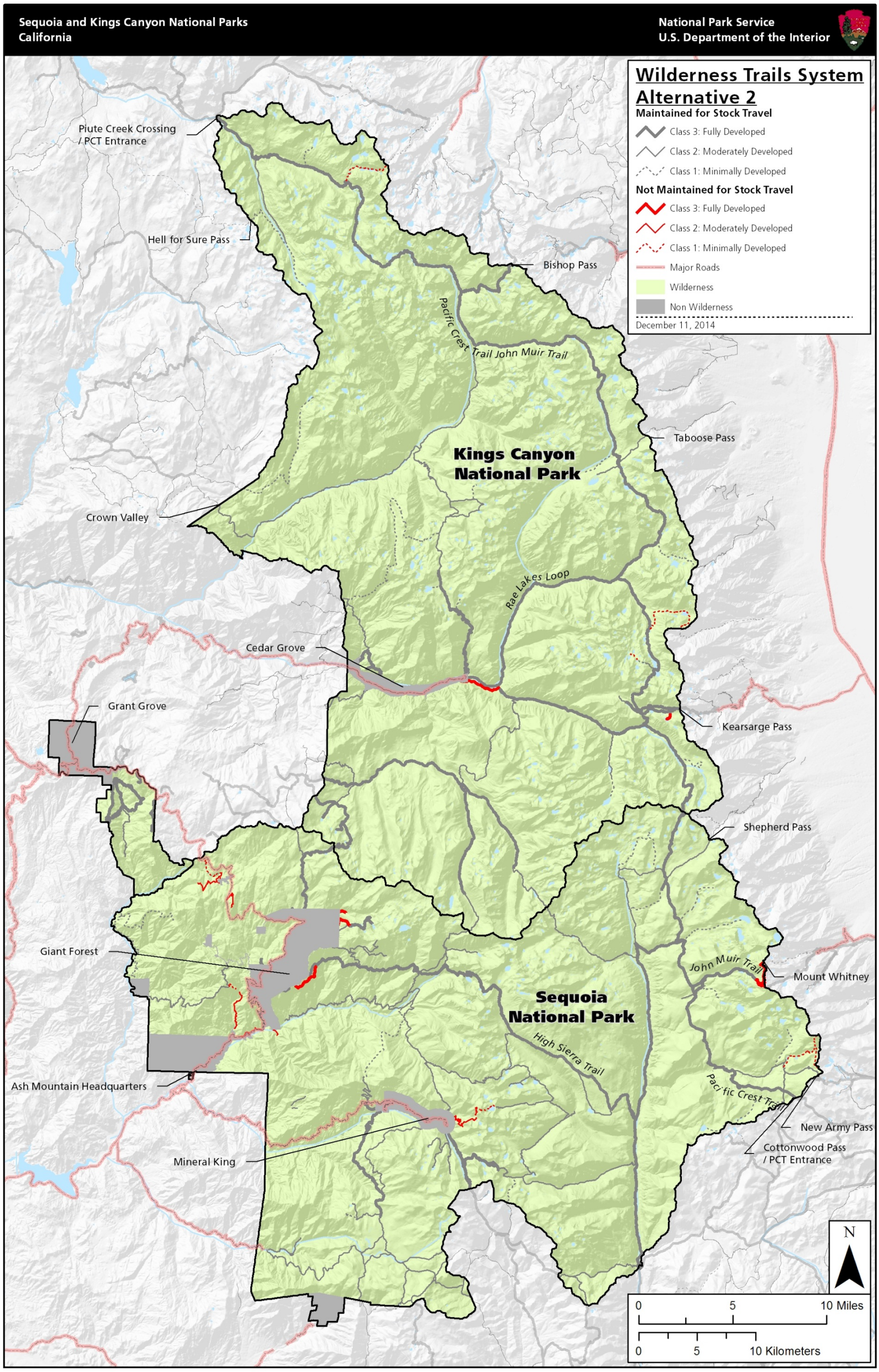

Figure 12: Wilderness Trails System – Alternative 2 (NPS Preferred Alternative)

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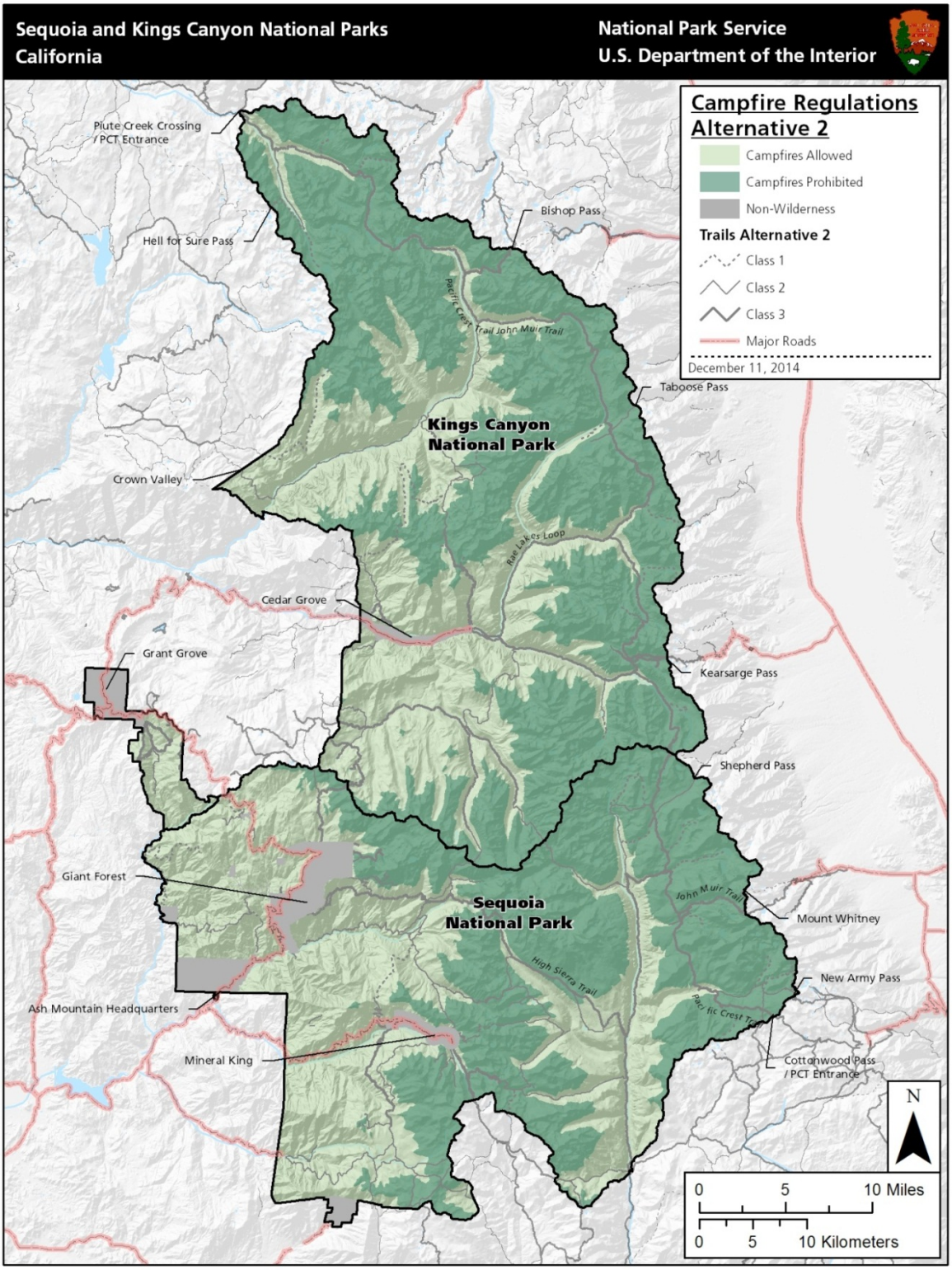
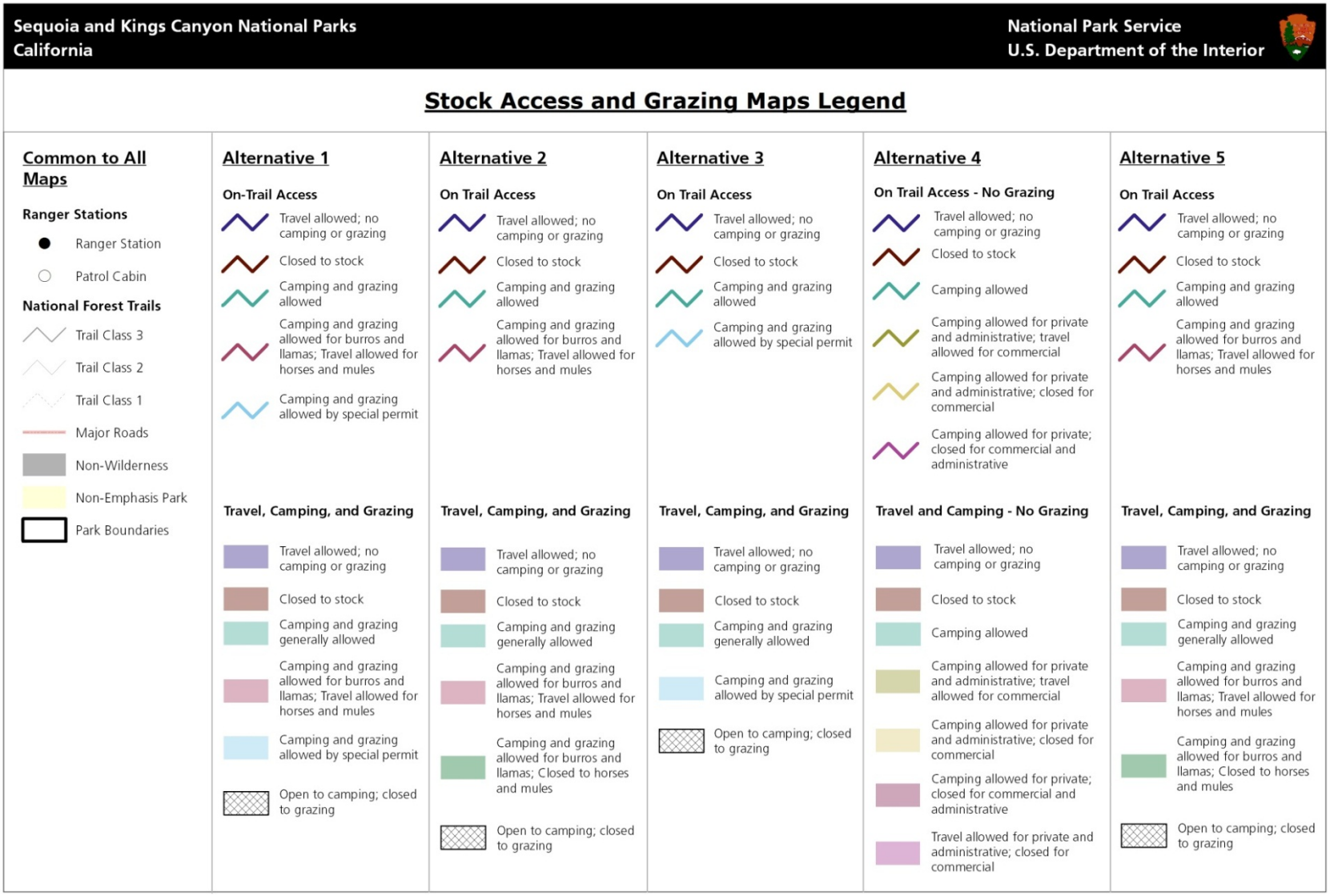


Figure 13: Campfire Regulations – Alternative 2 (NPS Preferred Alternative)

No campfires above 10,000 feet in Kings Canyon National Park and Kern River drainage; no fires above 9,000 feet in Kaweah and Tule river drainages.
(see figure 23, page 297, for drainages)



Legend to Accompany Figure 14a: Stock Access and Grazing – Alternative 2 (NPS Preferred Alternative), Kings Canyon National Park

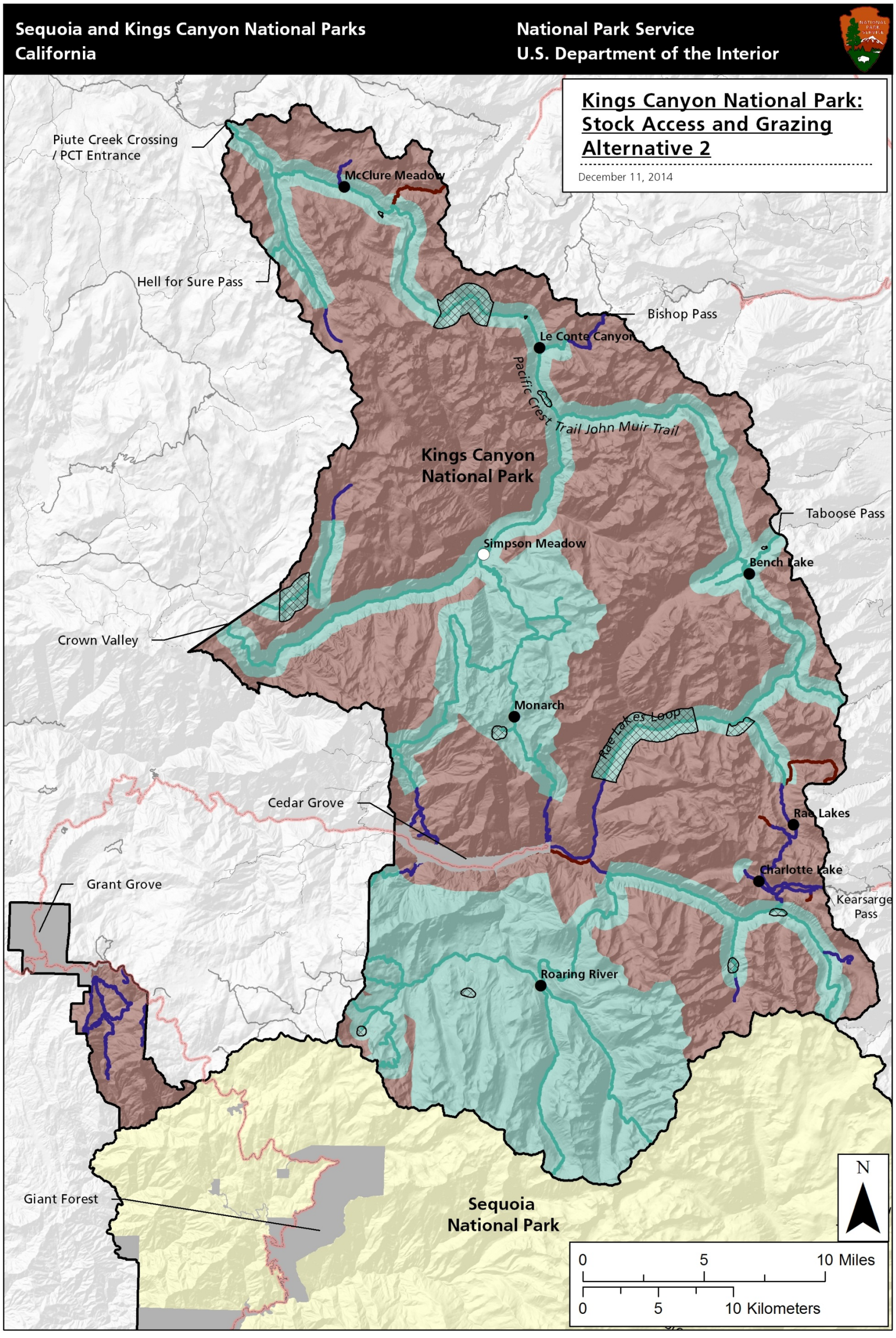


Figure 14a: Stock Access and Grazing – Alternative 2 (NPS Preferred Alternative), Kings Canyon National Park

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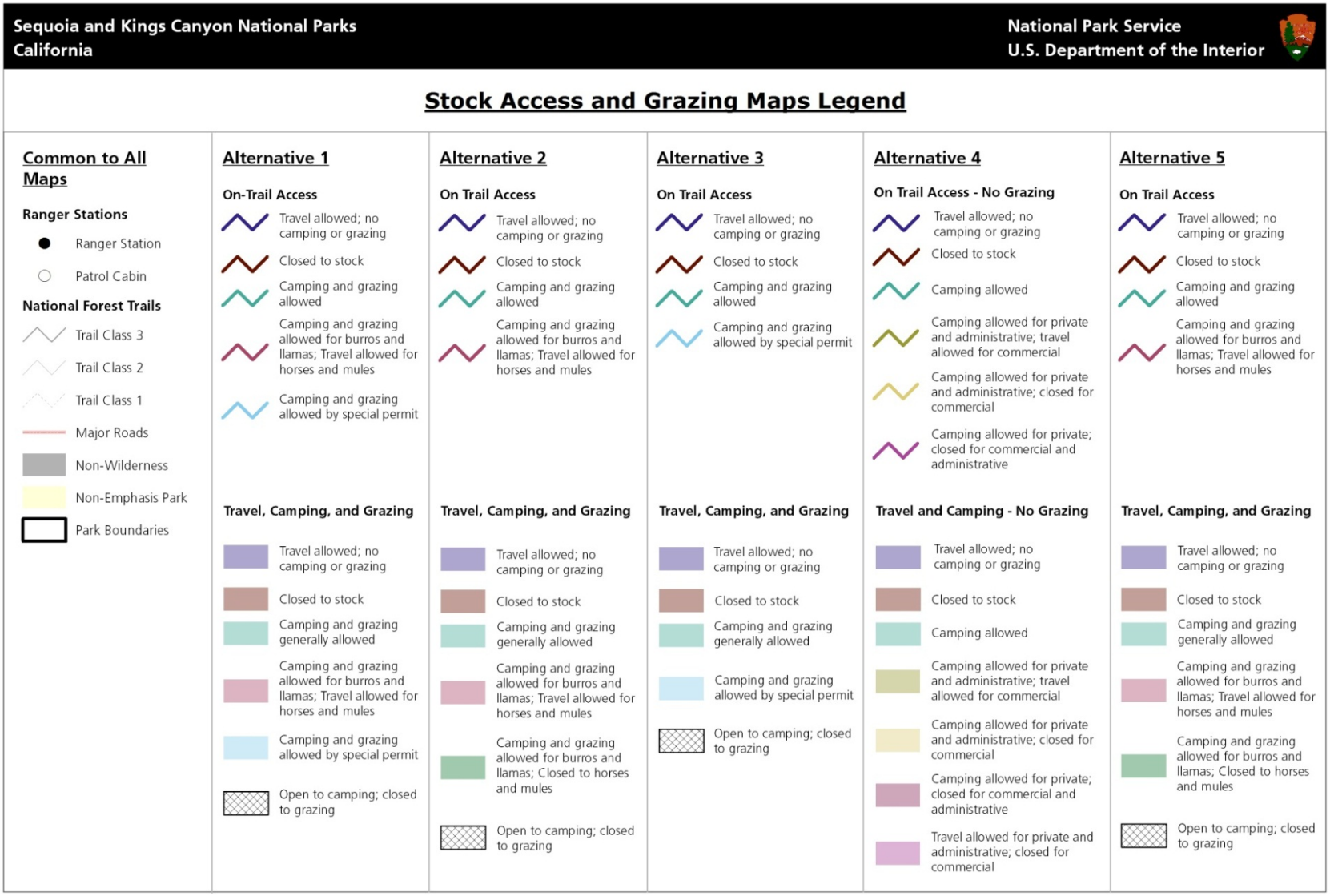

Legend to Accompany Figure 14b: Stock Access and Grazing – Alternative 2 (NPS Preferred Alternative), Sequoia National Park

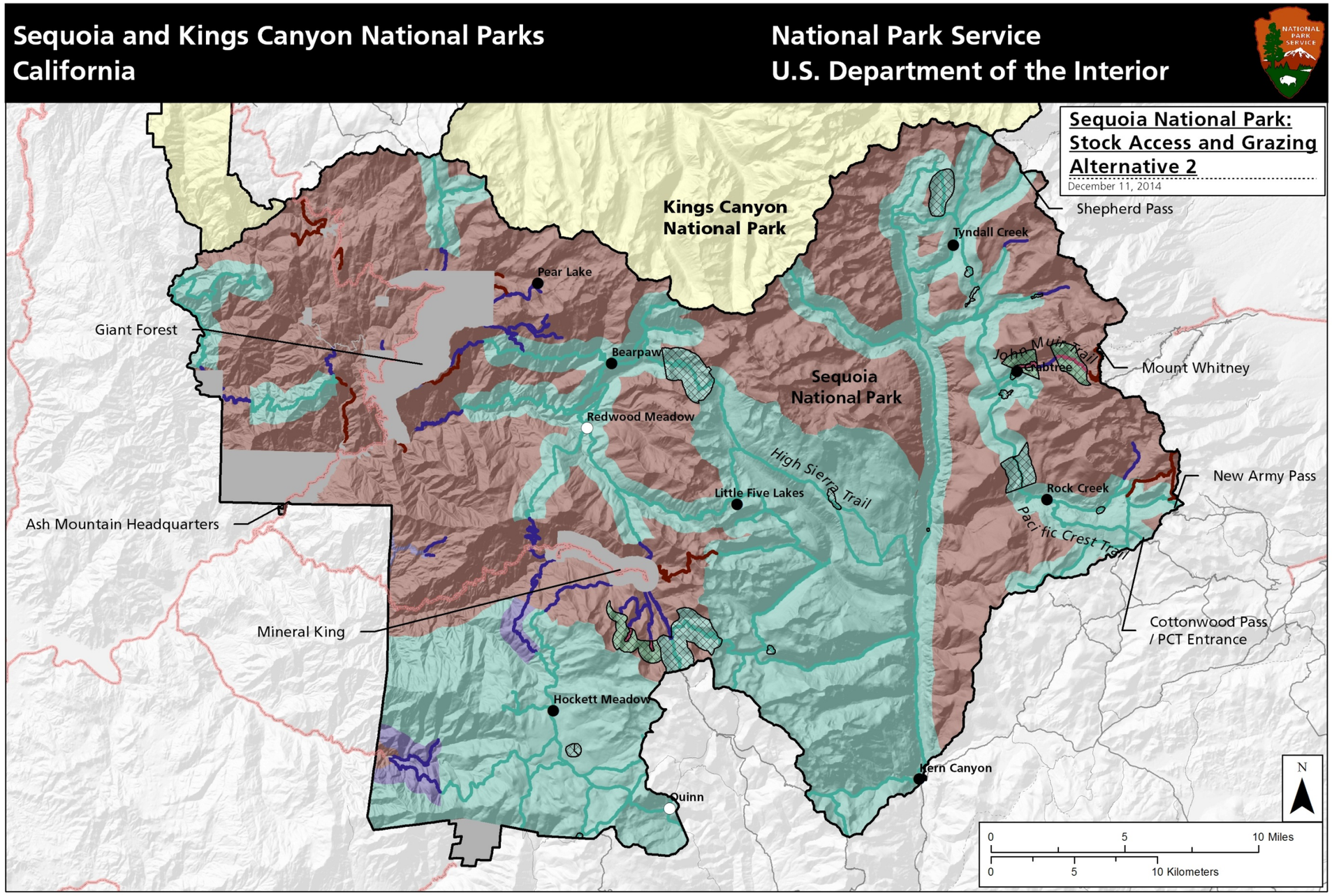

Figure 14b: Stock Access and Grazing – Alternative 2 (NPS Preferred Alternative), Sequoia National Park

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ALTERNATIVE 3: PROVIDE MORE OPPORTUNITIES FOR PRIMITIVE RECREATION

OVERVIEW

The overarching idea behind alternative 3 is that the WSP would focus on increasing opportunities for primitive recreation by allowing additional use, which would be expected to occur mostly in popular areas.

Alternative 3 General Concept: Increased opportunities for primitive recreation through increased use.

Allowing use to increase under this alternative would result in more visitors in the parks' wilderness. This would result in decreased opportunities for solitude and more visitors could have an increased impact on the resources. Therefore, to preserve the natural quality of wilderness, the popular use areas in wilderness would require additional development and restrictions on visitor behavior.

Quotas would generally remain at current levels in low-use areas, as there is no demand above current levels, but quotas would be increased for some of the most popular areas.

Most wilderness trails in the parks would remain open to stock under this alternative. Stock would continue to be allowed to travel up to 0.5 mile off maintained trails to reach campsites. Off-trail stock travel would continue to be allowed in four areas of the parks: on the Monarch Divide, in the Roaring River area, on the Hockett Plateau, and along the western side of the Kern River watershed south from the Chagoopa Plateau.

To increase access for visitors traveling with stock along the most popular trail corridors (JMT, PCT, and HST), additional controls would be placed on grazing, night limits, and party-size limits. In areas subject to high visitation or vulnerable to resource impacts, designated camping areas may be established.

There would be increased opportunities for commercial services commensurate with increased use (types of services and amount of use). Increased commercial services would be necessary to support a wider range of visitor skill levels and recreational opportunities.

KEY ELEMENTS OF ALTERNATIVE 3

This alternative addresses the key elements as described below.

Element 1: Visitor-use Levels

Planning Objective: Visitor use and enjoyment of wilderness would be promoted while ensuring the preservation of wilderness character. In this alternative, opportunities for visitor use and enjoyment of wilderness would be increased by permitting more visitor use.

Permits and Quotas — Daily trailhead quotas would be increased for some trailheads by up to 10%, including those that have the highest use. At trailheads where quotas do not currently fill, the quotas would remain the same, effectively allowing for increased use in those areas. Existing destination quotas

would continue to be applied. No additional destination quotas would be added and no day-use permits/quotas would be implemented.

The NPS would continue to work with the USFS to manage and improve the quota and permitting systems, to add trailheads currently missing from the quota system (e.g., Tehipite Valley and Kern River), and on other relevant cooperative cross-boundary wilderness-management issues.

Visitor Capacities and Encounter Standards — Alternative 3 presents the highest use levels that would be accommodated across the range of action alternatives. Use levels would be allowed to increase by increasing the numbers of permits issued in some areas (through increased trailhead quotas). The various types of use proposed under alternative 3 would remain the same as in alternative 2. To meet the planning objectives for this alternative, the overnight estimated visitor capacity wilderness-wide for these parks would be 175,000 VUDs per year. Ten-year average overnight use would be limited to 141,000–147,000 VUDs/year. This increased amount is more than 50% below peak historic use levels. While use levels would be allowed to reach the established capacities under this alternative, there are social, economic, and other factors that may lead to actual use being below capacity. Each year, total annual VUDs would be discussed and analyzed by an interdisciplinary group at an annual meeting on wilderness management. If determined to be out of standard, management actions to bring the measure back into standard would be adopted. Appendix A contains a detailed description of the methods used to develop the visitor capacity framework for this WSP.

As explained in alternative 2 and appendix A, the parks would adopt a measure of the number of people encountered per hour (EPH) on trails and would take action based on established standards. For this measure, each trail would be assigned to one of four encounter-rate standards: very high use (primarily Mount Whitney and day-use areas); high use (generally Class 3 trails, with some exceptions); moderate use (generally Class 2 trails, with some exceptions); and low use (generally Class 1 trails with some exceptions). Each has a specified EPH that serves as a standard. The standards for alternative 3 are shown in table 24.

Table 24: Encounters per Hour Standards for Alternative 3

Measure	Standard[1]			
	Very High	High	Moderate	Low
Trail Encounters – People Encountered Per Hour – by area	59	33	20	8

[1]Interpreted as the maximum number of people encountered per hour on 90% of days within the quota season (generally from the Friday before Memorial Day through the last Saturday in September) for selected monitored trail segments.

Currently, visitors may experience encounter rates higher than the proposed standard in the areas detailed below. The actions described under this alternative, along with the management actions described in the "Mitigation Common to All Alternatives" section in this chapter and in appendix A, would be taken to return the areas to within standards (table 25 on pages 147-148). [Note: Trail encounter data from 2012 to 2014 was collected opportunistically by park staff and volunteers. As a result, a larger proportion of samples occurred on weekend days and mid-day times than would be expected from a random or structured sample. A standardized sampling protocol will be developed upon completion of the WSP, and areas that are shown as out-of-standard and near standard in table 25 would be prioritized for re-sampling.]

Table 25: Trail Encounter Categories, Standards, and Proposed Management Actions for Alternative 3

Encounter Category	Encounter Standard[1]	Analysis Area	Status	Proposed Management Action
Very High	59	Mount Whitney	In standard	
		Road's End	Near standard	Obtain better data to confirm observations; adjust overnight stay limit; implement area specific restrictions.
		High Sierra Trail (Crescent Meadow to Wolverton Cutoff Junction)	In standard	
High	33	Lakes Trail	In standard	
		Mineral King Valley	In standard	
		Little Baldy Trail	In standard	
		Paradise Creek Trail	In standard	
		Redwood Canyon	In standard	
Moderate	20	Evolution Basin & Valley (JMT/PCT)	Near standard	Obtain better data to confirm observations; adjust overnight stay limit; implement area specific restrictions.
		Rae Lakes/JMT	Near standard	Obtain better data to confirm observations; adjust overnight stay limit; implement area specific restrictions.
		Mount Langley approach	Near standard	Obtain better data to confirm observations; adjust overnight stay limit; implement area specific restrictions; consult with USFS regarding area use levels.
		Crabtree Ranger Station to Trail Crest	Near standard	Obtain better data to confirm observations; adjust overnight stay limit; implement area specific restrictions.
		Rae Lakes Loop — Lower Portion	In standard	
		West side of Kearsarge Pass	Near standard	Obtain better data to confirm observations; adjust overnight stay limit; implement area specific restrictions.
		Dusy Basin	In standard	
		Twin Lakes Trailhead to Silliman Creek	In standard	
		High Sierra Trail (Wolverton Cutoff Junction to JMT Junction)	In standard	
		Rock Creek	In standard	
		Little Five	In standard	

Table 25: Trail Encounter Categories, Standards, and Proposed Management Actions for Alternative 3 (continued)

Encounter Category	Encounter Standard[1]	Analysis Area	Status	Proposed Management Action
Low	8	Sixty Lake Basin Trail (Rae Lakes 3)	Near standard	Obtain better data to confirm observations; lower limits on commercial use; reduction in area camping overnight limits; implement area specific restrictions.
		Crabtree Lakes (Crabtree 1)	Near standard	Obtain better data to confirm observations; lower limits on commercial use; reduction in area camping overnight limits; implement area specific restrictions.
		All other trails not identified above	In standard[2]	

[1] Interpreted as the maximum number of people encountered per hour on 90% of days within the quota season (generally from the Friday before Memorial Day through the last Saturday in September).
[2] Inferred from a small number of samples.

Element 2: Trails

Planning Objective: The trail system would facilitate access for visitor use and enjoyment of the wilderness. Trails would be well suited to the types and levels of visitor use (levels of visitor use would be increased over current levels under this alternative).

Most park trails are already designed and constructed to provide for appropriate access while preserving wilderness character. Many existing trail segments are inadequately constructed to support the projected use patterns of this alternative, and would be targeted for further development. A few trails would be designated hiking-only trails where there are known threats to sensitive resources, unacceptable visitor safety issues, or existing user conflicts between stock and hiker/backpacker parties. Where the designated unmaintained routes listed in the 1986 SUMMP are still passable to stock, and where stock travel does not pose undue threats to resources, they would be designated Class 1 or Class 2 trails and targeted for appropriate construction and maintenance. Other designated unmaintained routes would be abandoned and landscape restoration considered. Summary tables at the end of this chapter give a comparison of trail classes by mileage and use under each alternative. Figure 15 depicts the wilderness trail system for alternative 3 and can be found on page 163. More details on the trail management and classification system can be found in appendix K.

With additional site-specific planning and compliance, new Class 1 trails could be established to protect resources when visitor use may cause undue impacts. For example, establishing Class 1 trails on Lamarck Col and Mount Langley would provide resource protection in areas with increasing visitation.

Element 3: Campfires

Planning Objective: Visitors would have the opportunity to enjoy campfires where campfires are compatible with the protection of vegetation and downed wood resources. In this alternative, increased visitor use would be accommodated by limiting campfire use to areas with higher wood productivity.

Recreational campfires would be allowed in the foothill and montane forests and up to 9,000 feet wilderness-wide. With increased use expected wilderness-wide at high elevations, a parkwide fire restriction of 9,000 feet would be implemented to protect the ecologically and scientifically important wood resources.

In addition, site-specific restrictions would be implemented in the most popular areas, including:

- PCT/JMT
- Rae Lakes Loop
- HST
- Mineral King Valley (East Fork Kaweah River drainage)
- Rock Creek drainage
- Redwood Canyon area

This alternative allows recreational campfires in 293,840 acres of 837,806 acres of wilderness (35%). Figure 16 depicts campfire restrictions for alternative 3 and can be found on page 165.

Element 4: Food Storage

Planning Objective: Native wildlife would subsist only on naturally obtained food, uninfluenced by the presence of human food. In this alternative, increased visitor use in areas of known human/bear activity would drive the need for additional food-storage boxes.

All existing 86 food-storage boxes would be retained. To address higher levels of use, there would be up to 35 additional food-storage boxes added at key locations along the JMT and near highest-use camp areas. The locations of some existing food-storage boxes may shift to more appropriate, less sensitive locations to protect resources (e.g., moved away from streams and lakeshores).

Existing food-storage requirements would be modified based on the locations of additional food-storage boxes. A food-storage box at North Dome would be added (this location is outside of wilderness but serves wilderness visitors).

Additional portable container requirements may be implemented in specific areas if the need arises.

Locations for additional food-storage boxes under alternative 3 (all locations are in Kings Canyon National Park; locations could have more than one food-storage box added):

- Bench Lake junction
- Big Pete Meadow
- Cement Table Meadow
- Deer Meadow
- Dusy Basin
- Dusy Bench
- Evolution Lake
- Evolution Meadow
- Golden Staircase (base)
- Grand Palace Hotel Meadow
- Grave Meadow

- Grouse Meadow
- JMT/Bishop Pass trail junction
- Little Pete Meadow
- Lower Ranger Meadow
- Marjorie Lake
- McClure Meadow
- Palisade Lakes outlet
- JMT/Middle Fork Kings trail junction
- Redwood Canyon
- Sapphire Lake
- Shorty's Meadow outlet
- Simpson Meadow
- South Fork crossing
- State Lakes outlet
- Twin Lakes (Woods Creek)

The restroom near Emerald Lake

Element 5: Human-waste Management

Planning Objective: Human waste would not contaminate water or create unsanitary or unsightly conditions. Reflecting increased visitor use under this alternative, additional privies would be provided in targeted areas where the risk of contamination is high.

Cat-holes would continue to be required in areas with no privies/toilets. Pack-out waste kits would be required in the Mount Whitney area.

At highest use areas where soil development is inadequate for cat-holes, privies, and restrooms would be retained. New privies would be considered for highest use areas (e.g., Heather Lake) and in locations where designated campsites are established.

The NPS would consider implementation of new technologies for human-waste management as they are developed in the future. The use of new technologies may require on-site planning and compliance. Some technologies may require visitors to be more self-sufficient. Table 26 provides a list of public privies and restrooms and the justification for retaining or removing them under alternative 3.

Table 26: Public-use Privies and Restrooms Retained, Removed, or Added under Alternative 3

[Note: Number of privies/restroom is indicated in parentheses when more than one privy/restroom exists.]

Privy/Restroom Name/Location Listed North to South	Alternative 3 Actions	Discussion and Justification
Woods Creek Crossing	Retain	Popular and concentrated use and primary stopping point for multiple trip itineraries. A privy is necessary to protect the natural quality of wilderness and protect solitude (from litter associated with human waste).
Paradise Valley (3 – 1 each in Upper, Middle, and Lower)	Retain two privies (Upper and Lower) and remove privy at Middle Paradise	Less use in Middle Paradise Valley than Upper and Lower Paradise Valley. Removal of designated campsites in Middle Paradise under this alternative makes it more appropriate to disperse use by not having a privy available. Soils are suitable for cat-holes.
Sphinx	Retain	Use may increase under this alternative.
Roaring River area (3)	Remove privy at Sliding Box Camp; retain privy at Stewart E. White Camp (near RS). Remove privy at Knoll camp.	Less use at Sliding Box Camp and it is a large area with suitable soils for cat-holes. Stewart E. White Camp location has long-established and concentrated use. A privy is necessary to protect the natural quality of wilderness and protect solitude (from litter associated with human waste). Very low use at Knoll camp.
Twin Lakes (Clover Creek)	Retain	Popular area close to busy trailhead. Taking out the privy without a waste management alternative would result in impacts because of concentrated use. Use may increase under this alternative.
Heather Lake	Add one privy	Sensitive area with concentrated day-use (no overnight use at Heather Lake). Use may increase under this alternative.
Pear Lake (1 restroom)	Retain	Existing restrooms are a large development in wilderness, require high levels of maintenance, and are not functioning properly. Popular area where rocky shallow soils do not support use of cat-holes.
Emerald Lake (1 restroom)	Retain	Existing restrooms are a large development in wilderness, require high levels of maintenance, and are not functioning properly. This is a popular area where rocky shallow soils do not support use of cat-holes.
Bearpaw Area (3)	Retain all privies	Popular area and a well-established designated camp area. A privy is necessary near the designated backpacker camp to protect natural quality of wilderness and protect solitude (from litter associated with human waste). A privy is necessary near the Bearpaw Meadow High Sierra Camp to protect natural quality of wilderness and protect solitude (from litter associated with human waste). Use may increase under this alternative.
Hamilton Lakes	Retain	Popular area with rocky shallow soils not suitable for digging cat-holes.
Crabtree Area	Retain	Popular area where privy is necessary to protect the natural quality of wilderness and protect solitude (from litter associated with human waste).

Table 26: Public-use Privies and Restrooms Retained, Removed, or Added under Alternative 3 (continued)

[Note: Number of privies/restroom is indicated in parentheses when more than one privy/restroom exists.]

Privy/Restroom Name/Location Listed North to South	Alternative 3 Actions	Discussion and Justification
Rock Creek Area	Add one privy at Rock Creek crossing area	Popular and concentrated use. A privy is necessary to protect the natural quality of wilderness and protect solitude (from litter associated with human waste).
Kern Hot Spring	Retain	Popular and concentrated use. A privy is necessary to protect the natural quality of wilderness and protect solitude (from litter associated with human waste).
Upper Funston	Remove	Low-to-moderate use. Large area with suitable soils for cat-holes.
Monarch Lakes	Retain	Popular and concentrated use in this area. Rocky shallow soils do not support use of cat-holes. This is a launching point for longer trips. A privy is necessary to protect the natural quality of wilderness and protect solitude (from litter associated with human waste).
Eagle Lake and Mosquito Lakes (2 – 1 privy at each location)	Retain	Popular concentrated-use area. Generally visitors are day hikers or stay for one to two nights. Not a launching point for longer trips. Use may increase under this alternative.
Franklin Lakes	Retain	Popular and concentrated use in this area. Rocky shallow soils do not support use of cat-holes. This is a launching point for longer trips. A privy is necessary to protect the natural quality of wilderness and protect solitude (from litter associated with human waste).
Hockett Meadow	Remove	Low use and soil type is appropriate for cat-holes.
Dusy Basin, Evolution Valley, Guitar Lake, Kearsarge Lakes Basin, Mineral King Lake Basins, Middle and Upper Rae lakes, Redwood Canyon, Woods Creek Crossing, and other points along the PCT/JMT	Potential new privies	Affiliated with designated campsites.

Element 6: Party Size

Planning Objective: Party size would be set at levels high enough to allow for a variety of experiences, but low enough to protect wilderness character from impacts associated with large groups. In this alternative, an emphasis on increasing opportunities for primitive recreation would allow for an increase in party size in many areas.

To allow a greater diversity of recreational opportunities in the parks' wilderness, party-size limits would be increased to generally match those of the surrounding USFS wilderness lands. Limits would be lower in some areas. Tables 27 and 28 on the next page present party size limits under alternative 2.

Table 27: Party-size Limits for Hikers and Boaters for Alternative 3

Type of Trip	Maximum Party Size
On-trail (day use)	25
On-trail (overnight use)	15*
Off-trail (day and overnight use)	15*
Area-specific	Existing temporary party-size limits would be removed (party size of 8). A party-size limit of four would be implemented for camping at North Dome. A party-size limit of 10 would be retained for Redwood Canyon.

*Consistent with neighboring USFS areas.

Table 28: Party-size Limits for Stock Parties for Alternative 3

Type of Stock Trip	Maximum Party Size for People and Stock
Day rides (not including spot and dunnage)	People: 25 Stock: 25 Combined: 50
On-trail (including spot and dunnage trips that support overnight use)	People: 15 Stock: 25* Combined: 40
Off-trail (in areas specifically designated for day and overnight stock use)	People: 15 Stock: 25* Combined: 40
Area-specific	8 head stock maximum in Milestone Basin and by special permit only would be retained. Redwood Canyon would have a party-size limit of 10 stock for day-use.

*Consistent with neighboring USFS areas.

Element 7: Camping/Campsites and Night Limits

Planning Objective: Visitors would have the opportunity to choose camping locations, except in areas where camping would result in unacceptable impacts. In this alternative, increased visitor use would require an increase in camping restrictions.

To allow a greater diversity of recreational opportunities where risks of resource impacts are low, some areas close to the frontcountry would be opened to camping (e.g., North Dome). In addition, and with site-specific compliance, one or more universally accessible campsites could be constructed near a trailhead (e.g., near the confluence of Bubbs Creek and the South Fork Kings River).

Existing and additional areas that are appropriate for stock camps would be identified, and the parks would recommend that visitors traveling with stock use those camps. In specific, popular locations, stock users may be required to camp in designated stock camps. If an area is designated as a required stock camping site/area, backpacker camping would be prohibited.

First Allowable Campsite — The first allowable campsites would be the same as described in alternative 2 (see the "First Allowable Campsites" section in alternative 2, table 19 on page 116).

Length of Stay/Night Limits for All Campers (stock-supported and backpackers) — All overnight camping would be limited to seven consecutive nights at a single location, 20 consecutive nights per trip, and 60 nights per year for individual visitors. Table 29 presents additional overnight limits.

Table 29: Site-specific Exceptions to the Night Limits under Alternative 3

Location	Night Limits Exceptions (Consecutive Nights in one Location)
Charlotte Lake, Colony Mill Trail, Crabtree area, Don Cecil Trail, Dusy Basin, Emerald and Pear lakes (combined), Guitar Lake, Hamilton Lake, Kearsarge Basin, Milestone Basin, North Dome, Paradise Valley, Redwood Canyon, and Lower and Upper Soldier lakes (combined)	2-night limit
Current 1-night limit at Rae Lakes (per lake) would continue to apply. There would be a 1-night limit at any one location on the JMT between Woods Creek Crossing and Vidette Meadow.	1-night limit

Designated Campsites — To preserve the unconfined aspect of recreation in the parks' wilderness, most areas would have no restrictions on where overnight visitors can camp, except to follow the Leave No Trace© practices to preserve the natural quality. However, the use of designated campsites/camp areas would be mandatory at Emerald and Pear lakes, Lower Paradise Valley, and Bearpaw Meadow. Additional sites may be designated in areas where factors such as concentrated use and limited suitable campsites create a risk of physical or social campsite impacts. Areas considered for new campsite designation under this alternative include Dusy Basin, Evolution Valley, Guitar Lake, Kearsarge Lakes Basin, Mineral King lake basins, Middle and Upper Rae Lakes, Redwood Canyon, Woods Creek Crossing, and other points along the PCT/JMT. Designation of campsites or areas would require site-specific analysis.

Campsite Condition Standards — As explained in alternative 2, a metric of aggregate campsite impacts (Weighted Value per Campable Mile, WVCM) would be adopted under all alternatives to ensure that the number of campsites and their condition does not exceed standards. The metric of WVCM would be used to measure campsite condition. Under alternative 3, the standard for WVCM would be: 1300 for high use subzones, 650 for moderate use subzones, and 325 for low use subzones. A monitoring plan would be developed to establish protocols and schedule monitoring frequencies to ensure that subzones remain within their applied standard.

Under alternative 3, one subzone (83-1 Guitar Lake) would be considered out of standard in the high use category, and one subzone (80-3 Shepherd Pass Lake) would be considered out of standard in the moderate category. All other subzones would be considered within standard. Management actions to return the subzones to within standards are included in the "Mitigation Common to All Alternatives" section in this chapter, for a map of campsite condition standards see figure 10, page 119; for information on determining campsite condition and standards, see appendix A, page A-15 and A-24.

Element 8: Stock Use

Planning Objective: Visitors would have opportunities to travel with stock, from day rides to multi-day trips, in a manner that ensures the protection of wilderness character. Access and grazing would be managed to protect resources, provide other types of primitive recreation, and reduce conflict of user groups. Under this alternative, increased visitor use would result in a need for more stock structures and closure of selected off-trail grazing areas in order to protect resources.

Figures 17a and 17b depict stock access and grazing restrictions for alternative 3. Figure 17a shows stock access and grazing restrictions in Kings Canyon National Park and can be found on pages 166/167. Figure 17b shows stock access and grazing restrictions in Sequoia National Park and can be found on pages 170/171.

Stock Access and Travel

On-trail — Visitors traveling with stock would be allowed on most maintained trails (671 of 714 miles). Stock parties would be allowed to travel up to 0.5 mile from trails in areas where they are allowed to camp. In areas open to travel only, stock parties would be allowed to travel up to 100 yards from trails.

A horse and mule atop Elizabeth Pass

Approximately 565 miles of maintained trails would be open to camping with stock. Some trails would be open to stock parties for travel only, some would be open to use by special permit, and some would be closed to stock travel entirely for reasons including visitor safety, resource protection, and/or popular day-use by hikers. Trails with restricted stock access under alternative 3 are discussed below.

Trails open for travel only (106 miles; includes mileages to first camps):

- Admiration Point Trail
- Alta Trails
- Big Baldy Trail
- Buena Vista Trail

- Center Basin Trail (to Golden Bear Lake)
- JMT along Timberline Lake
- Kearsarge Lakes Trail
- Lake 11,092 Trail (shown as Lake 11,106 on older maps)
- Lake Reflection above the abandoned Harrison Pass Trail junction
- Lakes Trail (Hump Trail only)
- Little Baldy Trail
- Martha Lake Trail from 1 mile above Hell-for-Sure Junction
- Miter Basin Trail above Penned-up Meadow to a tie-up area at 11,300 feet in elevation below Sky Blue Lake.
- Muir Grove Trail
- Oriole Lake Trail
- Paradise Creek Trail
- Redwood Canyon area trails
- Upper Blue Canyon Trail
- Upper Sixty Lake Basin Trail
- Wallace Lake Trail above 11,200 feet in elevation
- White Chief, Eagle, and Mosquito Lakes trails
- Wright Creek Trail 11,200 feet in elevation

Trails open to camping by special permit (3 miles):

- Milestone Basin Trail

Trails closed to stock travel (43 miles):

- Baxter Pass Trail
- Bullfrog Lake Trail west of Kearsarge Lakes Trail
- Crabtree Lakes Trail (no travel above camp at 11,000 feet in elevation)
- HST from Crescent Meadow to Wolverton Cutoff
- Lamarck Col Trail
- Lower Sixty Lake Basin Trail
- Marble Falls Trail
- Monarch Lake Trail
- Mosquito Lakes Trail – upper lakes
- Mount Langley Trail

- Mount Whitney Trail – base of switchbacks to Trail Crest and summit
- Seville Lake Boy Scout Trail
- South Side Cedar Grove Sandflats Trail from Zumwalt Meadow Bridge to Bubbs Creek
- Sphinx Lakes Trail
- Tokopah Falls Trail
- Upper Soldier Lakes Trail
- Watchtower Trail

Off-trail — Stock parties would continue to be allowed to travel up to 0.5 mile from trails to reach camps. Travel more than 0.5 mile from maintained trails would continue to be allowed in four areas of the parks: on the Hockett Plateau, on the Monarch Divide, in the Roaring River drainage, and along the western side of the Kern River watershed south from the Chagoopa Plateau.

Stock Grazing — Grazing would be managed to maximize protection of resources while allowing visitors traveling with stock continued access to forage. Grazing would generally be allowed within 0.5 mile of maintained trails open to stock camping. Grazing would not be allowed in areas designated as open to stock travel only. Grazing would be generally prohibited in the off-trail travel areas with a few exceptions. Increased controls (such as head limits and night limits) could be implemented to prevent overuse in popular destinations.

Grazing would continue to be managed and informed by the results of the Stock Use and Meadow Monitoring Program, including the continued application of estimated grazing capacities, as described under alternative 2.

Areas closed to grazing would remain open to camping by visitors traveling with stock, but visitors would be required to hold and feed their animals. Administrative grazing would be managed to limit impacts on public grazing (Note: With rare exceptions, visitors are given preference for limited grazing resources).

The use of certified-weed-free forage in frontcountry areas, and of processed pellets, rolled grains, or fermented hay in wilderness, would be required as described under alternative 2.

The monitoring system described under alternative 2 and in appendix D would be employed to track use, document conditions, and provide information for preventing and mitigating impacts.

The meadows closed to grazing for scientific and social value by the SUMMP would remain closed. The meadows closed to grazing due to high visitation and resource concerns by the SUMMP would remain closed.

The following meadows located in cross-country travel areas which are otherwise closed to grazing would be open to grazing: Ansel Lake, Chagoopa Treehouse Meadow, Crytes Lakes, Laurel Creek Basin, Long Meadow (East Fork Ferguson Creek), Sugarloaf Creek Confluence, and West Fork Ferguson Creek (Log Meadows to Sheep Pen Meadows).

The following additional meadows which are otherwise open to camping with stock would be closed to grazing due to high levels of visitation and resource concerns: Crabtree Lakes (closed to stock access and grazing above the existing camp west of the lowest lake), Darwin Meadow proper, Forester Lake Meadow, Guyot Creek Meadows (expanding the existing closure to the meadows east of trail), Guitar

Lake, Kern Hot Spring Meadow, Kettle Dome (Randle Corral) Meadows, Milestone Basin, Mineral King basin, Summit Lake Meadow, and Upper LeConte Canyon above 10,000 feet in elevation.

Meadows associated with areas or trails closed to stock under this alternative would also be closed to grazing.

Recognizing that the opportunity to observe and experience ungrazed meadows is of value to many park visitors, the following meadows along popular travel routes which are otherwise open to camping with stock would be closed to grazing: Bighorn Plateau and the meadow 0.6 mi south of Bighorn Plateau; Chagoopa Plateau #3 Meadow; Darwin Meadow; Grouse Meadow; Lower Crabtree Meadow; and Taboose Pass Meadow. These closures would make it possible for visitors traveling along the JMT and HST to experience at least one ungrazed meadow in each drainage through which the trails pass.

The following restrictions in areas otherwise open to grazing would be adopted:

- Open to grazing by walking parties with burros or llamas, closed to grazing by parties with horses or mules: Bubbs Creek below Junction Meadow, and Evolution Lake to Muir Pass
- Open to administrative use and grazing only: Hockett Pasture, JR Pasture, Kern Ranger Station Pastures, Lackey Pasture, and Upper Redwood Meadow

Table 30 presents the site-specific night and/or head grazing limits on meadows in the parks under alternative 3.

Table 30: Site-specific Night and/or Head Limits on Grazing under Alterantive 3

Location	Stock Head Limit	Night Limit
Bubbs Creek (below Junction Meadow)	25	1
Castle Domes Meadow	15	1
Cement Table Meadow	15	3
Charlotte Creek (below drift fence)	25	2
Upper Crabtree Meadow	15	7
East Lake and Ouzel Meadows	12	2
Grave Meadow	15	3
Junction Meadow (Bubbs)	15	1
Junction Meadow (Kern)	15	1
Lower Funston Meadow	25	2
Redwood Meadow	15	2
Scaffold Meadow	15	2
Shorty's Meadow	25	2
Upper Crabtree and Sandy Meadows	10	7
Upper Evolution Valley (above Evolution Meadow)	25	1
Upper Funston Meadow	25	2
Upper Rock Creek (Nathan's Meadow and above)	25	2
Wallace Creek Waterfall Meadow	6	1

Stock Use Structures — Under this alternative, 14 hitch rails would be removed and 38 hitch rails would be retained. Five fences/gates would be removed, 49 would be retained, and one new fence with a gate would be constructed gates (see tables 51a and 51b starting on page 272 at the end of this chapter).

Element 9: Administrative Structures

Planning Objective: Administrative structures and developments would be the minimum necessary for the administration of wilderness, similar to current conditions.

Ranger Stations — Ranger stations that would be retained in their current locations:

- Crabtree
- Hockett Meadow
- LeConte Canyon
- Kern Canyon
- McClure Meadow
- Pear Lake
- Rae Lakes
- Rock Creek
- Tyndall Creek

The following ranger stations could be relocated or modified:

- Bearpaw Meadow Ranger Station would be removed and a new station could be constructed outside the historic district.
- Bench Lake tent platform would be relocated to a more suitable location for patrol functions and/or converted to a hard-sided station.
- Charlotte Lake Ranger Station would be relocated to a more suitable location for patrol functions and/or a new station would be constructed.
- Little Five Lakes tent platform would be relocated to a more suitable location for patrol functions and/or converted to a hard-sided station.
- Monarch tent platform would be relocated to a more suitable location for patrol functions and/or converted to a hard-sided station.
- Roaring River Ranger Station would remain in its current location but would be rehabilitated or reconstructed.

Each of the above actions would be subject to separate site-specific planning, design and compliance. The patrol cabins at Quinn, Redwood Meadow, and Simpson Meadow would be retained.

Other Administrative Structures — The Redwood Canyon Cabin would be retained as research support with reduced affiliated infrastructure. Use would include park staff, cooperators, research organizations, and universities (non-NPS staff would be required to obtain a permit). The supporting infrastructure (e.g., water system tables) would be removed, and the area rehabilitated.

The above modifications would require site-specific planning, design, and compliance.

Administrative Pastures — Existing administrative pastures and associated structures would be retained (Hockett Meadow, Kern, Roaring River, and Redwood Meadow).

Crew Camps — The number of trail crew camps in Kings Canyon National Park would be increased to 20, each with tool caches and 1 to 3 food-storage boxes. The number of trail crew camps in Sequoia National Park would be increased to 15, each with tool caches and 1 to 3 food-storage boxes. Other project crew camps (for administration of wilderness) would be established as needed on a case-by-case basis.

Element 10: Frontcountry Facilities to Support Wilderness Access and Use

Planning Objective: Frontcountry facilities that support activities in wilderness would encourage and/or facilitate visitor use and enjoyment of wilderness.

The types and levels of commercial services that may be performed in wilderness are discussed in detail in the END (appendix B). Commercial service providers would be permitted to use some frontcountry facilities, but other facilities would only be used by non-commercial or administrative entities.

Kings Canyon National Park

Cedar Grove Pack Station — The Cedar Grove Pack Station would continue to be operated under concession authority based on a contractual relationship with NPS. Stock camping sites would be developed at the Cedar Grove Pack Station primarily for private users. A holding pen/corral space, hitch rail(s), adequate parking and turnaround space for stock trailers, a campfire pit, picnic tables, restrooms, food-storage boxes, and water supply would be installed.

Sequoia National Park

Middle Fork Kaweah Trailhead — At the Middle Fork Kaweah Trailhead improved parking and turnaround space for stock trailers and additional hitch rail(s) would be provided; no other stock amenities would be provided. CUA holders could be allowed to use this trailhead. No camping would be allowed for hikers or stock users.

Mineral King Area — The Atwell Mill Campground at Mineral King would be adapted to accommodate stock camping in two to three sites. Facilities may include a holding pen, hitch rail(s), table, campfire pit, picnic table, and stock trailer parking. The site would be maintained through an agreement between the NPS and a cooperating partner. Commercial service providers would be allowed to use the Atwell / Hockett trailhead.

The Mineral King Pack Station and administrative corrals would continue to be used for park administrative purposes at the existing location or at a new location in the Mineral King area. Consistent with the outcome of the END process, if a market and financial viability study/analysis determines that a concessions contract is feasible, per the Concessions Management Act and NPS policies, the Mineral King Pack Station could be operated as a contracted concessions service in its current location or at a new location at Mineral King. The types and levels of service provided by a concessioner at Mineral King would depend on the financial viability analysis and could include public stock campsite(s) and other guided services on approved trails. However, due to the lack of suitable trails and safety concerns, no concessioner-led frontcountry day rides would be authorized. The concessioner would receive exclusive

use of commercial stock access to local trailheads open to stock use (i.e., CUA holders would not have access, but private users could still access wilderness on these trailheads).

North Fork Kaweah Trailhead — At the North Fork Kaweah Trailhead improved parking and turnaround space for stock trailers and additional hitch rail(s) would be provided. Commercial service providers would be allowed to use this trailhead, controlled through the conditions of the permit. A small (two-site) primitive trailhead campground (i.e., no water) for stock users and backpackers would be constructed. The area would be maintained through an agreement between the NPS and a cooperating partner.

South Fork Kaweah Campground and Trailhead — The South Fork Kaweah Trailhead would include improved campsite(s) for stock users in the campground and improved parking and turnaround space for stock trailers at the trailhead. This trailhead would be primarily for private users, with limited commercial (managed via CUA permit conditions) and administrative users. At the campsite, a holding pen, adequate parking and turnaround space for stock trailers, hitching rail(s), a campfire pit, and a picnic table would be provided. The site would be maintained through an agreement between the NPS and a cooperating partner.

Wolverton Area — At Wolverton, stock facilities would remain in place at the current location, but they would be modified to allow for use by the public and potentially commercial services through a concessions contract. The facilities would continue to be used for the parks administrative purposes. If a market and financial viability study/analysis determines that a concessions contract would be feasible per the Concessions Management Act and NPS policies a portion of the Wolverton Pack Station could be operated as a contracted concessions service. The types and levels of service provided by a concessioner at Wolverton would depend on the financial viability analysis and the END and could include public stock campsite(s), wilderness user services, and frontcountry day rides.

Modifications to frontcountry facilities would require site-specific planning, design, and compliance.

Element 11: Commercial Services in Wilderness

Planning Objective: Commercial services would be allowed to the extent necessary for activities which are proper for realizing the recreational or other wilderness purposes of the areas. Commercial services would support visitor use and enjoyment of wilderness in a variety of appropriate ways. Visitors with diverse backgrounds and skill levels would be encouraged to experience wilderness and to explore primitive recreation activities such as hiking, backpacking, stock trips, fishing, over-snow travel, or mountaineering, or to build skills in these activities. The availability of commercial support would be allowed to expand commensurate with potentially higher levels of visitor use.

To meet the objectives of this alternative, commercial services would need to be provided at levels higher than those in the no-action alternative. As part of allowing increased use, the levels of commercial services would need to increase to accommodate less experienced visitors to help educate visitors and to control the impacts of inexperienced or inadequately equipped visitors. Commercial services would be allowed to the extent necessary to support those visitors who want to experience wilderness but may need additional support. See also appendix B. Table 31 presents the levels and types of commercial services.

Table 31: Levels and Types of Commercial Services under Alternative 3

Activity		Proposed Allocation of Commercial Service Days
Total Visitor Use Days – private and supported by commercial services (this does not take into account use by PCT and JMT visitors that are not recorded by the parks' wilderness permit system).	**Proposed Visitor Capacity under Alternative 3** 144,000 average 175,000 maximum	For all, day and overnight, non-stock and stock-based services: 10,920
Non-stock Activities Backpacking and Hiking Trips. Overnight Camping – gear support by human porters Climbing and Mountaineering (summer and winter). Oversnow Travel (ski and snowshoe touring and winter camping – winter only [Nov. 15 to Apr 15]).	Wilderness-wide: activities that are supported by non-stock-based commercial services.	For all, day and overnight, non-stock-based services: 6,550 (60% of total commercial services)
	Mount Whitney Management Area: activities that are supported by non-stock-based commercial services.	Of the above total allocation for non-stock services, the level which can occur in the Mount Whitney Management Area between late-May and late-September: 1,210
Stock-based Activities Stock trips – riding, packing, day rides and overnight camping with stock. Overnight Camping – gear support, including stock spot and dunnage	Wilderness-wide: activities that are supported by stock-based commercial services.	For all, day and overnight stock-based: 4,370 (40% of all commercial services)
	Mount Whitney Management Area: activities that are supported by stock-based commercial services.	Of the above total allocation, the level which can occur in the Mount Whitney Management Area between late-May and late-September: 650

The Bearpaw Meadow High Sierra Camp and the Pear Lake Ski Hut are allowable non-conforming commercial enterprises that may continue operation within potential wilderness as authorized by Congress. The Bearpaw Meadow High Sierra Camp would continue to be operated by a concessioner of the parks at near or slightly above its current level of 1,700 use days, provided it can be accomplished within the camp's existing footprint and would not cause additional impacts on resources.

The Pear Lake Ski Hut would continue to be operated by a cooperating association under a cooperative agreement or by a park-contracted concession at near or slightly above its current level of 1,500 use days during the winter months as a ski hut (lodging facility), provided impacts remain acceptable.

On the following pages, figure 15 depicts the wilderness trail system for alternative 3, figure 16 depicts campfire restrictions for alternative 3, and figures 17a and 17b depict stock access and grazing restrictions for alternative 3.

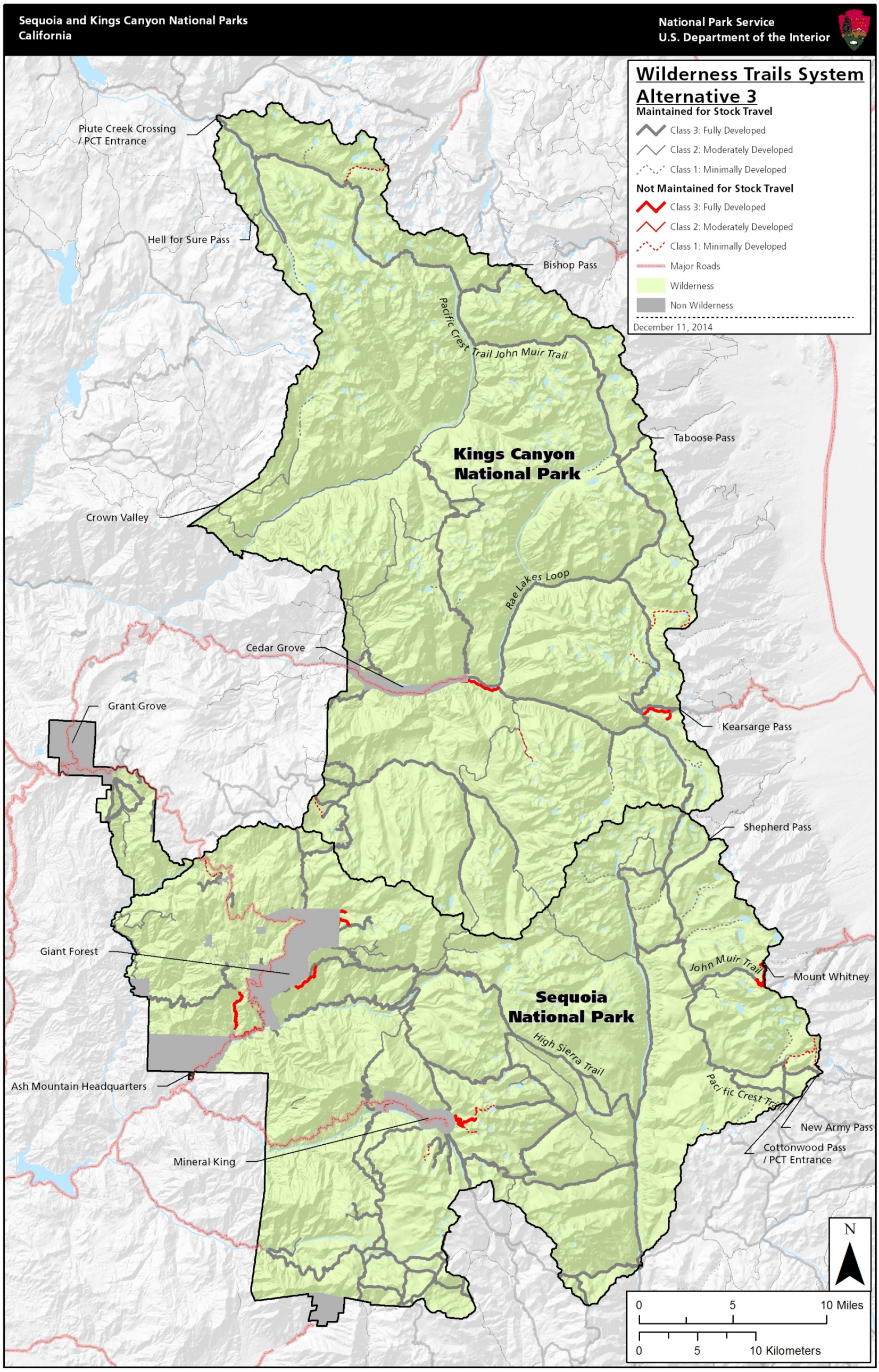

Figure 15: Wilderness Trails System – Alternative 3

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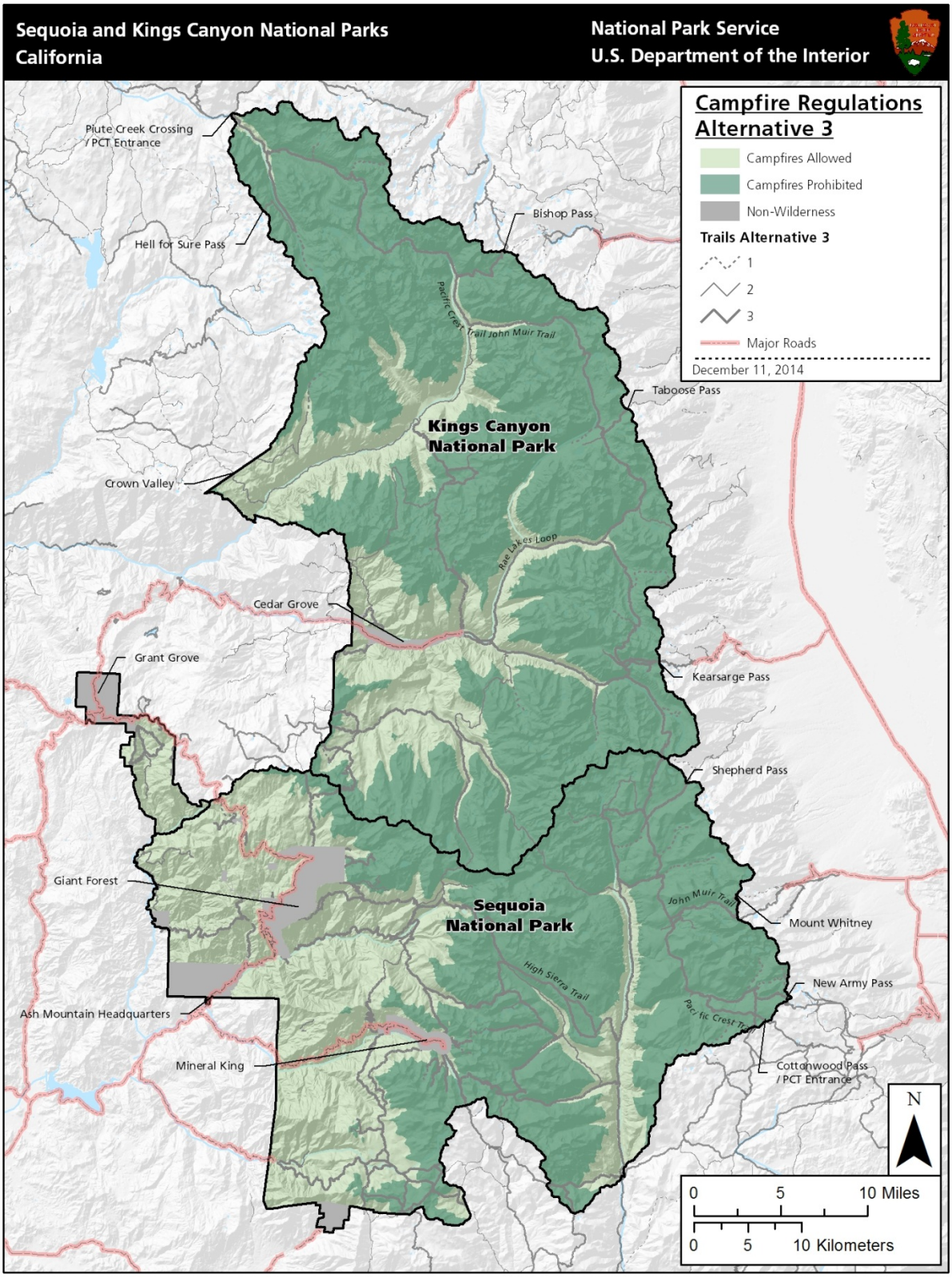
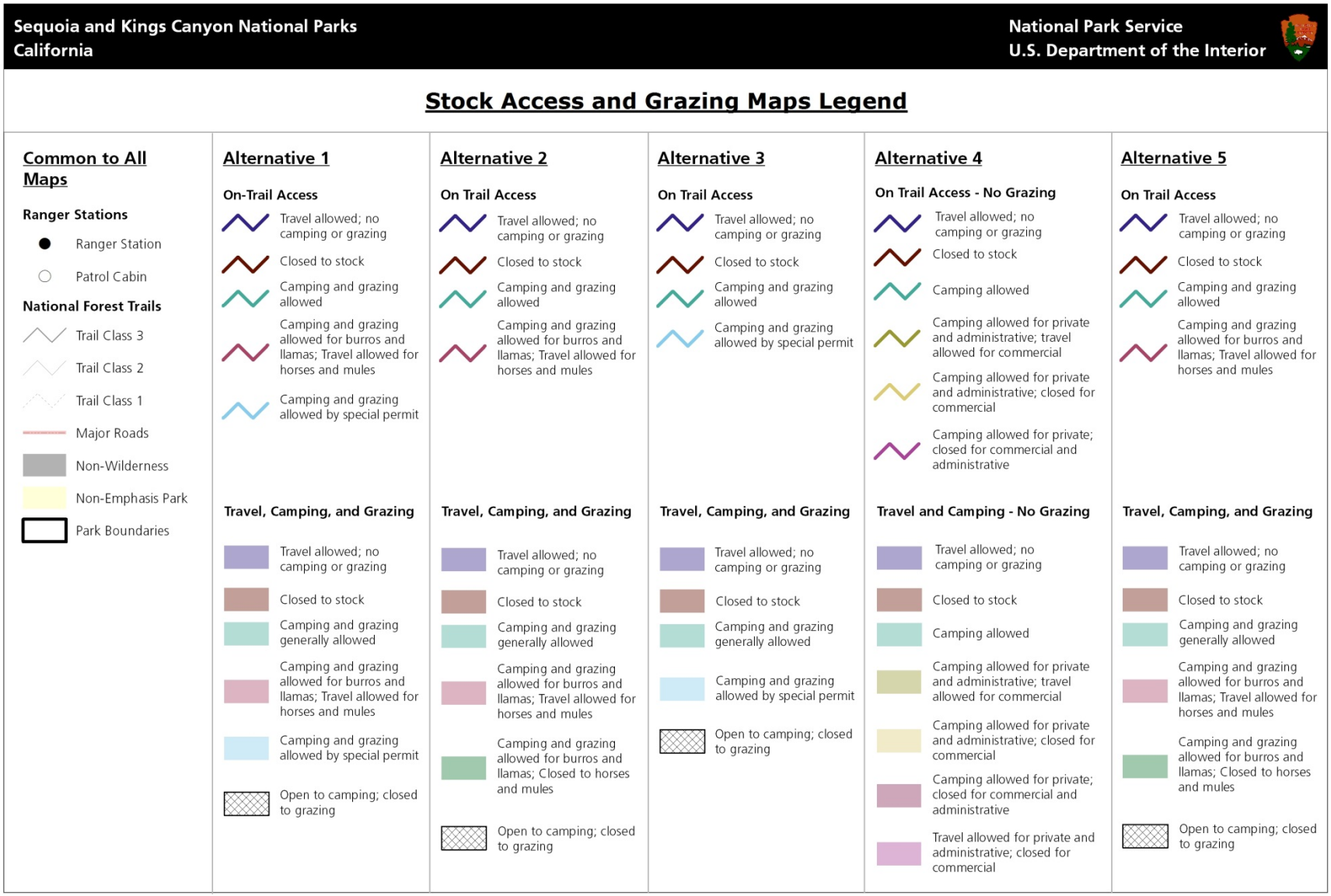


Figure 16: Campfire Regulations – Alternative 3

No campfires above 9,000 feet.



Legend to Accompany Figure 17a: Stock Access and Grazing – Alternative 3, Kings Canyon National Park

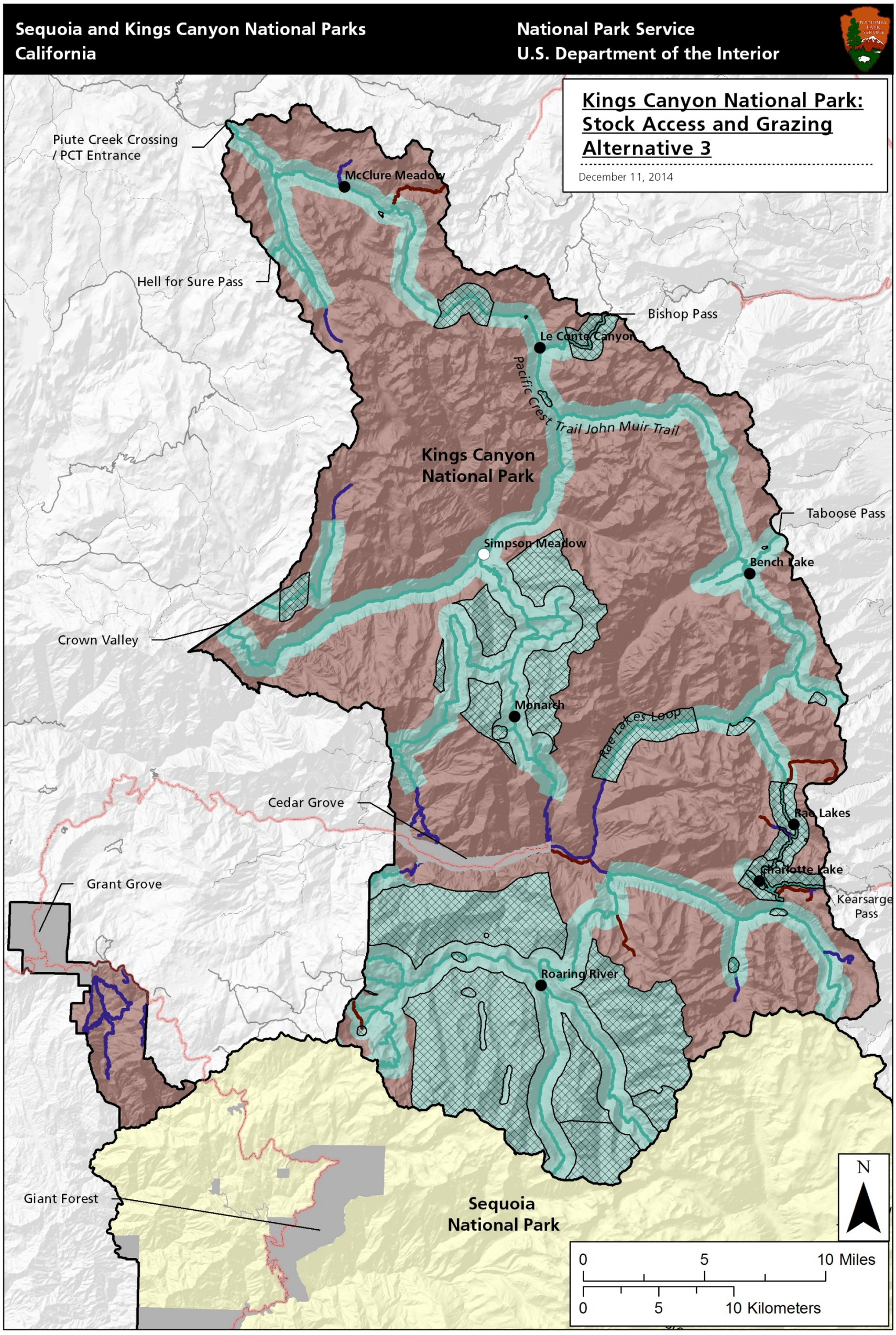


Figure 17a: Stock Access and Grazing – Alternative 3, Kings Canyon National Park

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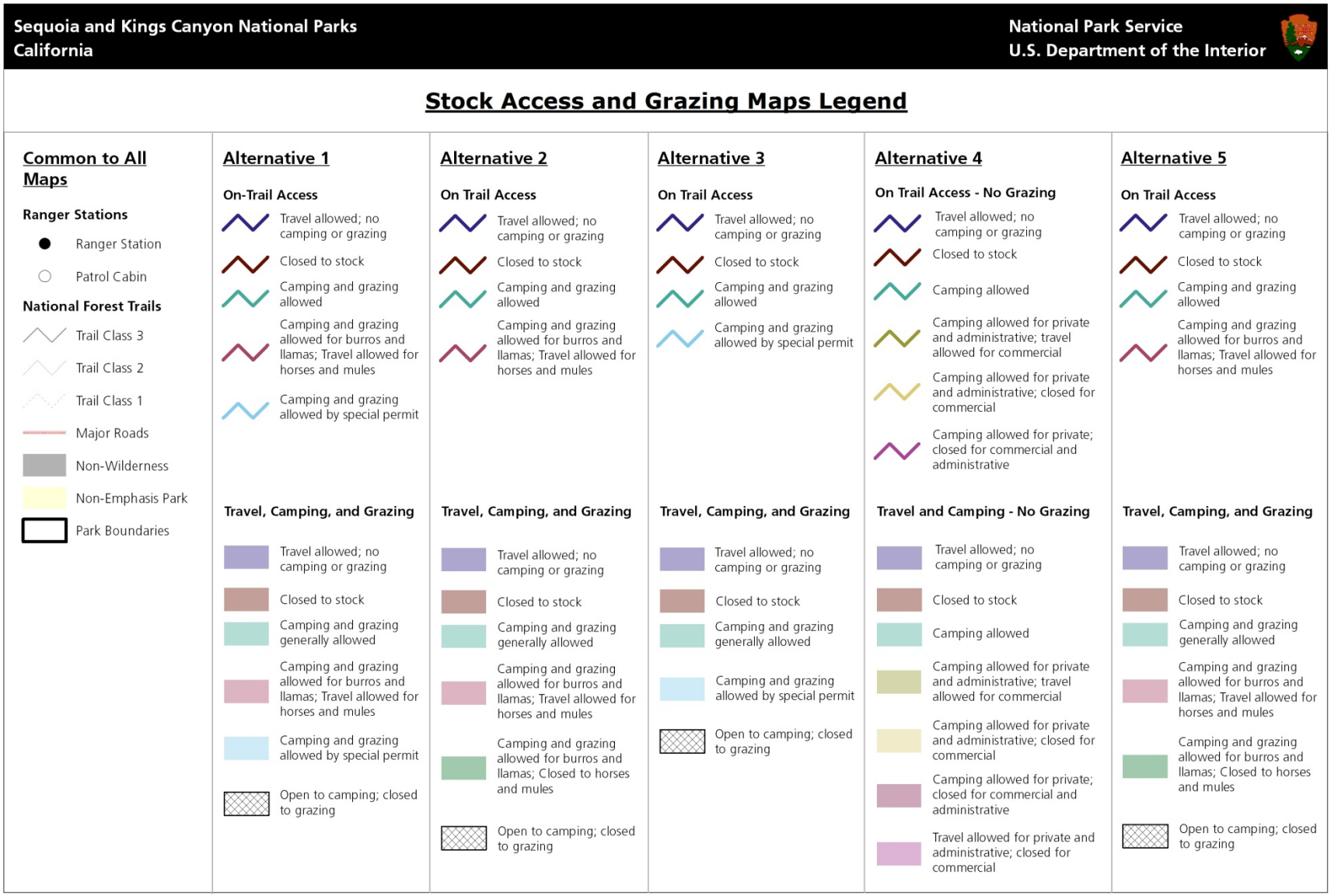

Legend to Accompany Figure 17b: Stock Access and Grazing – Alternative 3, Sequoia National Park

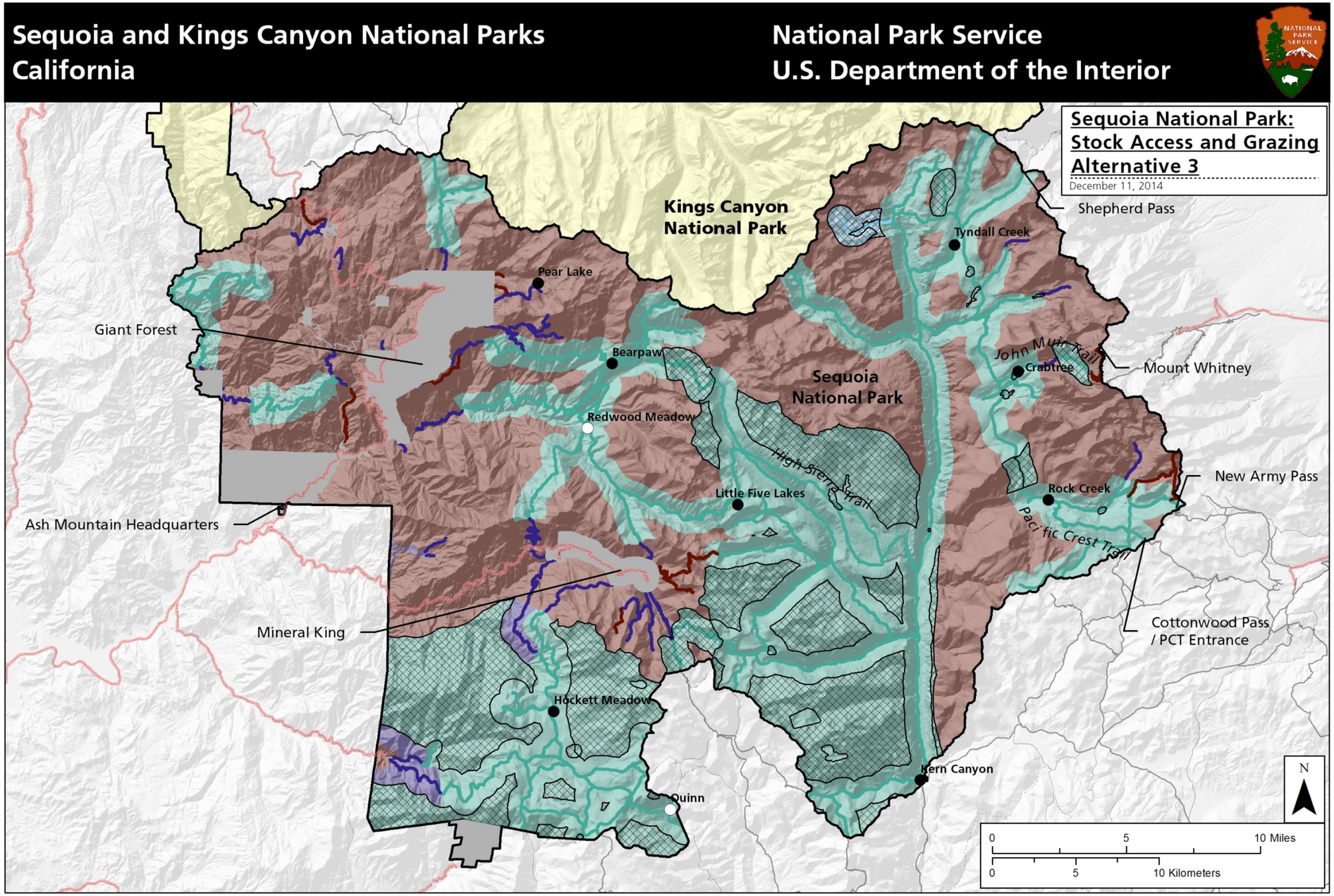

Figure 17b: Stock Access and Grazing – Alternative 3, Sequoia National Park

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ALTERNATIVE 4: EMPHASIZE UNDEVELOPED QUALITY AND NON-COMMERCIAL RECREATION

OVERVIEW

Alternative 4 General Concept: Emphasize undeveloped quality and non-commercial recreation.

The overarching idea behind alternative 4 is that the WSP would focus on emphasizing the undeveloped and non-commercial qualities of the parks' wilderness. Removal of development and reduction of commercial services would increase opportunities for solitude and encourage self-reliance in wilderness recreation.

This alternative would eliminate some of the development currently in wilderness to emphasize the undeveloped quality of wilderness. There would be fewer signs, bridges, stock-related facilities, and ranger stations. Restrooms/privies and food-storage boxes would be removed and there would be no designated campsites.

Because fewer resource-protecting developments would remain in place, the amount of use would need to be reduced to protect the natural quality of wilderness.

Trailhead quotas would remain at current levels or be slightly reduced in the most popular areas. In low-use areas, current trailhead quotas would be reduced to maintain current low use levels by preventing displacement of visitors who cannot get a permit when quotas for the most popular trailheads fill.

Commercial services would be notably reduced in both quantity and areas where they would be available. Types of commercial services would be similar to current conditions. The majority of wilderness would be managed for self-directed exploration and self-reliant travel, increasing the primitive and unconfined qualities of recreation.

Private parties traveling with stock would continue to have access to most trails in the parks, and stock would continue to be allowed to travel off-trail in the four designated areas. However, commercial stock use would be limited to certain destinations and trails. No private, commercial, or administrative stock grazing would be allowed under this alternative.

Campfires would not be allowed in wilderness under this alternative.

KEY ELEMENTS OF ALTERNATIVE 4

This alternative addresses the key elements as described below.

Element 1: Visitor-use Levels

Planning Objective: Visitor use and enjoyment of wilderness would be promoted while ensuring the preservation of wilderness character. In this alternative, increased emphasis on self-reliance and reduced development would be accompanied by a slight decrease in visitor numbers.

Permits and Quotas — Much of the development in wilderness serves the purpose of "hardening" specific areas to prevent unacceptable resource impacts. With reduction in development, recreational use levels would need to be reduced as well to protect resources. This would require slight reductions in quotas for trailheads accessing the most popular areas of wilderness. To prevent use from increasing beyond levels that the areas can sustain, trailhead quotas feeding low-use areas would also need to be reduced.

Existing destination quotas would continue to be applied, and additional destination quotas may be added in the future for specific areas, including Bearpaw Meadow, Dusy Basin, Guitar Lake, Hamilton Lake, Monarch Lake, Rae Lakes, and potentially others. No day-use permits/quotas would be implemented at this time but they may be considered in the future in the most popular areas to meet desired conditions.

The NPS would continue to work with the USFS to manage and improve the quota and permitting systems, to add trailheads currently missing from the quota system (e.g., Tehipite Valley and Kern River), and on other relevant cooperative cross-boundary wilderness management issues.

Visitor Capacities and Encounter Standards — Under alternative 4, the majority of the current types of use in wilderness would be retained. However, some proposed changes could affect the types and levels of use in specific areas. For example, commercial lodging and meal service at Bearpaw Meadow High Sierra Camp would be eliminated and multiple wilderness developments would be removed. Similarly, commercially provided day rides and other commercially provided day trips for any purpose (e.g., photography, fishing, hiking or climbing) would be eliminated. The overnight capacities would be lowered slightly under alternative 4, by reducing daily entry quotas at specific trailheads.

To meet the planning objectives for this alternative, the estimated overnight visitor capacity would be 127,000 VUDs per year. Ten-year average overnight use would be limited to 102,500–108,500 VUDs/year. Each year, total annual VUDs would be discussed and analyzed by an interdisciplinary group at an annual meeting on wilderness management. If determined to be out of standard, management actions to bring the measure back into standard would be adopted. Appendix A contains a detailed description of the methods used to develop the visitor capacity framework for this WSP.

As explained in alternative 2 and appendix A, the parks would adopt a measure of number of people encountered per hour (EPH) on trails and would take action based on established standards. The standards would vary depending on the desired conditions of solitude in a given area. For this measure, each trail would be assigned to one of four encounter-rate standards: very high use (primarily Mount Whitney and day-use areas); high use (generally Class 3 trails, with some exceptions); moderate use (generally Class 2 trails, with some exceptions); and low use (generally Class 1 trails, with some exceptions). Each has a specified EPH that serves as a standard. The standards for alternative 4 are shown in table 32.

Table 32: Encounters per Hour Standards for Alternative 4

Measure	Standard[1]			
	Very High	High	Moderate	Low
Trail Encounters – People Encountered Per Hour– by area	43	24	14	5

[1]Interpreted as the maximum number of people encountered per hour on 90% of days within the quota season (generally from the Friday before Memorial Day through the last Saturday in September) for selected monitored trail segments.

Currently, visitors may experience encounter rates higher than the proposed standard in the areas detailed below. The actions described under this alternative, along with the management actions described in the "Mitigation Common to All Alternatives" section in this chapter and in appendix A, would be taken to return the areas to within standards (table 33 below). [Note: Trail encounter data from 2012-2014 was collected opportunistically by park staff and volunteers. As a result, a larger proportion of samples occurred on weekend days and mid-day times than would be expected from a random or structured sample. A standardized sampling protocol will be developed upon completion of the WSP, and areas that are shown as out-of-standard and near standard in table 33 would be prioritized for re-sampling.]

Table 33: Trail Encounter Categories, Standards, and Proposed Management Actions for Alternative 4

Encounter Category	Encounter Standard[1]	Analysis Area	Status	Proposed Management Action
Very High	43	Mount Whitney	Near standard	Obtain better data to confirm observations; lower limits on commercial use; reduction in area camping overnight limits; reduce grazing limits in nearby meadows; consult with USFS regarding area use levels.
		Road's End	Near standard	Obtain better data to confirm observations; adjust overnight stay limit; implement area specific restrictions.
		High Sierra Trail (Crescent Meadow to Wolverton Cutoff Junction)	In standard	
High	24	Lakes Trail	In standard	Obtain better data to confirm observations; adjust overnight stay limit; implement area specific restrictions.
		Mineral King Valley	In standard	
		Little Baldy Trail	In standard	
		Paradise Creek Trail	In standard	
		Redwood Canyon	In standard	
Moderate	14	Evolution Basin & Valley (JMT/PCT)	Out of standard	Obtain better data to confirm observations; lower limits on commercial services; adjust trailhead quota; reduce night limits.
		Rae Lakes/JMT	Near standard	Obtain better data to confirm observations; lower limits on commercial services; adjust trailhead quota; reduce night limits; implement area specific restrictions.
		Mount Langley approach	Near standard	Obtain better data to confirm observations; lower limits on commercial services; adjust trailhead quota; reduce night limits; consult with USFS regarding use levels.

Table 33: Trail Encounter Categories, Standards, and Proposed Management Actions for Alternative 4 (continued)

Encounter Category	Encounter Standard[1]	Analysis Area	Status	Proposed Management Action
Moderate (continued)	14	Crabtree Ranger Station to Trail Crest	Near standard	Obtain better data to confirm observations; lower limits on commercial services; adjust overnight quota; overnight stay limit.
		Rae Lakes Loop — Lower Portion	Near standard	Obtain better data to confirm observations; adjust overnight quota; overnight stay limit.
		West side of Kearsarge Pass	Near standard	Obtain better data to confirm observations; lower limits on commercial services; adjust trailhead quota; reduce night limits; consult with USFS regarding use levels.
		Dusy Basin	In standard	
		Twin Lakes Trailhead to Silliman Creek	In standard	
		High Sierra Trail (Wolverton Cutoff Junction to JMT Junction)	Near standard	Obtain better data to confirm observations; adjust overnight quota; overnight stay limit.
		Rock Creek	In standard	
		Little Five	In standard	
Low	5	Sixty Lake Basin Trail (Rae Lakes 3) and Crabtree Lakes (Crabtree 1)	Near standard	Obtain better data to confirm observations; lower limits on commercial use; reduction in area camping overnight limits; implement area specific restrictions.
		All other trails not identified above	In standard[2]	

[1] Interpreted as the maximum number of people encountered per hour on 90% of days within the quota season (generally from the Friday before Memorial Day through the last Saturday in September).
[2] Inferred from a small number of samples.

Element 2: Trails

Planning Objective: The trail system would facilitate access for visitor use and enjoyment of the wilderness. Trails would be well suited to the types and levels of visitor use (levels of visitor use would be slightly decreased from current levels under this alternative).

The level of trail development would be lower under alternative 4. Only the day-use and very popular trails would continue to be maintained to Class 3 levels. This would be primarily the PCT, JMT, HST, Rae Lakes Loop, some primary stock travel corridors, and some feeder trails. The undeveloped quality of wilderness would be improved by maintaining many of the other trails to a lower development class than in the no-action alternative, or by abandoning them. A few designated unmaintained routes that are still passable to stock and where stock travel does not pose undue threats to resources would be designated Class 1 trails and targeted for appropriate construction and maintenance. Many of the designated unmaintained routes listed in the 1986 SUMMP would be abandoned, as would some existing Class 1 or Class 2 trails. A few trails would be designated hiking-only trails where there are known threats to

sensitive resources, unacceptable visitor safety issues, or existing user conflicts between stock and hiker/backpacker parties. Where trails or routes are abandoned, landscape restoration actions would be considered. Summary tables at the end of this chapter give a comparison of trail classes by mileage and use under each alternative. Figure 18 depicts the wilderness trail system for alternative 4 and can be found on page 187. More details on the trail management and classification system can be found in appendix K.

Bridges on Class 2 trails would be evaluated for removal (e.g., Cartridge Creek Bridge, East Creek Bridge, Granite Creek / Upper Middle Fork Kaweah Bridge, and Big Arroyo Bridge on the Lower Kern Trail). Additional site-specific planning and compliance would be needed for the removals and potential trail reroutes to access crossings.

With additional site-specific planning and compliance, new Class 1 trails could be established to protect resources when visitor use may cause undue impacts. For example, establishing Class 1 trails on Lamarck Col and Mount Langley would provide resource protection in areas with increasing visitation.

Element 3: Campfires

Planning Objective: In order to eliminate campfire impacts and emphasize self-reliant wilderness experiences, campfires would not be allowed.

No campfires would be allowed in wilderness under this alternative.

Element 4: Food Storage

Planning Objective: Native wildlife would subsist only on naturally obtained food, uninfluenced by the presence of human food. In this alternative, visitors would use self-reliant food-storage techniques; food-storage boxes would not be provided.

All 86 food-storage boxes would be removed under this alternative. Park-allowed portable containers would be required for all overnight visitors wilderness-wide.

Element 5: Human-waste Management

Planning objective: Human waste would not contaminate water or create unsanitary or unsightly conditions. Reflecting the emphasis on self-reliance and reduced development in this alternative, restrooms and privies would be removed.

Cat-holes would be required. Pack-out waste kits would be highly recommended or required in popular areas.

All public-use privies, vault toilets, and restrooms would be removed under this alternative (including Emerald and Pear lakes restrooms). No new privies, vault toilets, or restrooms would be constructed.

The NPS would consider implementing new technologies for human-waste management as they are developed in the future. The use of new technologies would require on-site planning and compliance. Some technologies may require visitors to be more self-sufficient.

Element 6: Party Size

Planning Objective: Party size would be set at levels high enough to allow for a variety of experiences, but low enough to protect wilderness character from impacts associated with large groups. In this alternative, an emphasis on self-reliance would result in a decrease in party size in many areas.

Party sizes would need to be reduced relative to alternative 1; party-size limits for alternative 4 are presented in tables 34 and 35.

Table 34: Party-size Limits for Hikers and Boaters for Alternative 4

Type of Trip	Maximum Party Size
On-trail (day use)	25; consider more restrictive party size for day-use in specific areas.
On-trail (overnight use)	12
Off-trail (day and overnight use)	8
Area-specific	Existing temporary party-size limits would be removed (maximum party size of 8 in specific locations), and replaced with a wilderness-wide off-trail party size of 8. Party-size limits of 8 people maximum for Redwood Canyon.

Table 35: Party-size Limits for Stock Parties for Alternative 4

Type of Stock Trip	Maximum Party Size for People and Stock
Day rides (not including spot and dunnage)	People: 15 Stock: 15 Combined: 30
On-trail (including spot and dunnage trips that support overnight use for those trails where stock is allowed)	People: 12 Stock: 15 Combined: 20
Off-trail (private stock parties only in areas specifically designated for day and overnight stock use)	People: 8 Stock: 7 Combined: 11
Area-specific	Redwood Canyon party-size limits: People: 8 Stock: 8 Combined: 16

Element 7: Camping/Campsites and Night Limits

Planning Objective: Visitors would have the opportunity to choose camping locations, except in areas where camping would result in unacceptable impacts. In this alternative, an emphasis on visitor self-reliance would allow fewer camping restrictions.

Camping would be prohibited in all areas close to the frontcountry. There would be no universally accessible campsite(s) developed under this alternative.

A one-person camp near Nine Mile Creek with a portable food-storage container

The locations of established stock camps would be identified and the NPS would recommend the use of these stock camps.

First Allowable Campsite — Camping would be prohibited within specified distances from each trailhead (see the "First Allowable Campsite" section under alternative 2, table 19 on page 116).

Length of Stay/Night Limits for All Campers (stock-supported and backpackers) — Visitors would be limited to stays of 10 consecutive nights in a single location, 21 total nights per trip, and 63 total nights per year. Table 36 presents exceptions to these night limits.

Table 36: Site-specific Exceptions to the Night Limits under Alternative 4

Location	Night Limits Exceptions (Consecutive Nights in One Location)
Crabtree Meadow area and Lower and Upper Soldier lakes (combined)	4-night limit
Colony Mill Trail, Charlotte Lake, Emerald and Pear lakes (combined), Guitar Lake, the JMT from Woods Creek crossing to Vidette Meadow (at any one location), North Dome, and Redwood Canyon	3-night limit
Dusy Basin, Hamilton Lake, Kearsarge Lakes Basin, Rae Lakes (per lake), and Paradise Valley	2-night limit

Designated Campsites — To preserve the unconfined aspect of recreation in the parks' wilderness there would be no designated campsites. All designated camping requirements at Emerald and Pear lakes, Lower Paradise Valley, and at Bearpaw Meadow would be discontinued. No other designated sites would be established at this time. Following Leave No Trace© practices will help to preserve the natural quality.

There would be no designated stock camps.

Campsite Condition Standards — As explained in alternative 2, a metric of aggregate campsite impacts (Weighted Value per Campable Mile, WVCM) would be adopted under all alternatives. Under alternative 4, the WVCM standard would be: 950 for high use subzones, 475 for moderate use subzones, and 235 for low use subzones. A monitoring plan would be developed to establish protocols and schedule monitoring frequencies to ensure that subzones remain within their applied standard.

Under alternative 4, two subzones (83-1 Guitar Lake and 86-1 Kern Hot Spring) would be out of standard in the high use category, and two subzones (80-3 Shepherd Pass Lake and 90-6 Hockett Meadow) would be out of standard in the moderate category. One low-use subzone, 47-1 Amphitheater Lake, would be at standard. All other subzones would be within standard. Management actions to return the subzones to within standards are included in the "Mitigation Common to All Alternatives" section in this chapter. For a map of campsite condition standards see figure 10 on page 119; for information on determining campsite condition and standards, see appendix A, page A-15 and A-24.

Element 8: Stock Use

Planning Objective: Visitors would have opportunities to travel with stock, from day rides to multi-day trips, in a manner that ensures the protection of wilderness character. To support the self-reliant aspect of this alternative: off-trail access would be limited to private stock, drift fences and hitch rails would be removed, and no grazing would be permitted (carry all feed).

Figures 19a and 19b depict stock access and grazing restrictions for alternative 4. Figure 19a shows stock access and grazing restrictions in Kings Canyon National Park and can be found on pages 190/191. Figure 19b shows stock access and grazing restrictions in Sequoia National Park and can be found on pages 194/195.

Stock Access and Travel

On-trail — Parties traveling with stock would be allowed on many maintained trails (527 of 643 miles), although some of these trails would be limited to private and administrative groups only. Stock parties would be allowed to travel up to 0.5 mile from trails in areas where they are allowed to camp. In areas open to travel only, stock parties would be allowed to travel up to 100 yards from trails.

Some trails would be open to stock parties for travel only, some would be open to use by private and administrative packers only, some would be open to camping for walking parties with burros and llamas but limited to travel only for parties with horses or mules, and some would be closed to stock travel entirely. These restrictions would be put in place for reasons including visitor safety, resource protection, and areas popular for day-use by hikers, to provide trails with no commercial stock travel, and to provide trails with no stock travel. Approximately 377 miles of maintained trails would be open to travel and camping by stock by all user groups (private, commercial, and administrative) with an additional 72 miles of maintained trails open to travel and camping by private stock or administrative stock parties only (closed or travel only for commercial stock). Trails with restricted stock access under alternative 4 are discussed below.

Trails open for travel only (61 miles – includes mileages to first camps):

- Don Cecil Trail
- Kearsarge Lakes Trail

- Oriole Lake
- Redwood Canyon, Hart Tree, and Sugarbowl Loop trails

Trails closed to commercial stock parties; stock travel only allowed for private and administrative stock parties (17 miles):

- Admiration Point Trail
- Alta Trails
- Center Basin Trail (to Golden Bear Lake)
- Lake 11,092 (shown as Lake 11,106 on older maps)
- Lakes Trail (Hump Trail only)
- Upper Sixty Lake Basin Trail
- Wallace Lake Trail above 11,200 feet in elevation

Trails open for travel only for commercial stock parties (no camping); travel and camping allowed for private and administrative stock parties (17 miles):

- Charlotte Lake Trail from JMT to Charlotte Creek drift fence
- Dusy Basin Trail (above 10,600 feet in elevation)
- JMT from Dollar Lake south to Vidette Meadow
- Kearsarge Pass Trail

Trails closed to commercial stock parties, camping allowed for private and administrative stock parties (56 miles):

- Avalanche Pass Trail – Sphinx Junction to Scaffold drift fence
- Cahoon Rock Trail
- Funston Lake Trail (Siberian Outpost to Funston Lake)
- Goddard Canyon Trail–JMT to Franklin-Montgomery Meadow
- Granite Lake Trail
- Grouse Lake Trail
- JMT from above Crabtree Ranger Station to base of Mount Whitney switchbacks (except Timberline Lake, day-use only)
- Lower Middle Fork Kings Trail
- Miter Basin Trail to Penned-up Meadow
- Muro Blanco Trail
- New Army Pass Trail
- Soda Creek Trail to Lower Big Arroyo
- Tehipite Switchbacks Trail

- Twin Lakes and Silliman Pass South Trails
- Volcanic Lakes Trail and Kennedy Canyon Trail east of Dead Pine Ridge
- Wallace Lake Trail below 11,200 feet in elevation

Trails closed to stock travel of any kind (116 miles):

- Baxter Pass Trail
- Big Baldy Trail
- Buena Vista Trail
- Bullfrog Lake Trail west of Kearsarge Lakes Trail
- South Side Cedar Grove Sand Flats Trail from Zumwalt Meadow Bridge to Bubbs Creek
- Colby Pass Trail from Grand Palace to Kern River
- Eagle Lake Trail
- Elizabeth Pass Trail from Upper Ranger Meadow to HST
- Goddard Canyon and Martha Lake Trails above Franklin-Montgomery Meadow
- Hell-for-Sure Pass Trail
- HST from Crescent Meadow to Wolverton Cutoff
- J.O. Pass Trail
- Kennedy Pass Trail from Frypan Meadow to the top of Dead Pine Ridge
- Ladybug Trail
- Lamarck Col Trail
- Little Baldy Trail
- Lost Canyon Trail
- Marble Falls Trail
- Monarch Lake Trail
- Mosquito Lakes Trail
- Mount Langley Trail
- Mount Whitney Trail – base of switchbacks to Trail Crest and summit
- Muir Grove Trail
- Over-the-Hill Trail
- Paradise Creek Trail
- Redwood Canyon Big Springs Trail
- Sawmill Pass Trail
- Shepherd Pass Trail
- Tamarack Lake Trail

- Tar Gap Trail
- Tokopah Falls Trail
- Watchtower Trail
- Whiskey Log Trail
- White Chief Trail

Off-trail — Stock parties would continue to be allowed to travel up to 0.5 mile from trails to reach camps. Travel more than 0.5 mile from maintained trails would continue to be allowed for private parties in four areas of the parks: on the Monarch Divide (except Kennedy Canyon), in the Roaring River area (except the upper end of Cloud and Deadman Canyons), on the Hockett Plateau (except the Tar Gap Trail), and along the western side of the Kern River watershed south from the Chagoopa Plateau (except the lower Big Arroyo). Off-trail travel more than 0.5 mile from maintained trails in these areas would be prohibited for administrative and commercial stock.

Stock Grazing — To reduce impacts on the natural and scenic aspects of wilderness character, grazing would not be allowed in wilderness under this alternative. Overnight stock use would continue to be allowed but stock users would be required to hold and feed their animals.

The use of certified-weed-free forage in frontcountry areas, and of processed pellets, rolled grains, or fermented hay in wilderness, would be required as described under alternative 2.

The monitoring system described in appendix D would be employed to track use, document conditions, and provide information for preventing and mitigating impacts associated with stock use but not related to grazing. Stock use would continue to be adaptively managed and informed by the results of the Stock Use and Meadow Monitoring Program, with increased emphasis on the prevention and mitigation of impacts associated with holding and feeding animals.

Stock Use Structures — All stock support facilities including drift fences, gates, and hitch rails not associated with ranger stations would be removed. Groups traveling with stock would be required to hold their stock while camping (e.g., set up high lines) on durable, non-vegetated surfaces.

Element 9: Administrative Structures

Planning Objective: Administrative structures and developments would be the minimum necessary for the administration of wilderness, but due to the emphasis on the undeveloped and self-reliant qualities of wilderness, the number of administrative developments would be reduced more than in any other alternative.

To minimize development, several administrative structures would be removed.

Ranger Stations — With reduced private and commercial use, some ranger stations in areas that are currently very popular could be removed. Some historic buildings that do not serve current wilderness administrative needs would be considered for removal.

Ranger stations that would be retained in their current locations:

- Crabtree
- Hockett Meadow

- Kern Canyon
- LeConte Canyon
- McClure Meadow
- Pear Lake
- Rae Lakes
- Rock Creek

Some ranger stations would be removed and no replacement stations would be built.

Ranger stations to be removed could be:

- Bearpaw Meadow
- Bench Lake
- Charlotte Lake
- Little Five Lakes
- Monarch
- Roaring River
- Tyndall Creek

The Quinn Patrol Cabin would be retained. The Redwood Meadow and Simpson Meadow Patrol Cabins would be removed and no new cabins would be built. Each of the above actions would be subject to separate site-specific planning, design and compliance.

Other Administrative Structures — The use of the Redwood Canyon Cabin by researchers would be terminated within one year of WSP approval. The cabin would be removed over a two-year period after WSP approval. Future cave research activities in Redwood Canyon could continue, but without the use of the cabin or associated permanent infrastructure. Project-specific compliance would be required for the removal.

Administrative Pastures — Existing administrative pastures and associated fences would be removed (Hockett Meadow, Kern, Roaring River, and Redwood Meadow).

Crew Camps — Short-term project crew camps (for administration of wilderness) would be established as needed on a case-by-case basis. All installations solely for crew use would be removed. Trail crews would conduct trail maintenance through use of mobile operations, moving with stock or backpacks and using minimum impact camping practices; there would be no facilities placed at these camps.

Element 10: Frontcountry Facilities to Support Wilderness Access and Use

Planning Objective: Frontcountry facilities that support activities in wilderness would encourage and/or facilitate visitor use and enjoyment of wilderness.

The types and levels of commercial services that may be performed in wilderness are discussed in detail in the END (appendix B). Commercial service providers would be permitted to use some frontcountry facilities, but other facilities would only be used by non-commercial or administrative entities.

Kings Canyon National Park

Cedar Grove Pack Station — The concessioners' wilderness operations originating from the Cedar Grove Pack Station would be reduced. Future use of the Cedar Grove Pack Station as a concessions operation would be subject to the Concessions Management Act and NPS policies. Stock camping sites would be developed at the Cedar Grove Pack Station for private users. A holding pen/corral space, hitch rail(s), adequate parking and turnaround space for stock trailers, a campfire pit, picnic tables, restrooms, food-storage boxes, and water supply would be installed for use by private stock only.

Sequoia National Park

Middle Fork Kaweah Trailhead — At the Middle Fork Kaweah Trailhead improved parking and turnaround space for stock trailers and additional hitch rail(s) would be provided. Commercial services in this area would not be authorized.

Mineral King Area — No facilities would be developed to support stock use in the Atwell Mill Campground in Mineral King. Commercial service providers would not be allowed to use the Atwell / Hockett trailhead.

Existing facilities at the Mineral King administrative corrals in east Mineral King Valley would continue to be used in their existing location or in a new location for park administrative purposes. Stock facilities would be modified or constructed to allow for short-term public use (e.g., staging and/or short-term camping). If kept in the same location, the footprint of the corrals would be reduced by removing the remnants of the former pack station (i.e., removing buildings and corrals to reduce the level of development). The site could be modified with adequate parking and turnaround space for stock trailers, a small corral, water, a picnic table, and a vault toilet or restroom to provide stock camping opportunities for private parties (1 or 2 sites, 1 or 2 night limits). No commercial service providers would be authorized to use this facility. The site would be maintained through an agreement between the NPS and a cooperating partner.

North Fork Kaweah Trailhead — At the North Fork Kaweah Trailhead improved parking and turnaround space for stock trailers and additional hitch rail(s) would be provided. Commercial service providers would not be authorized to use this trailhead. The area would be maintained through an agreement between the NPS and a cooperating partner. No camping for stock or backpackers would be provided and camping would not be allowed.

South Fork Kaweah Campground and Trailhead — The South Fork Kaweah Trailhead would be modified to improve parking and turnaround space for stock trailers at the trailhead. Only private and administrative users would have access to this trailhead; commercial service providers would not be authorized to use this area. The site would be maintained through an agreement between the NPS and a cooperating partner.

Wolverton Area — Stock facilities at Wolverton would remain in place at the current location, but they would be modified to allow for public use by private parties. There would be no commercial services provided at the facility through a concessions contract, but the facilities would continue to be used by private parties and for administrative purposes. The addition of adequate parking and turnaround space for stock trailers, a corral, hitch rail(s), picnic table(s), and a campfire pit would be considered. Restrooms and water access exist currently at the site. The site would be maintained through an agreement between the NPS and a cooperating partner.

The above modifications to frontcountry facilities and trailheads would require site-specific planning, design, and compliance.

Element 11: Commercial Services in Wilderness

Planning Objective: Commercial services would be allowed to the extent necessary for activities which are proper for realizing the recreational or other wilderness purposes of the areas. Commercial services would support visitors in limited ways and circumstances in order to emphasize the self-reliant aspect of wilderness character.

This alternative emphasizes self-reliant recreation. To meet the objectives of this alternative, commercial services would be reduced to levels significantly lower than those in the no-action alternative and commercial services would be limited in high-use areas (table 37). See also appendix B.

Table 37: Levels and Types of Commercial Services under Alternative 4

Activities		Proposed Allocation of Commercial Service Days
Total Visitor-use Days – private and supported by commercial services (this does not take into account use by PCT and JMT visitors that are not recorded by the parks' wilderness permit system).	**Proposed Visitor Capacity Alternative 4** 103,500 average 127,000 maximum	For all, day and overnight, non-stock and stock-based services: 4,390
Non-stock Activities Backpacking and Hiking Trips. Overnight Camping – gear support by human porters Climbing and Mountaineering (summer and winter). Oversnow Travel (ski and snowshoe touring and winter camping – winter only [Nov. 15 to Apr 15]).	Wilderness-wide: activities that are supported by non-stock based commercial services.	For all, day and overnight, non-stock based services: 2,630 (60% of total commercial services)
	Mount Whitney Management Area: activities that are supported by non-stock based commercial services.	Of the above total allocation for non-stock services, the level which can occur in the Mount Whitney Management Area between late-May and late-September: 490
Stock-based Activities Stock trips – riding, packing, day rides and overnight camping with stock. Overnight Camping – gear support, including stock spot and dunnage	Wilderness-wide: activities that are supported by stock-based commercial services.	For all, day and overnight stock-based: 1,760 (40% of all commercial services)
	Mount Whitney Management Area: activities that are supported by stock-based commercial services.	Of the above total allocation, the level which can occur in the Mount Whitney Management Area between late-May and late-September: 260

The Bearpaw Meadow High Sierra Camp, including any historic elements, would be removed and the area would be restored to natural conditions. No commercial services would be provided at the Bearpaw Meadow High Sierra Camp.

The commercial use of Pear Lake Ranger Station as a winter ski hut would be discontinued.

On the following pages, figure 18 depicts the wilderness trail system for alternative 4 and figures 19a and 19b depict stock access and grazing restrictions for alternative 4.

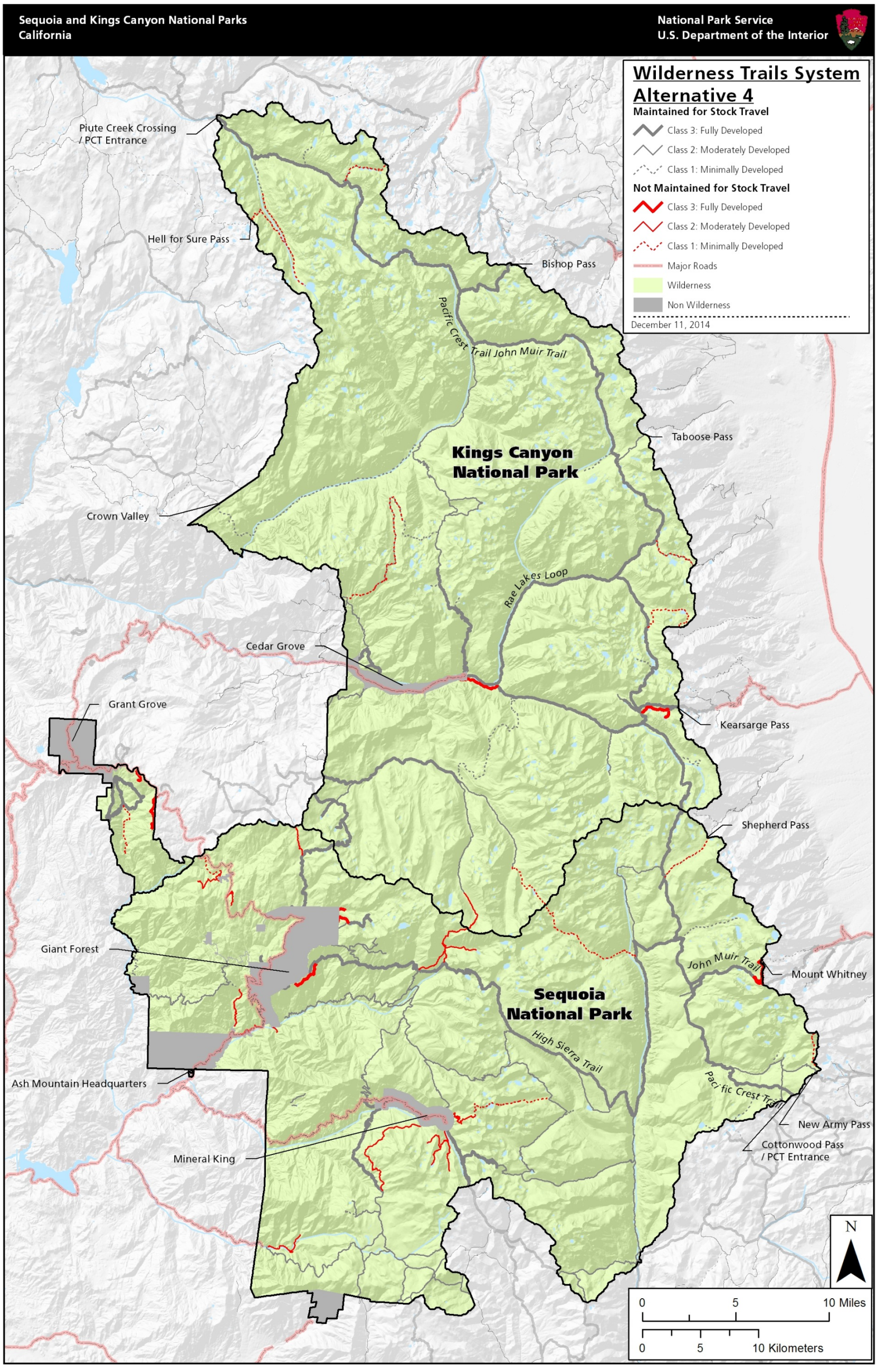

Figure 18: Wilderness Trails System – Alternative 4

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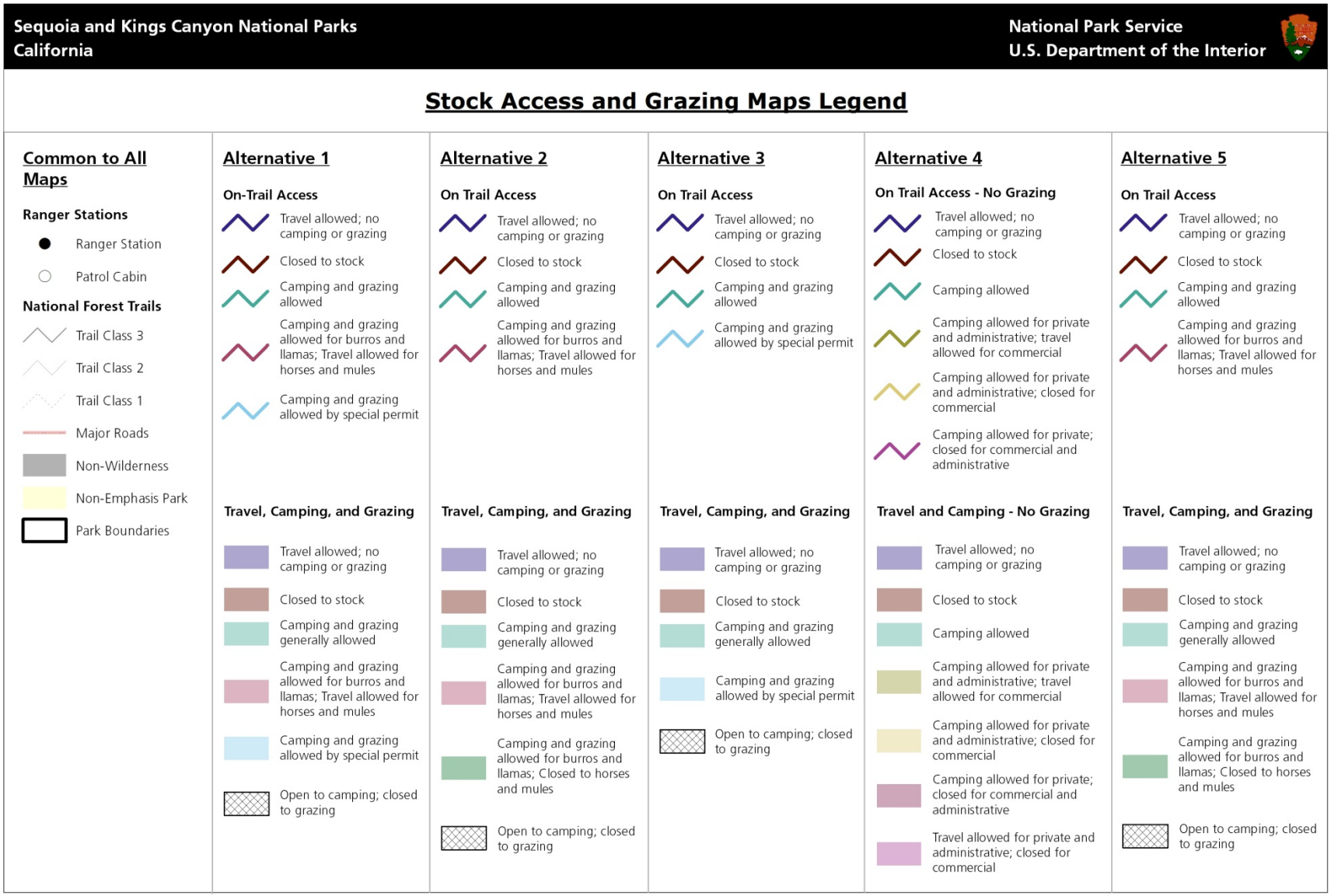

Legend to Accompany Figure 19a: Stock Access and Grazing – Alternative 4, Kings Canyon National Park

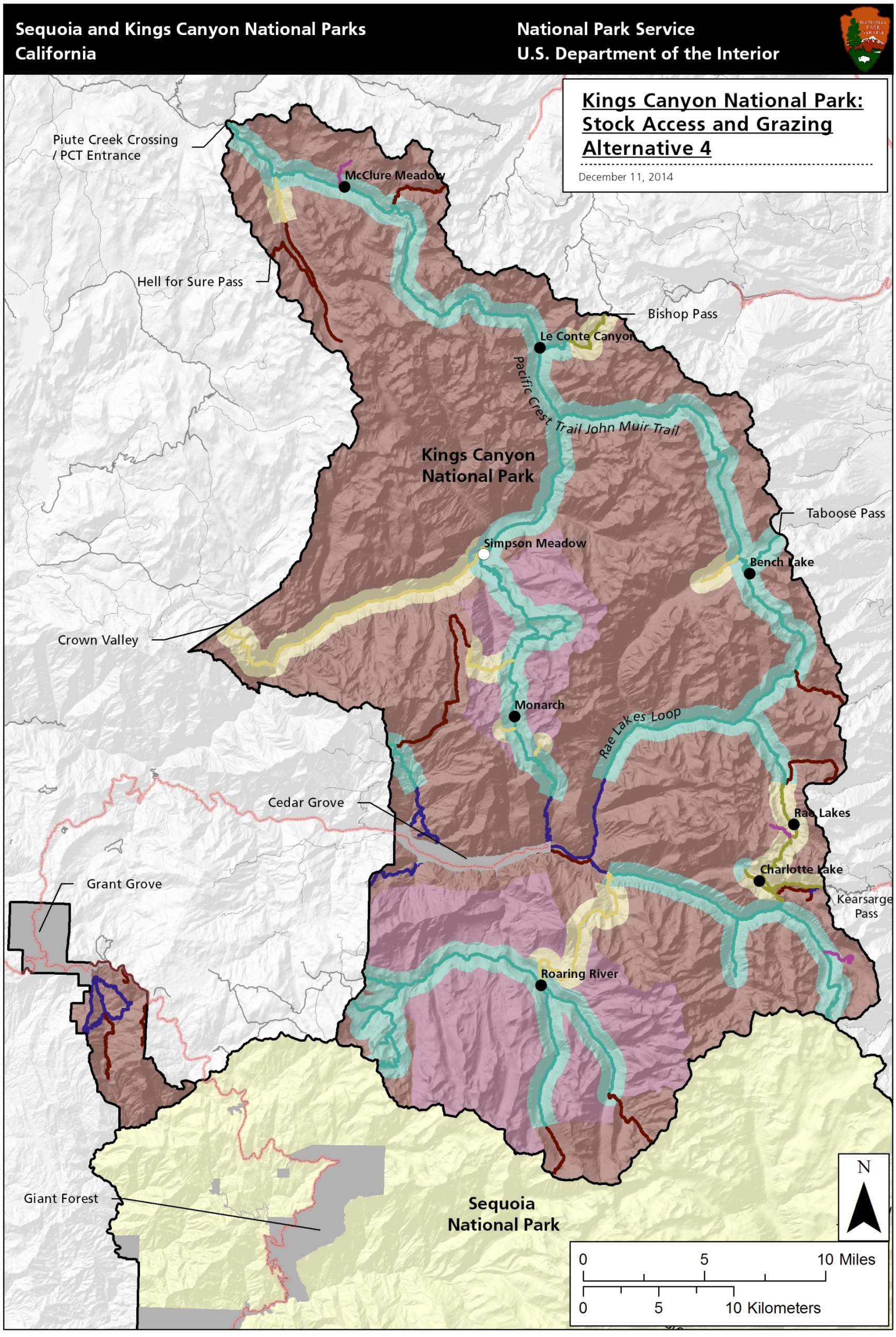

Figure 19a: Stock Access and Grazing – Alternative 4, Kings Canyon National Park

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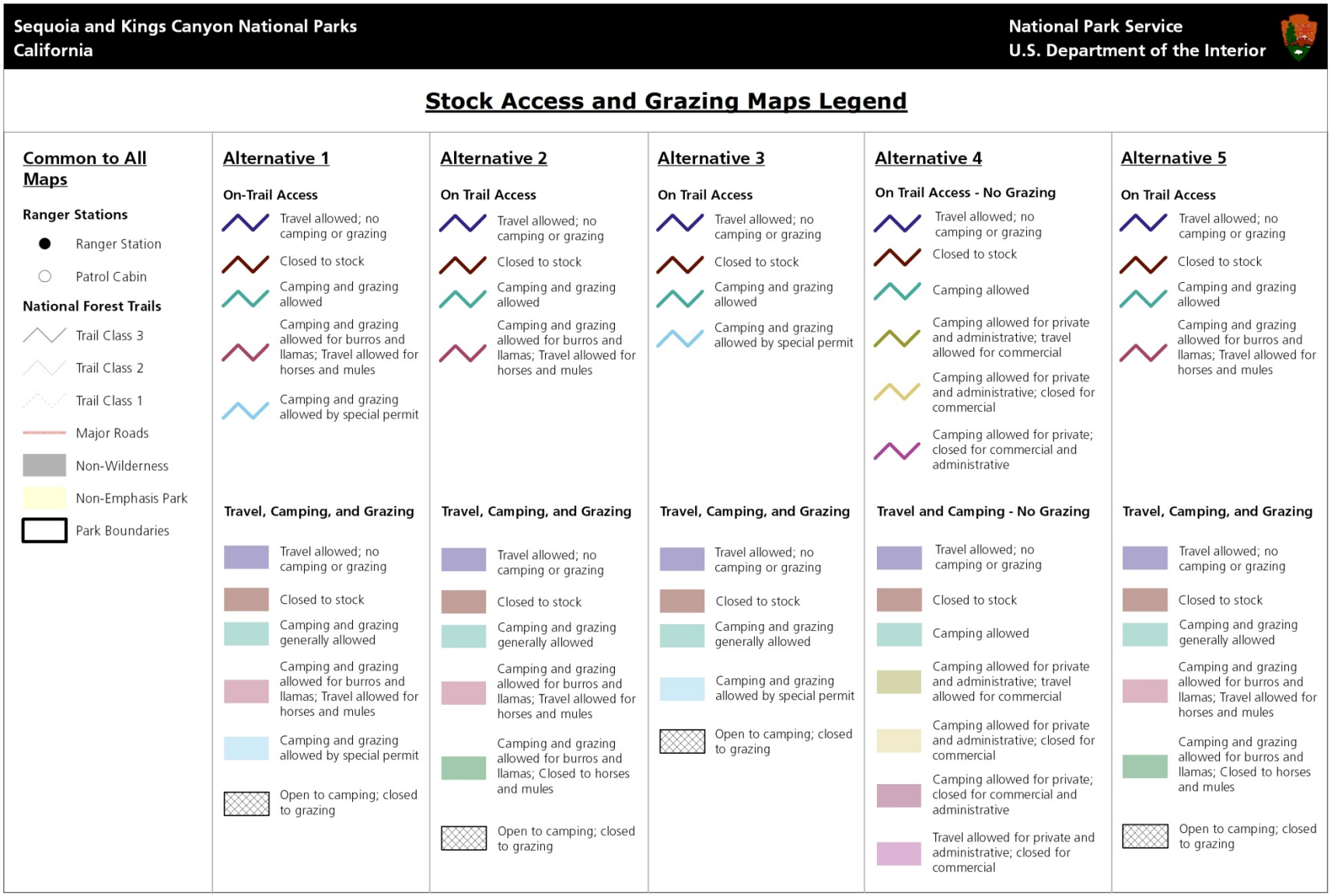

Legend to Accompany Figure 19b: Stock Access and Grazing – Alternative 4, Sequoia National Park

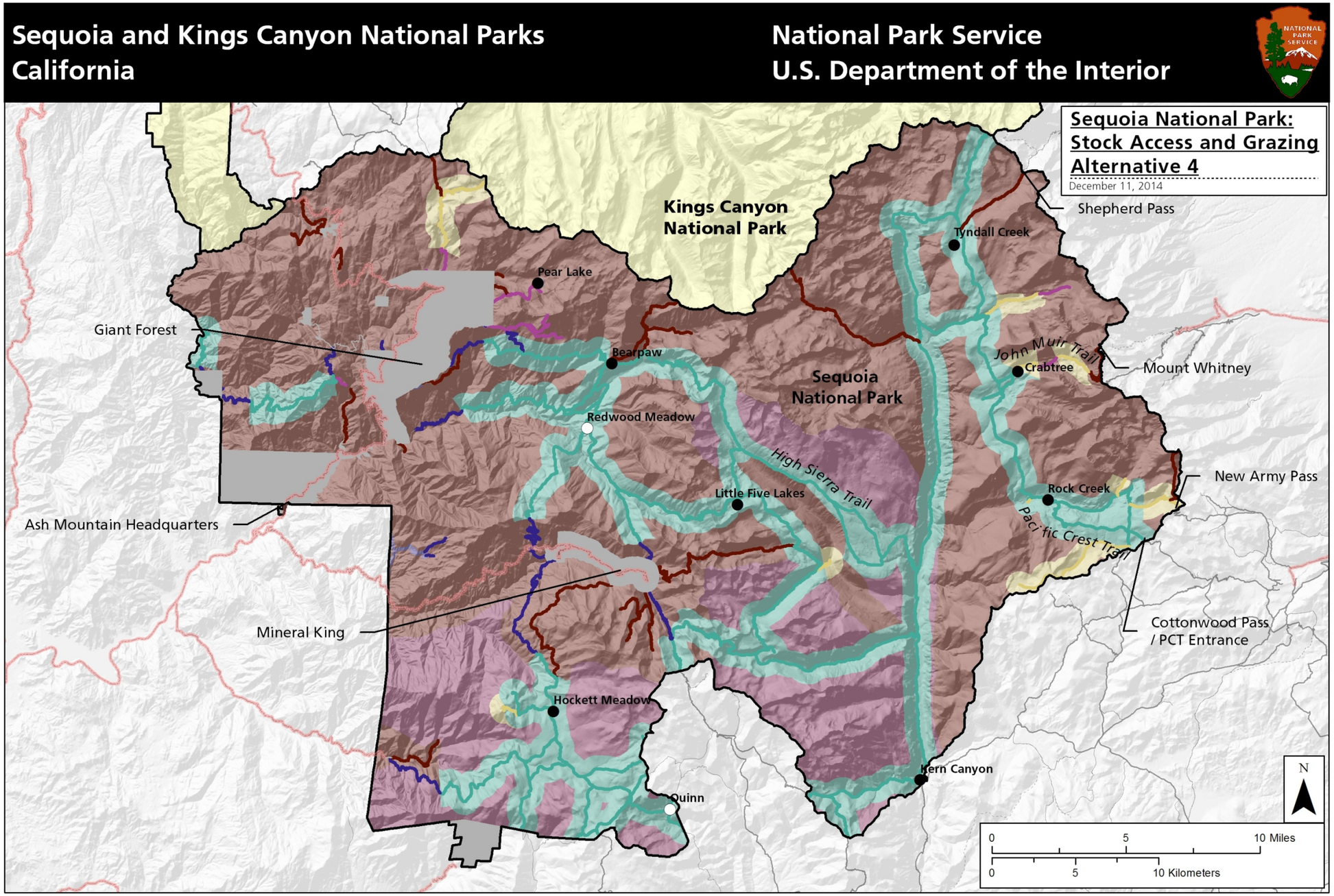

Figure 19b: Stock Access and Grazing – Alternative 4, Sequoia National Park

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ALTERNATIVE 5: EMPHASIZE OPPORTUNITIES FOR SOLITUDE

OVERVIEW

Alternative 5 General Concept: Emphasize opportunities for solitude by reducing overall visitor use.

The overarching idea behind alternative 5 is that the WSP would focus on enhancing the quality of solitude available in wilderness. To achieve this, the total number of wilderness visitors allowed in wilderness would be reduced, as would party size.

The presence of fewer visitors in wilderness would in turn allow for reduced levels of development, along with reduced restrictions on visitor behavior (fewer people need fewer facilities). Reducing the numbers of visitors would also result in reduced impacts on resources.

Trailhead quotas would be reduced to protect against future increases in use wilderness-wide, even at trailheads that currently do not have their quotas filled.

Visitation by stock users would be lower; therefore, fewer controls on stock travel and grazing would be needed in those areas open to stock use. Commercial services would be allowed, but less use would be expected overall with reduced trailhead quotas for all visitors (including commercial service providers) and reduced party sizes.

KEY ELEMENTS OF ALTERNATIVE 5

This alternative addresses the key elements as described below.

Element 1: Visitor-use Levels

Planning Objective: Visitor use and enjoyment of wilderness would be promoted while ensuring the preservation of wilderness character. In this alternative, increased opportunities for solitude would be achieved with a decrease in visitor numbers.

Permits and Quotas — Daily trailhead quotas for the most popular trailheads would be reduced by 30% wilderness-wide (e.g., a quota of 25 would be reduced to 18). Trailhead quotas for low-use trailheads (table 4 on pages 61-63) would be capped at a 10-year daily use average, calculated for the years 2003–2012, and with no quotas being established at less than 10 people per day (Note: low-use trailheads receive no more than 10 visitors per day on average during the peak season).

Existing destination quotas at Emerald and Pear lakes would be discontinued. New destination quotas may be implemented in the future for specific popular areas.

A day-use permit system with quotas would be implemented to control levels of use at popular destinations including Lakes Trail, Mist Falls, and Monarch Lakes, and potentially other areas.

The NPS would continue to work with the USFS to manage and improve the quota and permitting systems, to add trailheads currently missing from the quota system (e.g., Tehipite Valley and Kern River), and on other relevant cooperative cross-boundary wilderness management issues.

Visitor Capacities and Encounter Standards — This alternative proposes the lowest use levels across the range of alternatives and as such strongly emphasizes the solitude quality of wilderness character. This would lead to reductions in opportunities for primitive recreation by limiting use levels and access. The majority of the current types of use in wilderness would generally be retained with alternative 5. However, some proposed changes would affect the types and levels of use in specific areas. Levels of use would be notably reduced and levels of development would be somewhat reduced from that of alternative 1. The lower levels of use would also provide for the reduction of some controls, or restrictions on visitor behavior, e.g., fewer night limits. Commercial services would be reduced proportionally with overall visitor-use levels. The overnight capacities would be lowered considerably with alternative 5, by reducing daily entry quotas at the majority of trailheads.

To meet the planning objectives for this alternative, the estimated overnight visitor capacity would be approximately 93,300 VUDs/year. Ten-year average overnight use would be limited to 74,700–84,700 VUD/year. Each year, total annual VUDs would be discussed and analyzed by an interdisciplinary group at an annual meeting on wilderness management. If determined to be out of standard, management actions to bring the measure back into standard would be considered and adopted. Appendix A contains a detailed description of the methods used to develop the visitor capacity framework for this WSP.

As explained in alternative 2, and appendix A, to ensure that there are opportunities for solitude, the parks would adopt a measure of the number of people encountered per hour (EPH) on trails and would take action based on established standards. The standards would vary depending on the desired condition of solitude in a given area. For this measure, each trail would be assigned to one of four encounter-rate standards: very high use (primarily Mount Whitney and day-use areas); high use (generally Class 3 trails, with some exceptions); moderate use (generally Class 2 trails, with some exceptions); and low use (generally Class 1, with some exceptions). Each has a specified EPH that serves as a standard. The standards for alternative 4 are shown in table 38.

Table 38: Encounters per Hour Standards for Alternative 5

Measure	Standard[1]			
	Very High	High	Moderate	Low
Trail Encounters – People Encountered Per Hour– by area	25	18	11	4

[1]Interpreted as the maximum number of people encountered per hour on 90% of days within the quota season (generally from the Friday before Memorial Day through the last Saturday in September) for selected monitored trail segments.

Currently, visitors may experience encounter rates higher than the proposed standard in the areas detailed below. The actions described under this alternative, along with the management actions described in the "Mitigation Common to All Alternatives" section in this chapter and in appendix A, would be taken to return the areas to within standards (table 39 on page 199). [Note: Trail encounter data from 2012-2014 was collected opportunistically by park staff and volunteers. As a result, a larger proportion of samples occurred on weekend days and mid-day times than would be expected from a random or structured sample. A standardized sampling protocol will be developed upon completion of the WSP, and areas that are shown as out-of-standard and near standard in table 39 would be prioritized for re-sampling.]

Table 39: Trail Encounter Categories, Standards, and Proposed Management Actions for Alternative 5

Encounter Category	Encounter Standard[1]	Analysis Area	Status	Proposed Management Action
Very High	25	Mount Whitney	Out of standard	Obtain better data to confirm observations; lower limits on commercial use; reduce trailhead quotas; reduce night limits; reduce grazing limits in nearby meadows; consult with USFS regarding area use levels.
		Road's End	Out of standard	Obtain better data to confirm observations; reduce trailhead quota; explore day-use permitting.
		High Sierra Trail (Crescent Meadow to Wolverton Cutoff)	In standard	
High	18	Lakes Trail	Near standard	Obtain better data to confirm observations; reduce trailhead quota; reduce night limits; explore day-use permitting.
		Mineral King Valley	Near standard	Obtain better data to confirm observations; reduce trailhead quota; reduce night limits; explore day-use permitting.
		Little Baldy Trail	In standard	
		Paradise Creek Trail	In standard	
		Redwood Canyon	In standard	
Moderate	11	Evolution Basin & Valley (JMT/PCT)	Out of standard	Obtain better data to confirm observations; reduce trailhead quota; reduce night limits.
		Rae Lakes/JMT	Out of standard	Obtain better data to confirm observations; lower limits on commercial use; reduce trailhead quota; reduce night limits.
		Mount Langley approach	Near standard	Obtain better data to confirm observations; lower limits on commercial use; reduce trailhead quota; reduce night limits; consult with USFS regarding area use levels.
		Crabtree Ranger Station to Trail Crest	Out of standard	Obtain better data to confirm observations; lower limits on commercial use; reduce trailhead quota; reduce night limits; implement area specific restrictions.
		Rae Lakes Loop — Lower Portion	Near standard	Obtain better data to confirm observations; lower limits on commercial use; reduce trailhead quota; reduce night limits.
		West side of Kearsarge Pass	Near standard	Obtain better data to confirm observations; reduce trailhead quota; reduce night limits; implement area specific restrictions.

Table 39: Trail Encounter Categories, Standards, and Proposed Management Actions for Alternative 5 (continued)

Encounter Category	Encounter Standard[1]	Analysis Area	Status	Proposed Management Action
Moderate (continued)	11	Dusy Basin	Near standard	Obtain better data to confirm observations; lower limits on commercial use; reduce in area camping overnight limits; implement area specific restrictions.
		Twin Lakes Trailhead to Silliman Creek	Near standard	Obtain better data to confirm observations; reduce trailhead quota; reduce night limits; implement area specific restrictions.
		High Sierra Trail (Wolverton Cutoff Junction to JMT Junction)	Near standard	Obtain better data to confirm observations; reduce trailhead quota; reduce night limits; implement area specific restrictions.
		Rock Creek	Near standard	Obtain better data to confirm observations; reduce trailhead quota; reduce night limits; implement area specific restrictions.
		Little Five	Near standard	Obtain better data to confirm observations; reduce trailhead quota; reduce night limits; implement area specific restrictions.
Low	4	Sixty Lake Basin Trail (Rae Lakes 3) and Crabtree Lakes (Crabtree 1)	Out of standard	Obtain better data to confirm observations; lower limits on commercial use; reduce in area camping overnight limits; implement area specific restrictions.
		All other trails not identified above	In standard[2]	

[1] Interpreted as the maximum number of people encountered per hour on 90% of days within the quota season (generally from the Friday before Memorial Day through the last Saturday in September).
[2] Inferred from a small number of samples.

Element 2: Trails

Planning Objective: The trail system would facilitate access for visitor use and enjoyment of the wilderness. Trails would be well suited to the types and levels of visitor use (levels of visitor use would be decreased from current levels under this alternative).

This alternative calls for most trails to be maintained at their current class so that a variety of users can use them to seek solitude. A few trails would be designated hiking-only trails where there are known threats to sensitive resources, unacceptable visitor safety issues, or existing user conflicts between stock and hiker/backpacker parties. Some of the designated unmaintained routes listed in the 1986 SUMMP where stock travel does not pose undue threats to resources would be designated Class 1 stock use trails and targeted for appropriate construction and maintenance. Where trails or routes are abandoned, landscape restoration actions would be considered. See summary tables at the end of this chapter for a comparison of trail classes by mileage and use. Figure 20 depicts the wilderness trail system for alternative 5 and can be found on page 213. More details on the trail-classification system and trail management can be found in "Appendix K: Trail Management and Classification System for Sequoia and Kings Canyon National Parks."

With additional site-specific planning and compliance, new Class 1 trails could be established to protect resources when visitor use may cause undue impacts.

Element 3: Campfires

Planning Objective: Visitors would have the opportunity to enjoy campfires where campfires are compatible with the protection of vegetation and downed wood resources. In this alternative, decreased visitor use would allow campfires at higher elevations in some areas.

Recreational campfires would be allowed in the foothill and montane forest areas where adequate wood supplies exist. There would be no campfires allowed above 10,000 feet wilderness-wide. This alternative allows recreational campfires in 425,276 acres of 837,806 acres of wilderness (51%) and would increase the total area with no campfire restrictions when compared with the no-action alternative. Figure 21 depicts campfire restrictions for alternative 5 and can be found on page 215.

Element 4: Food Storage

Planning Objective: Native wildlife would subsist only on naturally obtained food, uninfluenced by the presence of human food. In this alternative, visitors would use self-reliant food-storage techniques, reflecting the lower levels of visitor use and increased opportunities for solitude; food-storage boxes would not be provided.

All food-storage boxes would be removed from wilderness. Self-determined food-storage methods would be required (i.e., visitors would be required to keep food from animals), although posting an alert guard would still be prohibited. The NPS would retain the ability to require portable containers in specific areas in the future in response to increased incidents

Element 5: Human-waste Management

Planning Objective: Human waste would not contaminate water or create unsanitary or unsightly conditions. Reflecting decreased levels of visitor use in this alternative, restrooms and privies would be removed.

Cat-holes would be required in all areas, unless visitors elected to use pack-out waste kits. Pack-out waste kits would be recommended in certain areas.

All existing public-use privies and restrooms would be removed under this alternative (including Emerald and Pear Lake restrooms). No new privies, vault toilets, or restrooms would be constructed.

The NPS would consider implementing new technologies for human-waste management as they are developed in the future. The use of new technologies would require on-site planning and compliance. Some technologies may require visitors to be more self-sufficient.

Element 6: Party Size

Planning Objective: Party size would be set at levels high enough to allow for a variety of experiences, but low enough to protect wilderness character from impacts associated with large groups. In this alternative, an emphasis on opportunities for solitude would result in a decrease in party size wilderness-wide.

Party size would be reduced wilderness-wide (tables 40 and 41).

Table 40: Party-size Limits for Hikers and Boaters for Alternative 5

Type of Trip	Maximum Party Size
On-trail (day use)	20; consider more restrictive party size for day-use in specific highly visited areas (Lakes Trail, Mist Falls, Monarch Lake, and potentially other areas).
On-trail (overnight use)	10
Off-trail (day and overnight use)	8
Area-specific	A wilderness-wide off-trail party size limit of 8 would be established. There would be a 6-person maximum party size for Redwood Canyon.

Table 41: Party-size Limits for Stock Parties for Alternative 5

Type of Stock Trip	Maximum Party Size for People and Stock
Day Rides (not including spot and dunnage)	People: 13 Stock: 13 Combined: 26
On-trail (including spot and dunnage trips that support overnight use, for those trails where stock is allowed)	People: 10 Stock: 13 Combined: 18
Off-trail	No off-trail stock use allowed
Area-specific	All existing temporary party-size limits would be removed (maximum party size of 8 in specific locations), and stock would not be allowed off-trail. Redwood Canyon party-size limits: People: 6 Stock: 6 Combined: 12

Element 7: Camping/Campsites and Night Limits

Planning Objective: Visitors would have the opportunity to choose camping locations, except in areas where camping would result in unacceptable impacts. In this alternative, decreased visitor use would allow fewer camping restrictions.

Camping would be allowed in specific areas close to the frontcountry (e.g., Colony Mill Trail, Don Cecil Trail, and North Dome) to allow for a greater diversity of recreational opportunities where risks to resources are low.

The locations of established stock camps would be identified and the NPS would recommend their use.

First Allowable Campsite — As described under alternative 2, camping would not be allowed within specified distances from each trailhead (see the "First Allowable Campsites" section under alternative 2, table 19 on page 116).

Length of Stay/Night Limits for All Campers (stock-supported and backpackers) — Under this alternative, campers would be limited to staying 10 consecutive nights in a single location, 21 total nights per trip, and 63 total nights per year. Table 42 presents exceptions to these night limits.

Table 42: Site-specific Exceptions to the Night Limits under Alternative 5

Location	Night Limits Exceptions (Consecutive Nights Stay per Location)
Colony Mill Trail, Crabtree Meadow area, Guitar Lake, and the JMT from Woods Creek Crossing to Vidette Meadow	4 night limit (at any one location)
Don Cecil Trail, Dusy Basin, Emerald and Pear lakes (combined), Kearsarge Lakes Basin (combined), Paradise Valley (whole valley), Rae Lakes (per lake), and Redwood Canyon	3-night limit
Hamilton Lake	2 night limit

Additional site-specific night limits could be applied in the future to reduce adverse impacts (both social and physical).

Designated Campsites — To preserve the unconfined aspect of recreation in the parks' wilderness there would be no designated campsites. Existing designated camping requirements at Emerald and Pear lakes, Paradise Valley, and Bearpaw Meadow would be discontinued. No new designated sites would be established.

There would be no designated stock camps.

Campsite Condition Standards — As explained in alternative 2, a metric of aggregate campsite impacts (Weighted Value per Campable Mile, WVCM) would be adopted under all alternatives to ensure that the number of campsites and their condition does not exceed standard. Under alternative 5, the WVCM standard would be: 700 for high use subzones; 350 for moderate use subzones; and 175 for low-use subzones. A monitoring plan would be developed to establish protocols and schedule monitoring frequencies to ensure that subzones remain within their applied standard.

In lower Paradise Valley

Under alternative 5, six subzones (39-4 LeConte Ranger Station, 42-2 Middle Dusy Basin, 42-5 Lower Dusy Lakes, 80-7 Lakes above Tyndall, 83-1 Guitar Lake, and 86-1 Kern Hot Spring) would be out of standard in the high-use category, and six subzones (39-7 JMT-Simpson Junction, 42-3 11,393 Lakes, 42-4 South Dusy Lakes, 80-3 Shepherd Pass Lake, 90-1 Atwell-Hockett Trail, and 90-6 Hockett Meadow) would be out of standard in the moderate category. One subzone, 47-1 Amphitheater Lake, would be out of standard in the low use subzone. All other subzones would be within standard. Management actions to return the subzones to within standards are included in the "Mitigation Common to All Alternatives" section in this chapter, for a map of campsite condition standards see figure 10, page 119; for information on determining campsite condition and standards, see appendix A, page A-15 and A-24.

Element 8: Stock Use

Planning Objective: Visitors would have opportunities to travel with stock, from day rides to multi-day trips, in a manner that ensures the protection of wilderness character. Access and grazing would be managed to protect resources, provide other types of primitive recreation, and reduce conflict of user groups. In areas where stock would be permitted, fewer restrictions would be needed to protect wilderness character given the lower levels of visitor use in this alternative. Off-trail areas would not be open to stock.

Figures 22a and 22b depict stock access and grazing restrictions for alternative 5. Figure 22a shows stock access and grazing restrictions in Kings Canyon National Park and can be found on pages 216/217. Figure 22b shows stock access and grazing restrictions in Sequoia National Park and can be found on pages 220/221.

Stock Access and Travel

On-trail — Visitors traveling with stock would continue to have access to most trails (665 of 702 miles). Stock parties would be allowed to travel up to 0.5 mile from trails in areas where they are allowed to camp. In areas open to travel only, stock parties would be allowed to travel up to 100 yards from trails.

Approximately 555 miles of maintained trails would be open to camping with stock. Some trails would be open to stock parties for travel only, some would be open to camping by walking parties with burros and llamas but limited to travel only for parties with horses or mules, and some would be closed to stock travel entirely for reasons including visitor safety, resource protection, and/or popular day-use by hikers. Trails with restricted stock access under alternative 5 are discussed below.

Trails open to stock for travel only (110 miles – includes mileages to first camps):

- Admiration Point Trail
- Alta Trails
- Big Baldy Trail
- Buena Vista Trail
- Center Basin Trail (to Golden Bear Lake)
- Dusy Basin Trail (above 10,600 feet in elevation)
- JMT along Timberline Lake

- JMT from Dollar Lake to Glen Pass
- Kearsarge Lakes, and Bullfrog Lake Trails
- Lake 11,092 Trail (shown as Lake 11,106 on older maps)
- Lakes Trail (Hump Trail only)
- Martha Lake Trail from 1 mile above Hell-for-sure Junction
- Miter Basin Trail above Penned-up Meadow to a tie-up area at 11,300 feet in elevation below Sky Blue Lake.
- Oriole Lake Trail
- Redwood Canyon area Trails
- Upper Blue Canyon Trail below 10,000 feet in elevation
- Upper Sixty Lake Basin Trail
- Wallace Lake Trail above 11,200 feet in elevation
- Wright Creek Trail above 11,200 feet in elevation

Trails open to parties with horses or mules for travel only; camping use for walking parties with burros and llamas allowed (1 mile, not including mileage to first camps):

- Eagle Lake Trail
- Mosquito Lakes Trails
- White Chief Trail

Closed to stock travel (37 miles):

- Baxter Pass Trail
- Crabtree Lakes Trail (no travel above camp at 11,000 feet in elevation)
- HST from Crescent Meadow to Wolverton Cutoff
- Lamarck Col Trail
- Little Baldy Trail
- Lower Sixty Lake Basin Trail
- Marble Falls Trail
- Monarch Lake Trail
- Mount Langley Trail
- Mount Whitney Trail – base of switchbacks to Trail Crest and summit
- Muir Grove Trail
- Paradise Creek Trail
- South Side Cedar Grove Sand Flats Trail from Zumwalt Meadow Bridge to Bubbs Creek
- Tokopah Falls Trail

- Watchtower Trail

Off-trail — Stock travel would be allowed up to 0.5 mile from maintained trails open to stock use to reach campsites. Stock travel would be prohibited more than 0.5 mile from maintained trails open to stock use.

Stock Grazing — Grazing would be managed to maximize protection of resources while allowing visitors traveling with stock continued access to forage. Grazing would generally be allowed within 0.5 mile of maintained trails open to overnight stock. Grazing would not be allowed in areas designated as open to day-use only or pass-through only.

Grazing would continue to be managed and informed by the results of the Stock Use and Meadow Monitoring Program, including the continued application of estimated grazing capacities, as described under alternative 2.

Areas closed to grazing would remain open to camping by visitors traveling with stock, but they would be required to hold and feed their animals. Administrative grazing would be managed to limit impacts on public grazing (Note: with rare exceptions, visitors are given preference for limited grazing resources).

The use of certified-weed-free forage in frontcountry areas, and of processed pellets, rolled grains, or fermented hay in wilderness, would be required as described under alternative 2.

The monitoring system described under alternative 2 and in appendix D would be employed to track use, document conditions, and provide information for preventing and mitigating impacts.

The meadows closed to grazing for scientific and social value by the SUMMP would remain closed to grazing. The meadows closed to grazing due to high levels of visitation and resource concerns by the SUMMP would remain closed with the following exception: Tom Sears Meadow would be reopened to grazing.

The following additional meadows which are otherwise open to camping with stock would be closed to grazing due to high levels of visitation and resource concerns: Crabtree Lakes (closed to stock access and grazing above the existing camp west of the lowest lake), Darwin Meadow proper, Forester Lake Meadow, Guitar Lake, Guyot Creek Meadows (expanding the existing closure to the meadows east of the trail), Kern Hot Spring Meadow, Kettle Dome (Randle Corral) meadows, Mineral King basin, Summit Lake Meadow, Upper LeConte Canyon above 10,000 feet in elevation, and Woods Lake basin (expanding the existing closure to the entire basin).

Meadows associated with areas or trails closed to stock under this alternative would also be closed to grazing.

The following restrictions in areas otherwise open to grazing would be adopted:

- Open to grazing by walking parties with burros or llamas, closed to grazing by parties with horses or mules: Bubbs Creek below Junction Meadow and Evolution Lake to Muir Pass
- Open to administrative use and grazing only: Hockett Pasture, JR Pasture, Kern Ranger Station Pastures Lackey Pasture, and Upper Redwood Meadow

Table 43 on the next page presents site-specific night and/or head limits for grazing on meadows in the parks under alternative 5.

Table 43: Site-specific Night and/or Head Limits for Grazing under Alternative 5

Location	Stock Head Limit	Night Limit
Bubbs Creek (below Junction Meadow)	13	1
Castle Domes Meadow	13	1
Charlotte Creek (below drift fence)	13	2
East Lake and Ouzel Meadows	12	2
Junction Meadow (Bubbs)	13	1
Scaffold Meadow	13	2
Shorty's Meadow	13	2
Upper Crabtree and Sandy Meadows	10	10
Upper Evolution Valley (above Evolution Meadow)	13	1
Upper Rock Creek (Rock Creek Lake and above)	13	2

Stock Use Structures — Under this alternative, 24 hitch rails would be retained and 28 hitch rails would be removed. A total of 36 fences or gates would be retained, 18 fences and gates would be removed, and one gate would be added (see tables 51a and 51b starting on page 272 at the end of this chapter).

A gate across the trail to prevent stock from drifting

Element 9: Administrative Structures

Planning Objective: Administrative structures and developments would be the minimum necessary for the administration of wilderness, but due to lower levels of visitor use, the number of administrative developments would be reduced.

Ranger Stations — With reduced use, some ranger stations could be removed. Historic buildings would be preserved for their historic value.

Ranger stations that would be retained in their current location:

- Charlotte Lake
- Crabtree
- Hockett Meadow
- Kern Canyon
- LeConte Canyon
- McClure Meadow
- Pear Lake
- Rae Lakes
- Roaring River
- Rock Creek
- Tyndall Creek

Four ranger stations would be removed and no replacement stations would be built:

- Bearpaw Meadow
- Bench Lake
- Little Five Lakes
- Monarch

The patrol cabins at Quinn, Redwood Meadow, and Simpson Meadow would be retained.

Site-specific compliance would be required for the removal of ranger stations.

Other Administrative Structures — Use of the Redwood Canyon Cabin by researchers would be terminated within two years of WSP approval. The cabin would be removed within three years of WSP approval. Future cave and other research activities in Redwood Canyon could continue but without the use of a permanent structure. Project-specific compliance would be required for the removal.

Administrative Pastures — Historically, some areas of the parks have been patrolled by mounted rangers. To maintain stock close to the patrol cabins for quick emergency response, and to reserve some grazing for park stock, some of these locations have fenced pastures. Under this alternative, the Redwood Meadow pasture fence would be removed. The Kern and Hockett Meadow pastures would be reduced in size. The Roaring River pastures would be retained.

Crew Camps — All installations solely for crew use would be removed. Trail crews would conduct trail maintenance through use of mobile operations, moving with stock or backpacks and using minimum impact camping practices. There would be no semi-permanent established camps. Project crew camps (for administration of wilderness) would be established as needed on a case-by-case basis.

Element 10: Frontcountry Facilities to Support Wilderness Access and Use

Planning Objective: Frontcountry facilities that support activities in wilderness would encourage and/or facilitate visitor use and enjoyment of wilderness.

The types and levels of commercial services that may be performed in wilderness are discussed in detail in the END (appendix B). Commercial service providers would be permitted to use some frontcountry facilities, but other facilities would only be used by non-commercial or administrative entities.

Kings Canyon National Park

Cedar Grove Pack Station — The Cedar Grove Pack Station would continue to be operated under concession authority based on a contractual relationship with the NPS. Stock camping sites would be developed at the Cedar Grove Pack Station primarily for private users. A holding pen/corral space, hitch rail(s), adequate parking and turnaround space for stock trailers, a campfire pit, picnic tables, restrooms, food-storage boxes, and water would be installed.

Sequoia National Park

Middle Fork Kaweah Trailhead — At the Middle Fork Kaweah Trailhead improved parking and turnaround space for stock trailers and hitch rail(s) would be provided; no other stock amenities would be provided (same as alternative 2). Commercial service providers would be allowed to use this trailhead.

Mineral King Area — No changes would be made at the Atwell Mill Campground in Mineral King. Stock would not be allowed to be held overnight in the campground. Commercial service providers would not be allowed to use the Atwell / Hockett trailhead.

All facilities at Mineral King administrative corrals and pack station in east Mineral King Valley would be removed and the area would be restored to natural conditions. A limited area for trailhead parking and stock turnaround below the corral site would be retained. Commercial service providers would be allowed to use the Mineral King Valley trailheads (managed by CUA permit conditions).

North Fork Kaweah Trailhead — At the North Fork Kaweah Trailhead improved parking and turnaround space for stock trailers and additional hitch rail(s) would be provided. Commercial service providers would be allowed to use this trailhead (managed by CUA permit conditions). The trailhead area would be maintained through an agreement between the NPS and a cooperating partner. No camping for stock or backpackers would be allowed.

South Fork Kaweah Campground and Trailhead — The South Fork Kaweah Trailhead would be modified to improve parking and turnaround space for stock trailers at the trailhead. In addition, a hitching post would be provided at this site. The trailhead would be primarily for private users with limited commercial (managed by CUA permit conditions) and administrative use. The site would be maintained through an agreement between the NPS and a cooperating partner.

Wolverton Area — Stock facilities at Wolverton would remain in place at their current location, but they would be modified to allow for public use by private parties and for short-term use by commercial service

providers. There would be no long-term commercial use of the facility by a resident pack station concession. The facilities would continue to be used for the parks administrative purposes. The addition of adequate parking and turnaround space for stock trailers, a corral, hitch rail(s), picnic table(s), and a campfire pit would be considered. Restrooms and water access exist at this site. The site would be maintained through an agreement between the NPS and a cooperating partner.

The above modifications to frontcountry facilities and trailheads would require site-specific planning, design, and compliance.

Element 11: Commercial Services in Wilderness

Planning Objective: Commercial services would be allowed to the extent necessary for activities which are proper for realizing the recreational or other wilderness purposes of the areas. Commercial services would support visitor use and enjoyment of wilderness in a variety of appropriate ways. Visitors with diverse backgrounds and skill levels would be encouraged to experience wilderness and to explore primitive recreation activities such as hiking, backpacking, stock trips, fishing, over-snow travel, or mountaineering, or to build skills in these activities. The types of commercial support would be similar to current conditions, but the lower overall levels of visitor use would result in lower overall levels of commercial support.

To meet the objectives of this alternative, commercial services would be needed at levels lower than those in the no-action alternative in most locations (appendix B). The percentage of total visitor use supported by commercial services would be similar to the no-action alternative to ensure that reduced access does not disproportionally affect any particular user group. The types of commercial services allowed may be expanded from the no-action alternative to support a range of recreational experiences, and to support more solitary recreation choices. Commercial services would be allowed to the extent necessary to support those visitors who want to experience wilderness but may need additional support. Table 44 presents the levels and types of commercial services.

Table 44: Levels and Types of Commercial Services under Alternative 5

Activities		Proposed Allocation of Commercial Service Days
Total Visitor-use Days – private and supported by commercial services (this does not take into account use by PCT and JMT visitors that are not recorded by the parks' wilderness permit system).	**Proposed Visitor Capacity Alternative 5** 77,700 average 93,300 maximum	For all, day and overnight, non-stock and stock-based services: 5,880
Non-stock Activities Backpacking and Hiking Trips. Overnight Camping – gear support by human porters Climbing and Mountaineering (summer and winter). Oversnow Travel (ski and snowshoe touring and winter camping – winter only [Nov. 15 to Apr 15]).	Wilderness-wide: activities that are supported by non-stock-based commercial services.	For all, day and overnight, non-stock-based services: 3,530 (60% of total commercial services)
	Mount Whitney Management Area: activities that are supported by non-stock-based commercial services.	Of the above total allocation for non-stock services, the level which can occur in the Mount Whitney Management Area between late-May and late-September: 650

Table 44: Levels and Types of Commercial Services under Alternative 5 (continued)

Activities		Proposed Allocation of Commercial Service Days
Stock-based Activities Stock trips – riding, packing, day rides and overnight camping with stock. Overnight Camping – gear support, including stock spot and dunnage	Wilderness-wide: activities that are supported by stock-based commercial services.	For all, day and overnight stock-based: 2,350 (40% of all commercial services)
	Mount Whitney Management Area: activities that are supported by stock-based commercial services.	Of the above total allocation, the level which can occur in the Mount Whitney Management Area between late-May and late-September: 350

The Bearpaw Meadow High Sierra Camp is an allowable non-conforming commercial enterprise that may continue operation within potential wilderness as authorized by Congress. The Bearpaw Meadow High Sierra Camp would continue to be operated at reduced levels of use-days by a concessioner. The size of the facility would be reduced and the season of operation would be shortened.

The Pear Lake Ski Hut would be used as a warming hut (with no overnight lodging) and would be operated by NPS. Operation by the cooperating association would be discontinued. There would be no commercial services provided.

Pear Lake Ski Hut (Ranger Station) in Sequoia National Park

On the following pages, figure 20 depicts the wilderness trail system for alternative 5, figure 21 depicts campfire restrictions for alternative 5, and figures 22a and 22b depict stock access and grazing restrictions for alternative 5.

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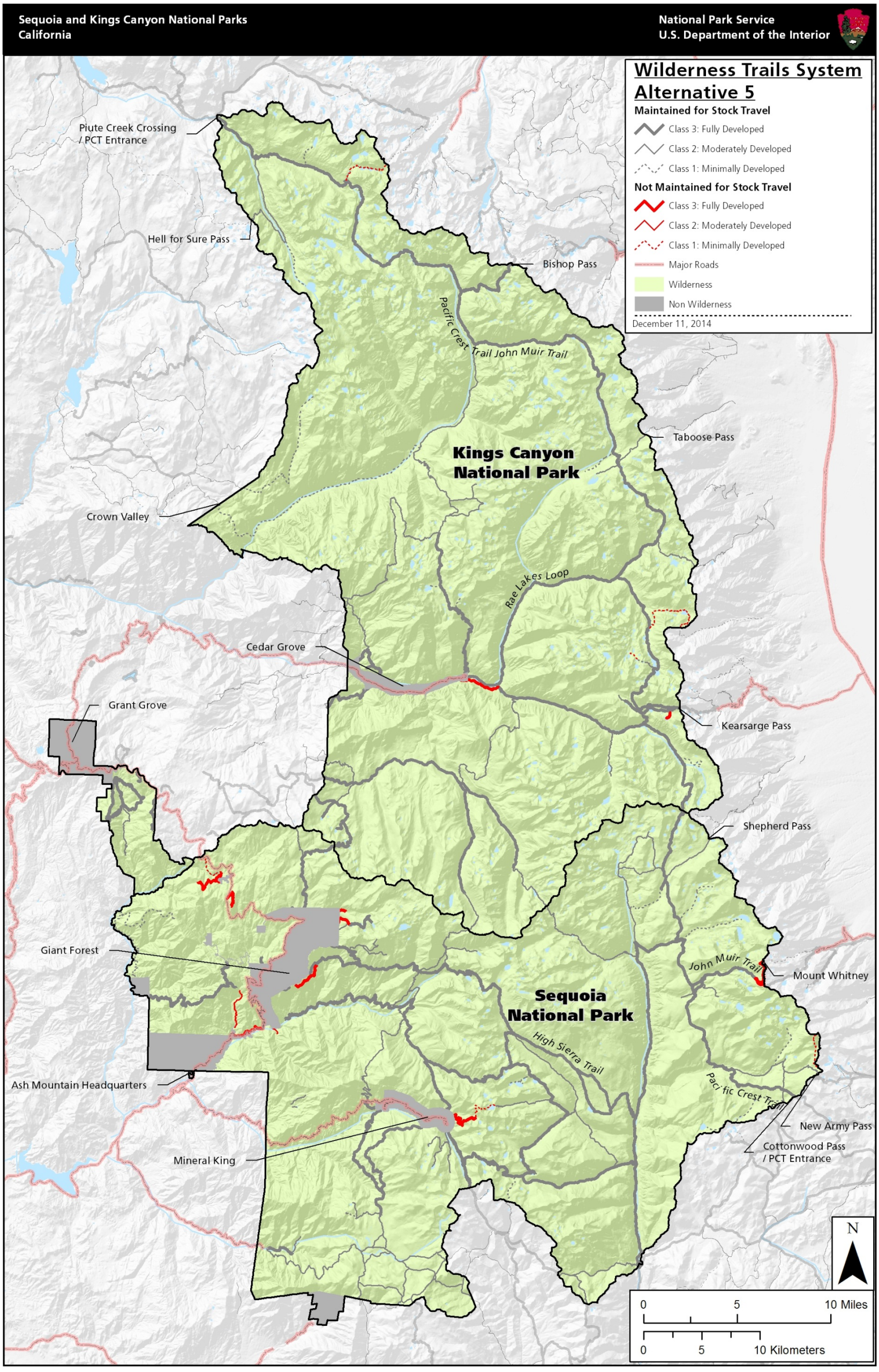

Figure 20: Wilderness Trails System – Alternative 5

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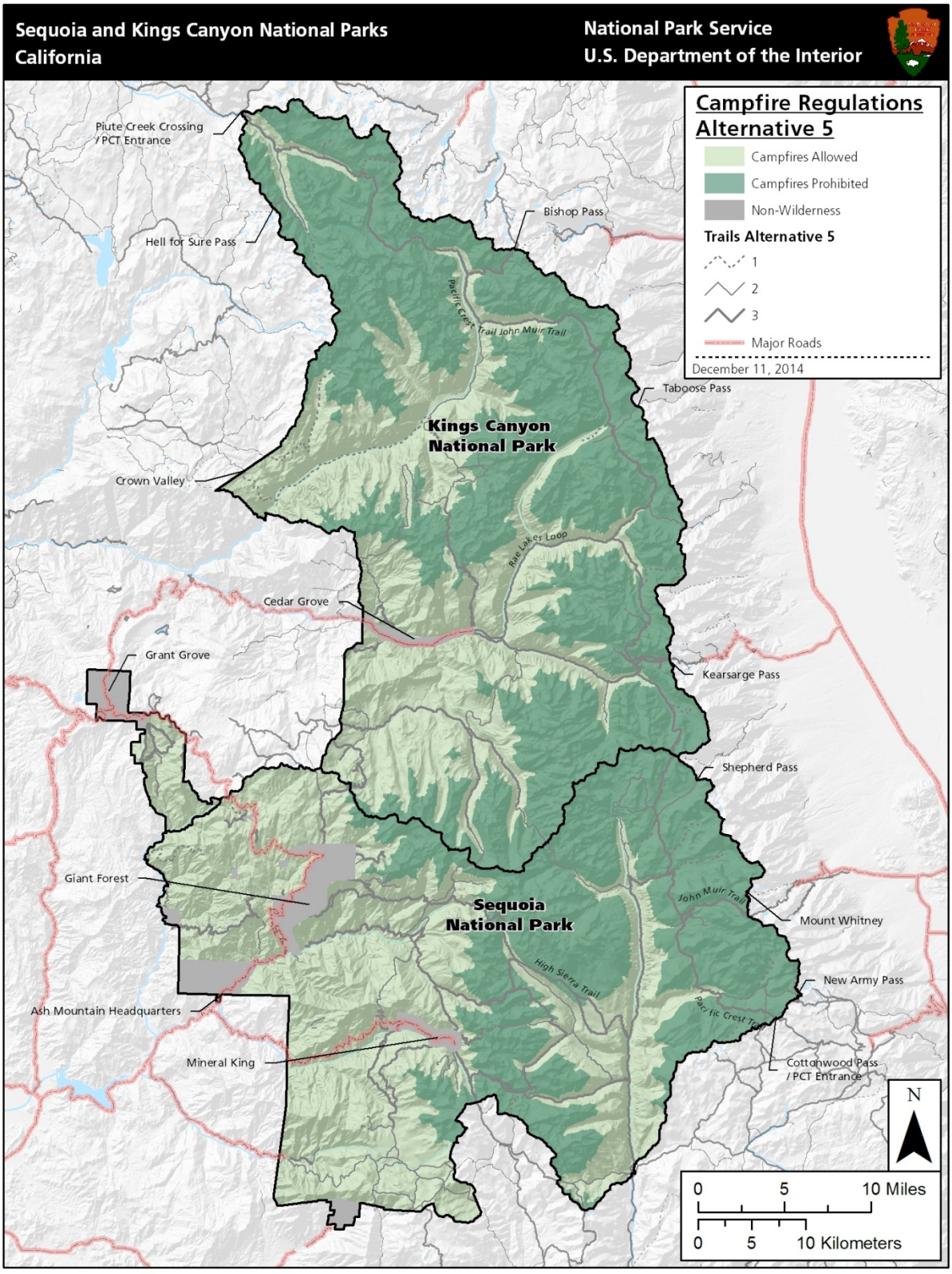
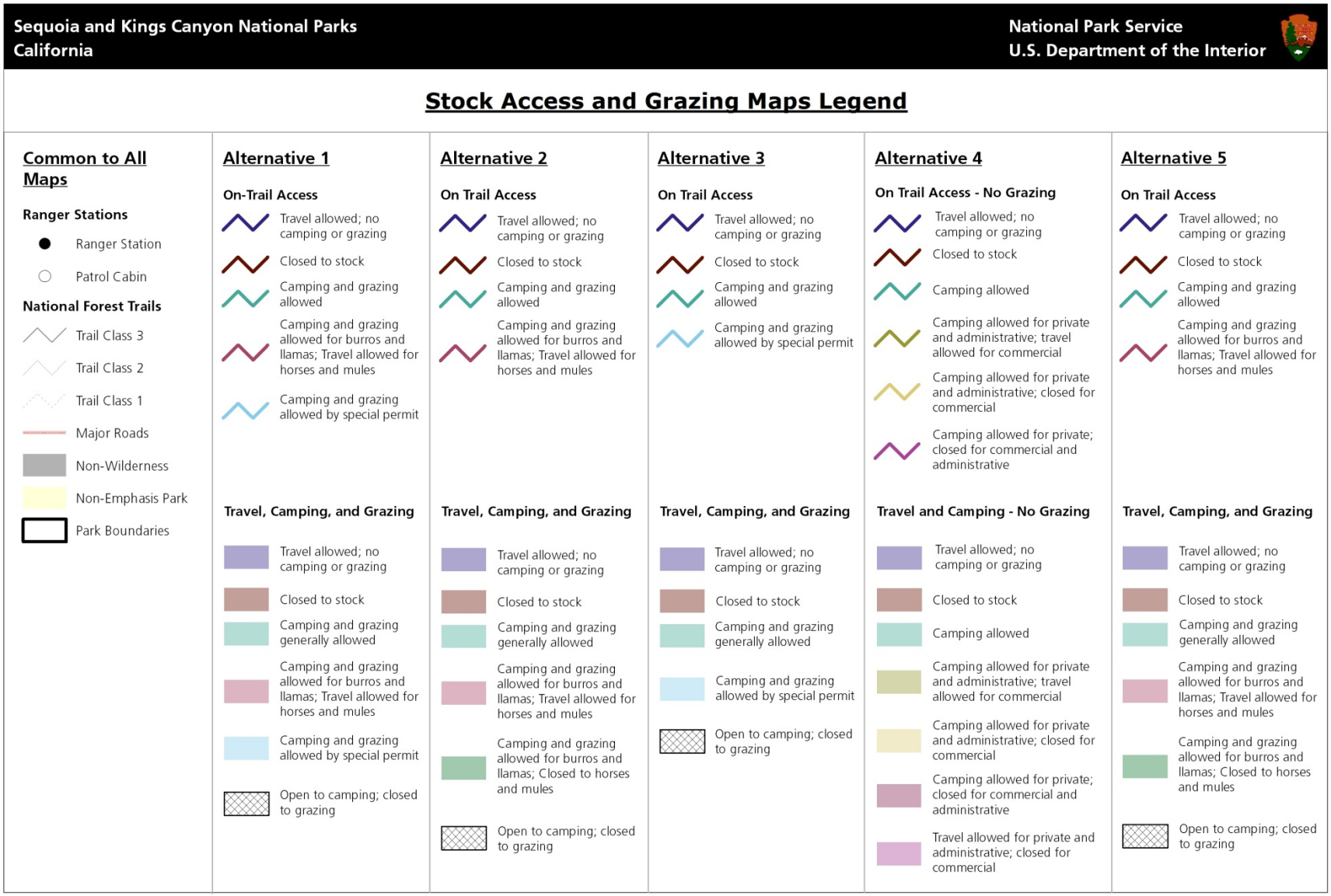


Figure 21: Campfire Regulations – Alternative 5

No campfires above 10,000 feet.



Legend to Accompany Figure 22a: Stock Access and Grazing – Alternative 5, Kings Canyon National Park

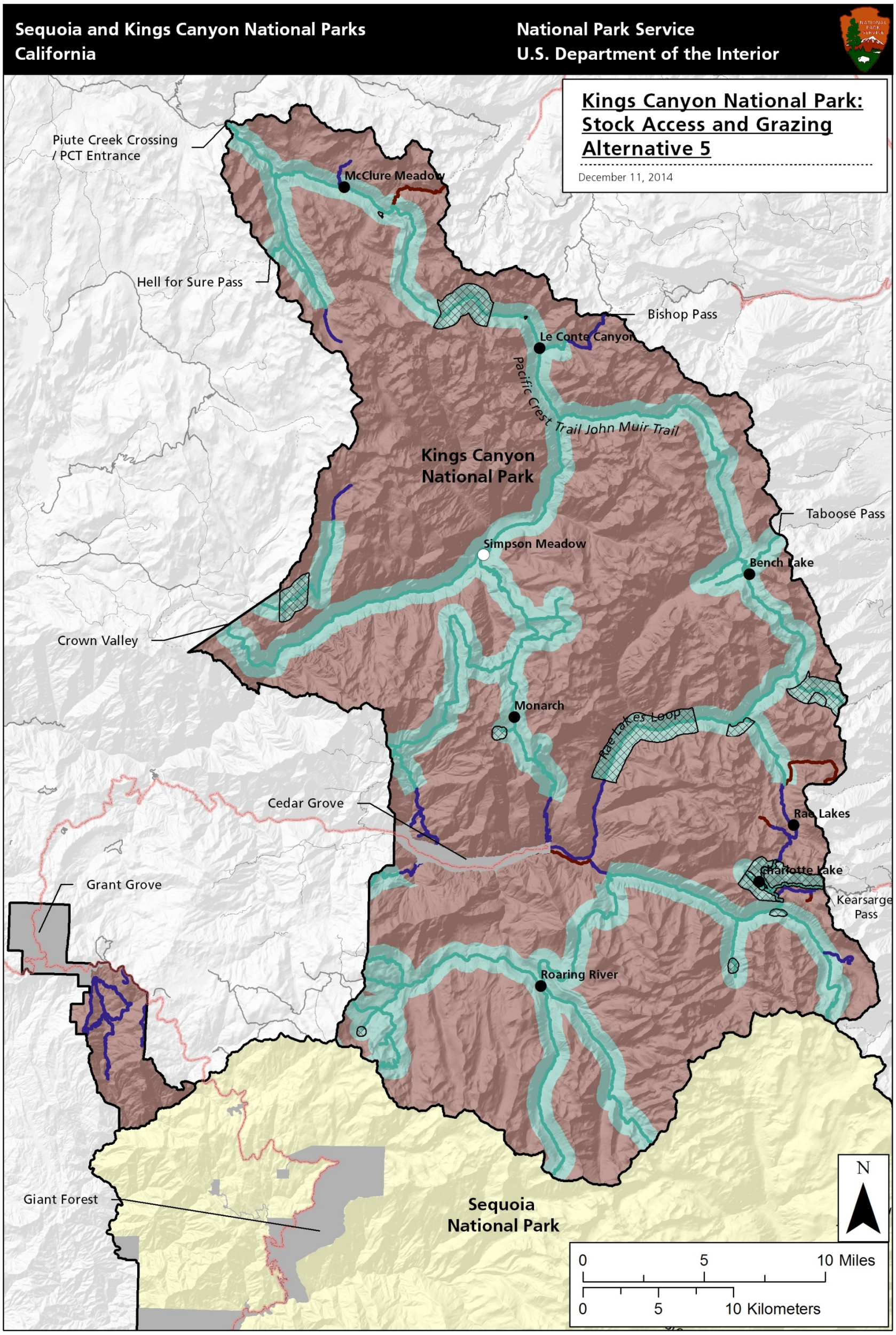


Figure 22a: Stock Access and Grazing – Alternative 5, Kings Canyon National Park

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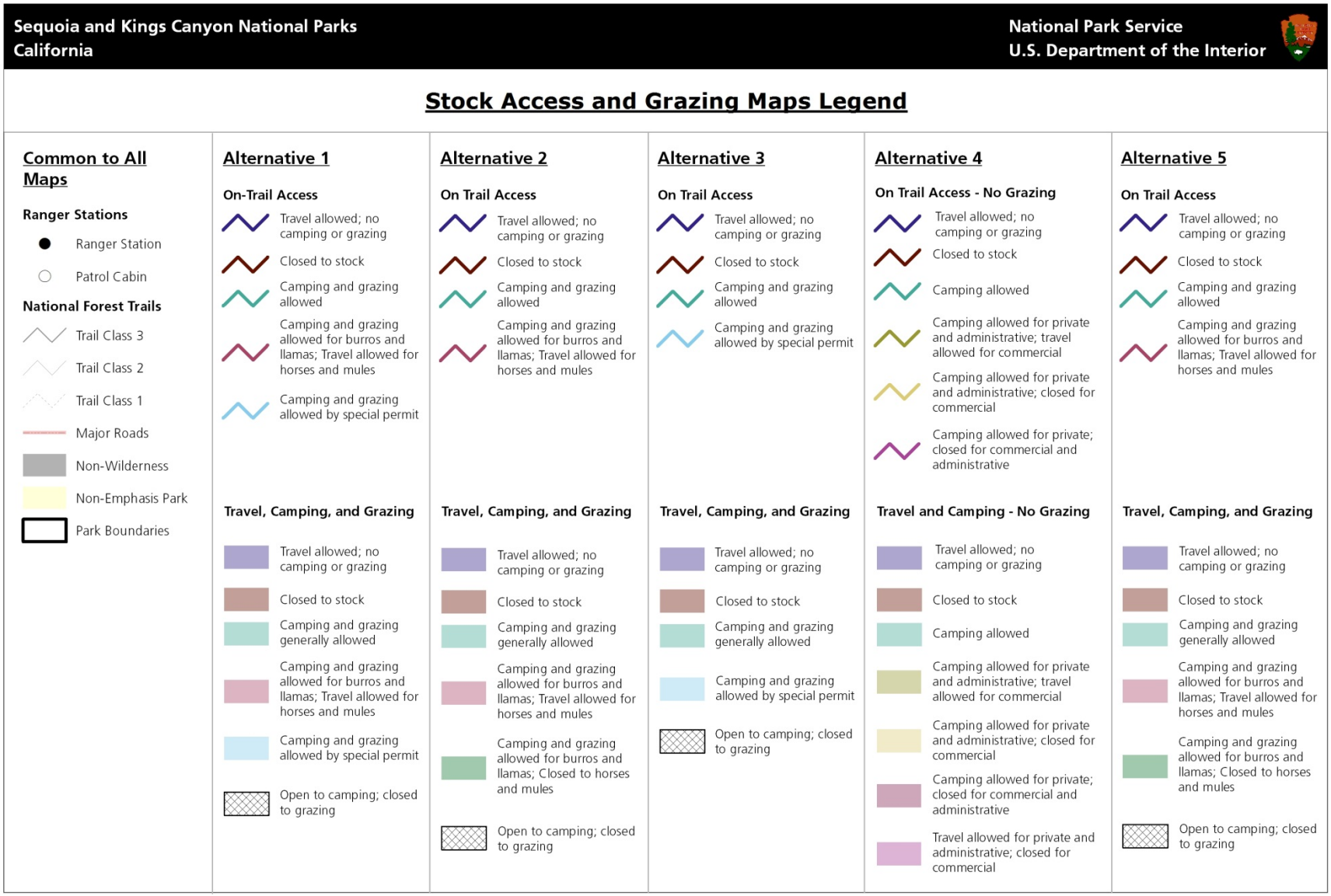

Legend to Accompany Figure 22b: Stock Access and Grazing – Alternative 5, Sequoia National Park

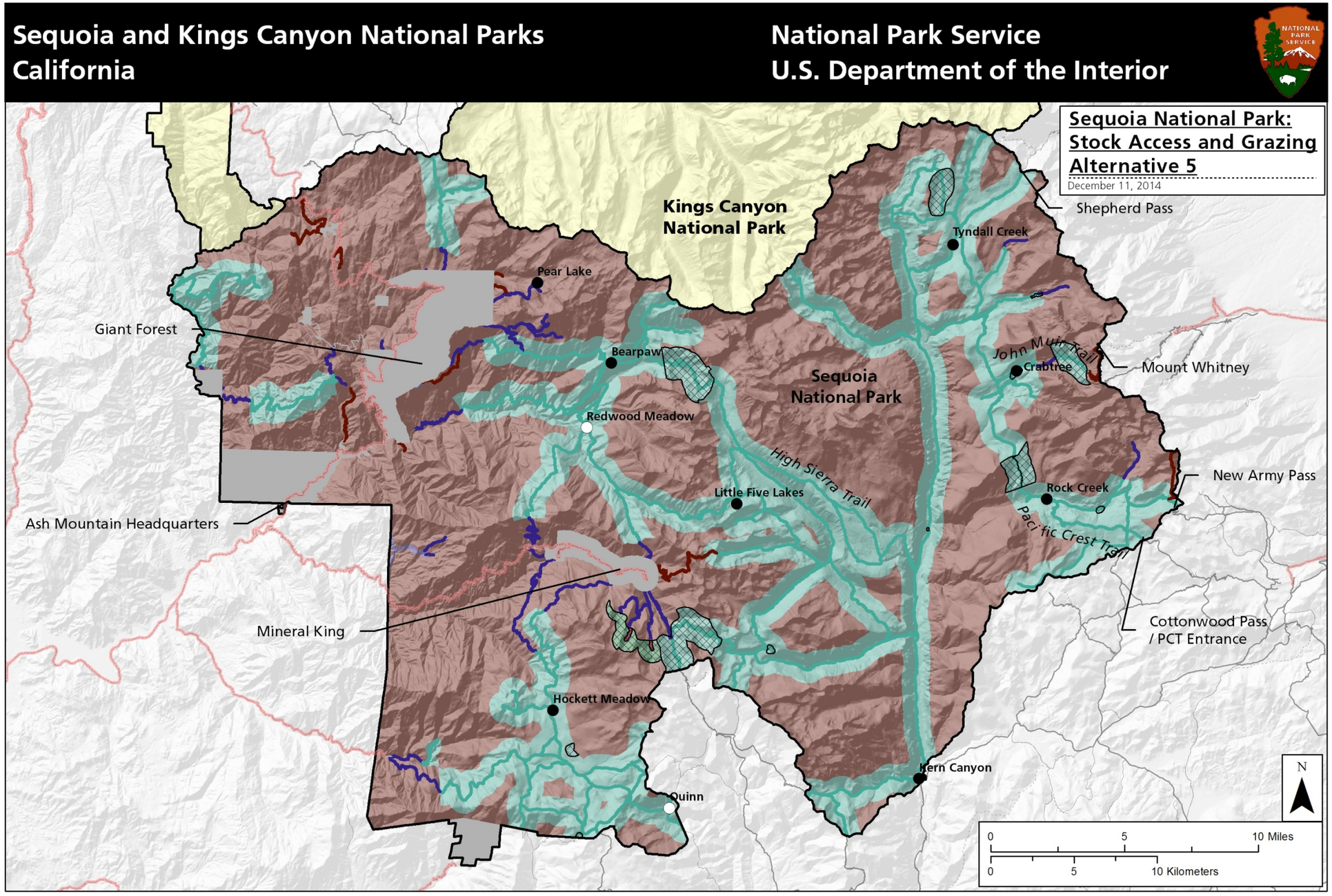

Figure 22b: Stock Access and Grazing – Alternative 5, Sequoia National Park

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PROGRAMMATIC MINIMUM REQUIREMENTS ANALYSIS

The concept of minimum requirements comes from section 4(c) of the Wilderness Act of 1964:

> . . . except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area.

Section 6.3.5 of NPS *Management Policies 2006* states that the minimum requirement concept will be a two-step process to [1] determine if the management action is necessary "for administration of the area as wilderness and does not cause a significant impact on wilderness resources and character; and [2] the techniques and types of equipment needed to ensure that impacts on wilderness resources and character are minimized." Also: "When determining minimum requirements, the potential disruption of wilderness character and resources will be considered before, and given significantly more weight than, economic efficiency and convenience."

A programmatic MRA has been prepared as part of this planning effort. This MRA process was used to help screen alternatives in anticipation of the need to authorize actions in the future while ensuring the preservation of wilderness resources and character. The programmatic MRA (appendix M) evaluates the program-level activities or actions to determine if they are appropriate or necessary for the administration of the area as wilderness, and analyzes how the selected alternative would achieve the desired conditions, focusing on the overall goal of preserving wilderness character. The programmatic MRA also provides a summary linked to the analysis in the WSP of the effects of each element on wilderness character.

The appropriately named sky pilot, which blooms at high elevations

MITIGATION COMMON TO ALL ALTERNATIVES

This plan incorporates mitigations to protect wilderness character and visitor experience under each alternative. The basis of this plan is to mitigate impacts on wilderness character. In addition, there are wilderness-specific visitor-use limits and regulations (per CFR and the Superintendent's Compendium; appendix F) that preserve wilderness character.

A summary of the mitigation measures is provided below. More detailed mitigation and monitoring strategies are found in the referenced appendices. Additional mitigation measures may be added in the future as knowledge about stressors increases.

MEASURES TO MANAGE VISITOR CAPACITY

(See appendix A)

Campsite Conditions — Management actions that could be taken to return out-of-standard areas to within standards include:

- Increase education – to the visiting public at large and to specific area visitors.
- Increase patrols to achieve compliance.
- Rehabilitate impacted areas.
- Take site-specific actions, such as modifying sites to render them uninviting to camping, or implement site-specific closures (short- or long-term) to camping.
- Close areas to camping (short- or long-term).
- Change group size, night limit and or campfire restrictions.
- Reduce commercial visitor services in out-of-standard areas.
- Change trailhead quotas.

Trail Encounters — Management actions that could be taken to return out-of-standard areas to within standards include:

- Increase education – to the visiting public at large and to specific area visitors.
- Change group size, night limits, and / or campfire restrictions.
- Reduce commercial visitor service days in out-of-standard areas.
- Change trailhead quotas.
- Require day-use or special-management-area permits.
- Implement cross-boundary actions with the USFS.

MEASURES TO PROTECT WILDERNESS CHARACTER AND VISITOR EXPERIENCE

(See appendices A, C, D, F, and K)

- Appropriate actions would be taken to protect wilderness character and its formative qualities. Any proposed mechanized equipment use, motorized transport, installation, or other 4(c) prohibited actions, would be analyzed as mandated by the Wilderness Act through the MRA process.
- Standard noise abatement measures (e.g., using the quietest available equipment/tools) and educational actions (e.g., informing the public about project work) would be implemented, as appropriate, during park operations and construction activities to reduce impacts on visitor opportunities for solitude and primitive and unconfined types of recreation.
- The NPS will coordinate with the USFS to provide best available information to the public.
- If a trail is to be closed, efforts would be taken to inform the public about the closure and possible alternative routes. The wilderness office, public affairs office, visitor centers, and park partners would also be notified.

Stock Manure Handling Best Practices — The following best management practices can reduce the impacts of stock manure and urine on the natural environment and protect aesthetic aspects of wilderness character. Scattering (kicking) manure piles increases decomposition rates, reduces odors and fly concentrations, and reduces the potential for manure to enter water bodies.

Required:

- Remove manure from within 100 feet of core camping and tie-up areas and scatter manure on dry terrain. The core camp is defined as that area within 100 feet of the fire ring or cooking area.

Recommended:

- Carry a shovel and rake, and keep them readily accessible, for use in cleaning up and naturalizing areas.
- Scatter manure whenever encountered, paying particular attention to manure piles in or near water. Remove manure piles from water whenever possible. Scatter manure that accumulates at riding break areas.
- After stock have grazed or have been held in an area, inspect the area and scatter manure piles.
- Take measures that give stock an opportunity to urinate and defecate away from water (e.g., stop to let them urinate before leading them to water to drink).
- At parking areas and trailheads, pick up and remove all manure from the parks.

MEASURES TO PROTECT WILD AND SCENIC RIVERS

- Potential impacts on outstandingly remarkable values or free-flowing character would be assessed prior to project work in accordance with the river protection measures established by parks' GMP (NPS 2007a).

MEASURES TO PROTECT EMPLOYEES

- Tree and other environmental hazards would be considered in selection/maintenance of administrative camps. Choosing camps free of hazards is preferable to altering the environment to remove hazards; altering the environment to mitigate hazards would only be done pursuant to a site-specific MRA.

- Park staff would follow wilderness safety directives.
- The safety of wilderness staff requires effective communication. Existing radio repeaters would be maintained until they can be replaced with effective new technologies that better protect wilderness character. If structures are able to be removed, the installation sites would be restored to natural conditions.
- Park staff working in wilderness would be provided training and education on how to work, live, and travel safely in wilderness settings.
- To mitigate the inherent risks involved in wilderness travel and work, park staff will be trained to perform active risk management in the course of their duties.

MEASURES TO PROTECT CULTURAL RESOURCES

- Cultural resources, including archeological sites, historic structures, and ethnographic resources, would be managed in accordance with the NHPA, and other applicable laws.
- In accordance with section 106 of the NHPA, archeological surveys and investigations would precede new construction- or project-related ground disturbance in previously undisturbed areas (e.g., the development of new trails in wilderness, the relocation of ranger stations, and for paleontological or other research excavations) to ensure that significant archeological resources are avoided to the greatest extent possible.
- The locations of administrative camps, trail reroutes, ground disturbance, and similar areas of potential impact would be assessed on a case-by-case basis.
- Work in areas where known cultural resources exist would be avoided to the extent possible.
- Archeological resources would be left undisturbed and preserved in a stable condition to prevent degradation and loss of research values unless intervention could be justified based on compelling research or site protection needs. Recovered archeological materials and associated records would be treated in accordance with NPS *Management Policies 2006*, NPS Museum Handbook, and 36 CFR Part 79.
- Should previously unknown historic or prehistoric resources be unearthed during any project implementation, work will be halted in the discovery area, the site secured, and parks' cultural resource specialist notified. A qualified cultural resource management specialist will examine the area as soon as possible and will follow the procedures of 36 CFR Part 800.13[c].
- The parks would continue to provide federally recognized tribes with appropriate access to sacred sites and ethnographic resources in wilderness. Information received during tribal consultations will assist cultural resources management.
- Mitigation measures for structures and landscapes include documentation according to standards of the Historic American Buildings Survey/Historic American Engineering Record/Historic American Landscape Survey. The level of this documentation, which includes photography, archeological-data recovery, and/or a narrative history, would depend on significance (national, state, or local) and individual attributes (an individually significant structure, individual elements of a cultural landscape, etc.) of the resources. It would be determined in consultation with the CA SHPO, tribal historic preservation officer(s), local community (-ies), and/or other interested parties. When demolition of a historic structure is proposed, and following thorough documentation, its architectural elements and objects may be salvaged for reuse in rehabilitating similar structures or they may be added to the parks' collection. In addition, the historical alteration of the human environment and reasons for that alteration would be interpreted to national park visitors.

- Designs that are sensitive to and compatible with historic resources and cultural landscapes would be used for new construction. If adverse impacts could not be avoided, these impacts would be mitigated by strategies determined through a consultation process with all interested parties.

MEASURES TO PROTECT NATURAL RESOURCES

The following practices would be followed when importing stock and feed into the parks:

- California or Nevada certified weed-free forage (baled or loose hay, hay cubes, or straw bedding) would be required when hay products are used as supplemental forage or bedding in the frontcountry. This requirement would be included in pack station concession contracts and commercial use authorizations.
- Feed carried into wilderness would be commercially processed pellets, rolled grains, or fermented hay. These products have a high level of mechanical milling, heat treatment, and/or anaerobic fermentation that destroys seeds. Baled or loose hay and compressed hay cubes, which have little to no processing, would not be allowed in wilderness. This applies to all users: administrative, commercial, and private.
- Stock users would be encouraged to purge their animals for three days on pellets, rolled grains, fermented hay, or certified weed-free forage prior to entering the parks.
- As a desired practice, stock would be inspected and cleaned by handlers prior to entering the parks, or prior to moving from frontcountry to wilderness within the parks, to remove any plant parts, seeds, or soil that may have adhered to animals, tack, or equipment. Packers would handle loads and tack in such a way as to avoid picking up plant parts, soil, or mud. This desired practice would be included in pack station concession contracts and commercial use authorizations. Private stock users would be informed of this practice through outreach and education.
- Manure that accumulates in corrals would be removed from the parks and not stockpiled or burned within the parks. This requirement would be included in pack station concession contracts.
- As a desired practice, NPS administrative corrals and concessioner pack stations would be kept free of invasive plants within a 50-foot buffer of the facility. This will be the responsibility of the NPS corrals and concessioner pack station staff. Invasive plant staff will monitor sites for invasive plants and consult on appropriate management strategies. Because there is limited time and funding to accomplish this practice, invasive plant staff will continue to work with corrals and concessioner staff to control invasive plants in the highest-risk facilities.

The following practices will be followed to protect wilderness vegetation:

- As a desired practice, the Ash Mountain helibase and frontcountry helispots will be kept free of invasive plants within a 50-foot buffer of the facility to reduce the risk of contaminating clothing, shoes, gear, and external loads. Cargo nets will be inspected and cleaned after use, particularly after use outside the parks or in low elevations. This will be the responsibility of heliport staff. Invasive plant staff are available to consult.
- Helicopter users would be responsible for inspecting and cleaning their gear, clothing, boots, and external load items for plant seeds, plant parts, and caked dirt and mud before loading. Helitack staff would inspect and clean helicopter skids.

- Heliport staff will track helicopter landing sites and cargo net drops and provide locations to a designated contact annually. Invasive plant, heliport, and wilderness ranger staff will work together to survey for new introductions and control invasive plants in wilderness helispots.
- Trailheads would be inspected for invasive plants and kept weed-free. Invasive plant staff would work with trailhead rangers and trail crews to inspect for and remove invasive plants.
- When travelling from frontcountry to wilderness; from lower to higher elevations; from areas of known weed infestations (communicated in training); or to or from meadows, riparian areas, or other wetlands; wilderness users should inspect, remove, and properly dispose of plant seeds, plant parts, and caked dirt and mud found on clothing, boots, tools, and camping equipment. Disposal consists of removing the seed, plant parts, and dirt from clothing and equipment at the origin of the material, or bagging the seeds, plant parts, and dirt and disposing in bagged garbage. Public users would be informed of this practice through outreach efforts.
- Invasive plant staff will strive to train all parks personnel in invasive plant identification, early detection, and reporting
- Where possible, crews would use established stock camps, trail crew camps, and backpacker camps. When a project requires that a new site be established for crew camping, appropriate Resource Management and Visitor Protection subject matter experts would be consulted regarding camp selection. Paramount in selecting a new site would be the ability to restore the site once the work project is completed and the camp is no longer needed.
- Park staff would use scrim, a coarsely woven fabric, or other protective coverings to protect vegetation where concentrated activities (such as administrative camps) would otherwise be likely to have long-term adverse impacts on ground cover.

The following practices will be implemented to protect natural resources and federally listed species (see the "Measures to Minimize Impacts on Federally Listed Species" section below for specific practices to protect federally listed species).

(See appendices D, F, K, and N)

- Park staff will comply with food storage, garbage disposal requirements, and the proper treatment of human waste at all times.
- Proposed trail realignments in designated critical habitats will require review by NPS biologists or ecologists.
- Projects will avoid in-stream work when possible. If in-stream work is required, activities will be coordinated with NPS hydrologists and compliance specialists.
- When new raised causeways are required to prevent increasing trail associated resource impacts or to provide adequate trail footing, these causeways will be constructed so as to minimize the effects on natural hydrologic processes, in consultation with a NPS hydrologist.
- Management actions that will be taken to return campsites in out-of-standard areas to within standard include: increased education to the public in specific areas; increased ranger patrols to achieve compliance; rehabilitation of impacted areas, site-specific actions such as modifying sites to render them uninviting to camping or implementation of site specific short- or long-term closures to camping; changing group size, night limit, or campfire restrictions; reduction of commercial visitor services in out-of-standard areas; and changing trailhead quotas.
- Management actions that will be taken to return out-of-standard trail encounters to within standard include: increased education to the public in specific areas; changing group size, night

limit, or campfire restrictions; reduction of commercial visitor services in out-of-standard areas; changing trailhead quotas; require day-use or special-management-area permits; and implementation of cross-boundary actions with the USFS.

- A monitoring system is employed to track use, document conditions, and provide information for preventing and mitigating impacts from stock grazing. The monitoring program takes into account variation in annual climate, the characteristics of specific forage areas, and the inherent abilities of different species to withstand grazing and trampling pressure. The strategy for managing stock use is designed to prevent significant impacts to meadows through implementation of multiple complementary monitoring protocols and a suite of adaptive management tools. Taken together, the complementary elements of the management program at the parks—monitoring, which includes residual biomass and bare ground, stock use, species composition, repeat photography, and regularly scheduled site visits; an opening date system based on moisture, soil, and vegetation conditions; management tools including the ability to rest meadows when needed, as well as adjust use levels through controls on party size and length of stay; and ongoing research into meadow function and the effects of grazing on meadow ecology—is designed to protect meadows by preventing, minimizing and/or mitigating impacts.
- The NPS would adjust the number of nights a given party may graze an area; adjust the number of stock per party that may graze an area; adjust opening dates to reflect moisture conditions to prevent unacceptable mechanical disturbance to surface soil and vegetation; and temporarily close an area to stock access or grazing in order to protect meadow resources.

MEASURES TO MINIMIZE IMPACTS ON FEDERALLY LISTED SPECIES

The following measures will be implemented as required by the USFWS biological opinion for the WSP/FEIS (2015) to minimize adverse effects to the Northern Distinct Population Segment of the mountain yellow-legged frog, Sierra Nevada yellow-legged frog, and the Yosemite toad. These measures are non-discretionary.

- Camping by humans, and grazing and pasturing by stock will be carefully managed, and in some areas prohibited, in meadows and other aquatic areas where the Northern Distinct Population Segment of the mountain yellow-legged frog, Sierra Nevada yellow-legged frog, and the Yosemite toad are breeding or using the area in large numbers.
- Park staff and visitors will be educated about how to avoid impacting the mountain yellow-legged frog, and encouraged to exercise caution when they encounter the animal.
- The parks will provide the USFWS with a copy of the annual Stock Use and Meadow Monitoring field reports within ten (10) working days of completion.
- The parks will provide the USFWS with a copy of any scientific or management report completed on the three listed amphibians and activities included in the WSP within ten (10) working days of issuance.

To further limit the potential for adverse effects to federally listed species from the presence of hikers and stock, the following conservation measures would be implemented under all action alternatives:

- Existing trails that go through or near meadows used by the Yosemite toad may be rerouted away from those meadows.
- Park staff and visitors will be educated about how to avoid impacting the Yosemite toad and encouraged to exercise caution when they encounter these animals.

- Monitoring will be used to determine if effects of visitor use on the Yosemite toad or its habitat are approaching unacceptable levels; visitor use will be adjusted in Yosemite toad habitat to prevent or mitigate degradation.
- Existing trails that run immediately adjacent to waters used by the mountain yellow-legged frog may be rerouted away from these areas.
- New Class 1 trails may be designed to avoid running immediately adjacent to waters used by the mountain yellow-legged frog.
- Park staff will educate hikers and stock users about the status and importance of the mountain yellow-legged frog, the NPS' efforts to restore and conserve them, and encourage exercising caution when they encounter the animal.
- If monitoring detects habitats used by the mountain yellow-legged frog as being degraded due to overuse from stock grazing and/or hiker and stock traffic, visitor use restrictions could be changed to prevent or mitigate degradation.
- Off-trail travel may be limited near certain mountain yellow-legged frog populations to reduce the potential of trampling.
- New Class 1 trails will be constructed in a manner that minimizes opportunities for people to approach bighorn sheep from above or constructed completely outside of bighorn sheep habitat. Limiting human approaches from above would be beneficial because bighorn sheep generally run uphill when alarmed (Hicks and Elder 1979).
- Educational efforts cautioning park staff and visitors not to directly approach bighorn sheep will be increased.
- Helicopter use in bighorn sheep habitat will be scheduled to avoid sensitive periods (e.g., lambing season) and would avoid flying low or landing within one mile of bighorn sheep.

STRATEGIES TO ADDRESS CLIMATE CHANGE COMMON TO ALL ACTION ALTERNATIVES

- Under anticipated climate change scenarios, the NPS may need to increasingly emphasize strong prevention and early detection measures to keep nonnative plants from invading newly suitable sites at higher elevations.
- Recognizing that changes in climate are likely to lead to changes in meadow conditions, "Appendix D: Stock Use and Meadow Monitoring and Management Strategy" includes specific provisions for re-evaluating and modifying grazing levels in order to prevent unacceptable changes in plant productivity, species composition, and soil condition. Results from the Sierra Nevada Inventory and Monitoring network Wetland Ecological Integrity protocol will document changes occurring in ungrazed meadows, providing information on reference conditions that can be applied to wilderness management. In addition, ongoing research assessing the vulnerability of wilderness meadows to hydrologic changes anticipated under a changing climate would inform grazing management.

ALTERNATIVE ELEMENTS CONSIDERED BUT DISMISSED FROM DETAILED ANALYSIS

During the scoping and planning process, other management approaches were considered. Six management actions were considered and dismissed for the following reasons:

- **Bear Poles or Wires** — The NPS would not consider installation of bear poles or bear wires under any alternative, and would remove any remnant poles or wires. Bear poles and bear wires are developments in wilderness that have been tested by past management at the parks and have been found ineffective. These installations would also create an increased workload for maintenance staff.
- **Hockett Plateau High Sierra Camp** — The GMP called for the consideration of a new commercial high sierra camp on the Hockett Plateau. However, this option has been rejected from consideration due to the 2009 Omnibus Act requiring the area to be managed as wilderness (PL 111-11, March 30, 2009, 123 STAT. 991). Constructing a new camp would be inconsistent with the Wilderness Act and would create additional developments in an area managed as wilderness.
- **Flotation Devices** — The GMP includes the comprehensive plan for Wild and Scenic Rivers and established measures to preserve the outstandingly remarkable values for designated river segments within the parks. One of the protective measures was the prohibition of flotation devices, boats, and rafts on the South Fork of the Kings River (from the Bubbs Creek confluence with the South Fork Kings downstream to the park boundary). All other Wild and Scenic Rivers in the parks are open to flotation devices. This decision will not be revisited during the development of this WSP.
- **Elevational Limits for Grazing** — Elevation is known to be a driver of biophysical processes — including plant productivity and decomposition — and thus influences the ability of meadows and uplands to sustain grazing. However, other factors such as moisture availability are equally important and do not always correlate with elevation. Therefore, after careful consideration, a single elevation limit above which grazing would be prohibited was dismissed from detailed analysis. To allow continued access to areas able to sustain grazing while providing for resource protection, estimated grazing capacities for wilderness meadows have been developed using a model of biomass production and forage consumption that takes into account not only elevation, but also soil moisture and condition of the meadow. The capacities are also informed by vulnerability to erosion or change in hydrologic function, susceptibility to invasion by nonnative plants, habitat requirements of sensitive plants and animals, productivity and the ability to sustain herbage removal, and the requirements of unique ecological communities such as peat-accumulating wetlands. Should grazing be allowed, these site-specific grazing capacities would be refined on an ongoing basis to protect resource integrity and wilderness character in the face of a changing climate.
- **Manure Bags** — The requirement for all stock users to utilize "manure bags" on their animals was considered but dismissed. While these may be effective in urban environments or for day trips during which stock only wear them for several hours, these were not designed for wilderness use. They are not suitable for typical trips in the parks' wilderness because animals would be required to wear them for many hours or days, and it would concentrate large amounts of waste, resulting in waste disposal issues in wilderness.

  Manure bags are known to chafe the skin of stock, and the parks do not consider them a feasible alternative for use on stock traveling long distances and for long time periods on the trails in

wilderness. Manure handling mitigations to guide stock users in properly treating stock manure will be provided to wilderness stock users.

- **Equipment and Materials Transported Into Wilderness** — Members of the public, including commenters on the WSP/DEIS, have expressed divergent views about what equipment and materials are appropriate to bring into wilderness, and have proposed that NPS restrict certain types of equipment and materials that other wilderness visitors are permitted to bring, especially when using support by a commercial service provider. These parks have concluded that restricting items that are not already addressed by current law and policy is unnecessary and impracticable, and that current restrictions are sufficient to protect wilderness character. For example, wilderness visitors, regardless of their use of commercial support, are restricted from using items identified as prohibited in Section 4(c) of the Wilderness Act. Wilderness visitors are also required to comply with a number of wilderness and NPS regulations (see "Appendix F: Wilderness Regulations, Restrictions, and Permit Conditions") that are designed to minimize visitors' impacts on wilderness character and other visitors. These parks have considered but dismissed additional restrictions on equipment and material that are not prohibited by existing law and policy. Equipment and materials that have been proposed for additional restrictions include:

  - Electronics such as GPS units, portable music devices, satellite phones, and cell phones - Some wilderness visitors may find that the use of hand-held and other electronic devices (such as personal locator beacons and satellite phones) reduces their ability to experience solitude and self-reliance. The Wilderness Act does not prohibit the uses of these personal electronic devices. The NPS, while not prohibiting these devices, encourages visitors to minimize the support of modern technology to take full advantage of the wilderness experience. While the NPS does not restrict electronics in wilderness, it does regulate noise (see "Appendix F: Wilderness Regulations, Restrictions, and Permit Conditions"). Despite the prevalence of technology in modern society, 29% of wilderness visitors who responded to a 2011 survey (Martin and Blackwell 2013) reported traveling without any hand-held technology. This number increased to 34% for cross-country wilderness travelers. The devices most commonly used by wilderness visitors were cameras (39.4%), smartphones (29%), GPS units (25.5%), tablets/media devices (19.5%), and other cell or satellite phones (21%) (Martin and Blackwell 2013).

  - Camp support equipment, such as chairs, tables and ice chests - These items provide for some level of comfort for wilderness travelers and are not inconsistent with wilderness character preservation, or appropriate wilderness experiences. It is worthwhile to note that the issue of what some visitors deem to be "unnecessary items" was presented and ruled on in HSHA vs. U.S. Department of Interior, May 29, 2012. The court in denying the validity of the claim of "unnecessary items," stated "It is not appropriate for one group of the parks' users to impose its vision of wilderness etiquette over others." (High Sierra Hikers Association v. U.S. Department of the Interior, 2012 U.S. Dist. LEXIS, 74124 (N.D. Cal.))

  - Food packaging, such as plastic and foil - Plastic and foil are a commonly used lightweight method of storing and carrying food into wilderness, and if properly used pose no threat to wilderness character. There are restrictions on improper use of these materials (e.g., littering and abandoning property).

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

The CEQ defines the environmentally preferable alternative as ― the alternative that would promote the national environmental policy as expressed in NEPA § 101. Section 101 states that it is the continuing responsibility of the federal government to:

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. Assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
3. Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;
4. Preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice;
5. Achieve a balance between population and resource use which would permit high standards of living and a wide sharing of life's amenities; and
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The identification of the environmentally preferable alternative was based on analyses that balance factors such as physical impacts on the environment, mitigation measures to minimize impacts, and achievement of short- and long-term goals for protecting and improving wilderness character.

For a comparison of the alternatives and the potential environmental effects under each alternative, see "Table 45: Summary of Alternatives by Element" on page 237 and "Table 53: Summary of Impacts" on page 285. A full discussion of impacts is presented in "Chapter 4: Environmental Consequences."

All of the alternatives would fulfill all of the above CEQ requirements to some degree. The action alternatives would fulfill these requirements somewhat equally, through continuation of existing wilderness and resource management policies, ecological restoration of fragile meadow and riparian areas, protection of water quality, and protection of archeological resources. The alternatives would vary primarily in protection of historic resources, sensitive meadows and riparian areas, protection of downed wood and sensitive species, and the diversity of recreational (primitive and unconfined) opportunities and opportunities for solitude provided to the public. All alternatives provide for as safe an environment as possible, given that wilderness recreation involves inherent risks.

The NPS has determined that alternative 5 is the environmentally preferable alternative. Alternative 5 best promotes the requirements of the national environmental policy expressed in section 101(b) of NEPA. It is the alternative that causes the least amount of impacts on the biological and physical environment and that best protects, preserves, and enhances historic, cultural, and natural resources, and best achieves the short- and long-term goals for protecting and improving wilderness character. Alternative 5 best meets these requirements. A brief summary of how the environmentally preferable alternative was selected follows below.

Alternative 1 (no-action / status quo) preserves important historic, cultural, and natural aspects of our national heritage. It also provides for diversity and variety of primitive and unconfined recreational choice; however, it would not best fulfill any of the other requirements, particularly at popular areas, including Mount Whitney, where high levels of visitor use during busy periods would continue to

adversely affect visitor solitude, and potentially affect sensitive natural resources. Natural resources such as wetlands and meadows would continue to be affected by trampling and grazing from stock use in meadows open to grazing. As this alternative does not address the existing management concerns in a proactive manner, and would not specifically ensure the protection of wilderness character, this alternative is not the environmentally preferable alternative.

Alternative 2 is similar to alternative 1 in that it provides for diversity and a variety of primitive and unconfined recreation, but it would implement additional restrictions in selected areas to preserve or better protect natural resources and the visitor experience in those areas. Management strategies implemented under this alternative would improve conditions at the most popular areas in the wilderness, protecting ecologically sensitive areas, improving the natural quality of wilderness, and enhancing opportunities for solitude. The implementation of grazing capacities and the closure of selected meadows would result in an improvement of the natural quality of wilderness, while preserving opportunities for primitive and unconfined recreation. Removing some developments also improves the natural and undeveloped qualities under this alternative. However the removal of a significant historic resource at Bearpaw Meadow results in an adverse effect on a cultural landscape. Overall, impacts on natural resources would be similar to current conditions but with some increased beneficial effects due to the implementation of management strategies in popular areas. This alternative fulfills most of the CEQ requirements, but based on the environmental analysis in chapter 4, would result in fewer environmentally beneficial effects overall than alternative 5. Therefore this alternative was not selected as the environmentally preferable alternative.

Alternative 3 would allow for increased visitor use resulting in more recreational opportunities and individual choice. It would also impose the most restrictions on visitor use wilderness-wide. Alternative 3 would result in the most new facilities and increased encounter rates, resulting in the greatest adverse impact on the wilderness qualities of undeveloped and solitude when compared with the other alternatives. Although use would be allowed to increase with increases in the quota numbers, it is likely that only the quotas to busy areas would continue to be met; therefore these effects would be limited to the most popular areas. Similar to alternative 2, this alternative removes a significant historic resource at Bearpaw Meadow resulting in an adverse effect on a cultural landscape. Alternative 3 results in adverse impacts on some natural resources including soils and alpine vegetation due to an increase in visitors, stock, and development wilderness-wide, but it also results in beneficial effects on other resources such as high-elevation long-lived trees due to reduced impacts from firewood collection. Because of the potential for increased use resulting in increased adverse effects, this alternative is not the environmentally preferable alternative.

Alternative 4 would be similar to alternative 5 in preserving and protecting natural resources. Beneficial effects on soils, water quality, vegetation (wetlands and meadows), invertebrates, and special-status species would occur due to decreases in the number of stock that would likely result because there would be no grazing wilderness wide. There would be further restrictions on commercial access. Therefore, there would be reduced opportunities for primitive and unconfined recreation, and reduced recreational diversity and variety of individual choice. This alternative is the most protective of high-elevation forests because there would be no campfires allowed wilderness-wide, enforces the greatest restrictions on Yosemite toad habitat, and has substantial beneficial effects on native plant communities. However this alternative would result in the most adverse effects on cultural and historic resources. In addition to removing a significant historic resource at Bearpaw Meadow as does alternatives 2 and 3, this alternative also removes three ranger stations that are listed or eligible for listing on the National Register resulting in an adverse effect on these cultural resources. Alternative 4 would create the most improvement in the undeveloped quality, but may result in a reduced level of wilderness management overall. When weighing the overall effects of alternative 4, it would rank as the second-most environmentally preferable alternative.

Alternative 5 supports diversity and variety of individual choice, protects solitude without degradation or other undesirable consequences, and protects wilderness character and qualities. However, alternative 5 would reduce overall opportunities for primitive recreation. By reducing overall use levels, alternative 5 does not attain the widest range of beneficial uses of the environment nor achieve a balance between population and resource use. In addition, this alternative along with the other action alternatives removes a historic resource at Bearpaw Meadow resulting in an adverse effect on a cultural landscape. Alternative 5 is similar to alternatives 3 and 4 in preserving and protecting natural resources. Beneficial effects on soils, water quality, vegetation (wetlands, meadows, and alpine), invertebrates, and special-status species would occur due to decreases in administrative and commercial stock use, reduced stock-party size, reduced trailhead quotas, and closure of some meadows to grazing. However, this alternative is not as protective of high-elevation long-lived trees as alternative 4, as campfires would continue to be allowed, and would not be as protective of meadows as alternative 4, since grazing would continue to be allowed. Alternative 5 would best fulfill the responsibilities of the NPS to select the alternative that has the least amount of impacts to the biological and physical environment; that balances the preservation and protection of natural, aesthetic, historic, and cultural resources with visitor use, therefore, it is the environmentally preferable alternative.

SUMMARY AND COMPARISON OF ALTERNATIVES AND IMPACTS

This section includes tables which present more detailed comparisons of the five alternatives considered in this WSP/FEIS by wilderness management element.

SUMMARY TABLES

Table 45 provides a summary of the alternatives by each wilderness management element, excluding Element 10: Frontcountry Facilities that Support Wilderness Access and Use. In addition, there are more detailed summary tables for specific elements:

- Table 46 compares trailhead quotas under each alternative (element 1).
- Tables 47a to 47f provide information on mileage of trails by class and designation for hikers and stock users under each alternative (element 2).
- Table 48 and table 49 give party-size limits for hikers and stock users under each alternative (element 6).
- Table 50 provides a comparison of stock access and grazing under each alternative (element 8).
- Table 51a and 51b provide the list of stock facilities and a comparison of these facilities between alternatives (element 8).
- Table 52 summarizes actions regarding frontcountry facilities that support wilderness under each alternative (element 10).
- Table 53 summarizes the impacts of each alternative on each resource. More detail on the alternative impacts analysis can be found in chapter 4.

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Table 45: Summary of Alternatives by Element

[Note: See table 52 on page 279 for Element 10: Frontcountry Facilities to Support Wilderness Access and Use]

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Element 1: Visitor-use Levels Permitting/Quotas *See comparison table 46 on page 246.*	Trailhead quotas exist at most locations.	Trailhead quotas would remain the same or be slightly reduced in high-use areas.	Trailhead quotas would be increased by 10% in some areas.	Daily trailhead quotas would remain the same or be slightly reduced in highest use areas compared to alternative 1. Trailhead quotas in low-use areas would be reduced from those of alternative 1.	Trailhead quotas would be reduced by 30% wilderness-wide.
Element 1: Visitor-use Levels Destination Quotas	Destination quotas apply for Emerald and Pear lakes.	Existing destination quotas would continue to be applied. Additional destination quotas may be added for specific areas (e.g., Bearpaw, Dusy Basin, Guitar Lake, Hamilton Lake, Monarch Lakes, Rae Lakes, and other areas).	Existing destination quotas would continue to be applied. No additional destination quotas would be added.	Existing destination quotas would continue to be applied. Additional destination quotas may be added in the future for specific areas including Bearpaw, Dusy Basin, Guitar Lake, Hamilton Lake, Monarch Lake, Rae Lakes, and potentially others.	Existing destination quotas would be discontinued. New destination quotas may be implemented for specific popular areas.
Element 1: Visitor-use Levels Day-use Permits and Quotas	There are no day-use permits/quotas.	No day-use permits/quotas would be implemented at this time but they may be considered in the future in the most popular areas to meet desired conditions.	No day-use permits/quotas would be implemented.	Same as alternative 2.	Day-use quotas would be applied in specific areas (e.g., Lakes Trail, Mist Falls, Monarch Lake, and potentially other areas).
Element 2: Trails *See comparison tables 47a through 47f starting on page 246. Appendix K has more details on the trail management and classification system.*	There is currently no trail classification system. Trails are maintained, relocated, or reconstructed per the NPS Trail Maintenance Handbook standards and the BMP and SUMMP. No new trail construction is authorized.	A trail management and classification system would be established and trails would be designated Class 1, 2 or 3 and maintained to trail class. Some Class 3 trails would be downgraded to Class 2. Some Class 2 trails would be downgraded to Class 1. New Class 1 trails would be established to protect resources; some Class 1 trails would be abandoned.	A trail management and classification system would be established and trails would be designated Class 1, 2 or 3 and maintained to trail class. Some Class 2 trails upgraded to Class 3. New Class 1 trails could be established or abandoned to protect resources. Some Class 1 trails upgraded to Class 2.	A trail management and classification system would be established and trails would be designated Class 1, 2 or 3 and maintained to trail class. Some Class 3 trails downgraded to Class 2. Most Class 2 trails would be maintained to Class 2, but some would be upgraded to Class 3 or downgraded to Class 1. Some Class 1 trails would be abandoned.	A trail management and classification system would be established and trails would be designated Class 1, 2 or 3 and maintained to trail class. Most trails would be maintained at their "current" class.
Element 2: Trails Signs	Trail signs with directional markers and mileages are present. Interpretive signs are generally not authorized.	Signs would be appropriate to trail class.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.
Element 3: Campfire Restrictions	Recreational campfires would be allowed in the foothill and montane forest areas where adequate wood supplies exist. Recreational campfires would continue to be allowed up to: 10,000 feet in the San Joaquin and Kings river drainages. 9,000 feet in the Kaweah River drainage. 10,400 feet in the Kern River drainage.	Recreational campfires would be allowed in the foothill and montane forest areas where adequate wood supplies exist. Recreational campfires would be allowed up to: 10,000 feet in the San Joaquin, Kern, and Kings River drainages. 9,000 feet in the Kaweah and Tule River drainages.	Recreational campfires would be allowed in the foothill and montane forest areas where adequate wood supplies exist. Recreational campfires would be allowed up to 9,000 feet wilderness-wide.	No campfires in wilderness.	Recreational campfires would be allowed in the foothill and montane forest areas where adequate wood supplies exist. Recreational campfires would be allowed up to 10,000 feet wilderness-wide.

Table 45: Summary of Alternatives by Element (continued)

[Note: See table 52 on page 279 for Element 10: Frontcountry Facilities to Support Wilderness Access and Use]

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Element 3: Campfires Site-specific Variations	Additional site-specific prohibitions are in place in the Kings, Kaweah, Kern, and Tule River drainages.	In areas where available wood could be burned without unduly depleting ground fuels or consuming important resources, variances could be established. Site-specific prohibitions would be implemented at: Hamilton Lakes, Mineral King Valley, Pinto Lake, Redwood Canyon, and in selected sequoia groves.	No variances would be established. Site-specific prohibitions would be implemented in the most popular areas (e.g., PCT/JMT, Rae Lakes Loop, HST, Mineral King Valley, and Rock Creek drainage) and in selected sequoia groves.	N/A: No campfires in wilderness.	No variances would be established. Site-specific prohibitions would be implemented in selected sequoia groves.
Element 3: Campfires Summary	Allows recreational campfires in 398,829 acres of 837,806 acres of wilderness.	Allows recreational campfires in 395,710 acres of 837,806 acres of wilderness.	Allows recreational campfires in 293,840 acres of 837,806 acres of wilderness.	Allows recreational campfires in 0 acres of wilderness.	Allows recreational campfires in 425,276 acres of 837,806 acres of wilderness.
Element 4: Food-storage Food-storage Boxes	There are 86 food-storage boxes currently in wilderness and these would remain.	Of the existing 86 food-storage boxes, 48 would be retained and 26 would be removed. An additional 13 food-storage boxes would be tested prior to removal. Food-storages boxes would be retained in highest use areas (e.g., Rae Lakes Loop, HST). Some boxes could be relocated.	Existing food-storage boxes would be retained; however, they may be relocated. Up to 35 new food-storage boxes would be added in key areas.	All food-storage boxes would be removed.	Same as alternative 4.
Element 4: Food-storage Portable Container Requirements	Portable food-storage containers are required for overnight use at Rae Lakes Loop and vicinity, Dusy and Palisades basins, and in the Rock Creek area.	Portable containers would be required for overnight use at North Dome, Dusy Basin, Rae Lakes Loop and Rock Creek areas, and may be required in other areas.	Existing portable container requirements would be modified based on the locations of additional food-storage boxes. Additional portable container requirements would be implemented in specific areas as needs arise.	Portable containers would be required for all overnight users wilderness-wide.	The NPS would retain the ability to require portable containers in specific areas.
Element 4: Food-storage Requirements – Commercial Guides	Commercial guides (stock and hiking) are required to use portable containers wilderness-wide (CUA condition).	Same as alternative 1.	Same as alternative 1.	Same as alternative 1.	Same as alternative 1.
Element 4: Food-storage Other Methods	Counterbalancing and hanging food is allowed. Guarding food items is not allowed.	Counterbalancing and hanging would be allowed in areas where containers are not required. Guarding food items is not allowed.	Same as alternative 2.	Counterbalancing and hanging and guarding food items would not be allowed.	Self-determined food-storage methods would be required (counterbalancing and hanging food or portable containers). Guarding food items would not be allowed.
Element 5: Human Waste Cat-holes	Cat-holes are required where there are no privies/restrooms.	Same as alternative 1.	Cat-holes would be required where there are no privies/restrooms except in areas where pack-out waste kits are required.	Cat-holes would be required (except in areas with pack-out waste kit requirements).	Cat-holes would be required in all areas. Visitors may elect to use pack-out waste kits.

Table 45: Summary of Alternatives by Element (continued)

[Note: See table 52 on page 279 for Element 10: Frontcountry Facilities to Support Wilderness Access and Use]

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Element 5: Human Waste Privies and Restrooms	There are two restrooms and 21 privies in wilderness.	Existing privies and restrooms (Emerald and Pear lakes) would be evaluated and those beyond reasonable repair or in unsuitable locations (low-use, close-in areas, where soils allow for cat-holes) would be removed. Nine public-use privies would be retained; seven public-use privies would be removed; one public-use privy would be added at Rock Creek Crossing. New privies would be considered for high day-use areas. Five additional privies/restroom buildings could be removed if maintaining them becomes cost prohibitive or if pack-out waste kit testing is successful.	All existing privies and restrooms would be retained. New privies would be considered for popular day-use areas (e.g., Heather Lake) and popular overnight areas.	All existing privies and restrooms would be removed (including Emerald and Pear Lake restrooms), except those affiliated with administrative structures. No new privies, vault toilets, or restrooms would be constructed.	Same as alternative 4.
Element 5: Human Waste Pack-out Waste Kits	Pack-out waste kits are highly recommended in the Mount Whitney area.	Pack-out waste kits may be required in certain areas to minimize the need for privies and restrooms.	Pack-out waste kits would be required in the Mount Whitney area. Existing privies would remain and be maintained in their current locations.	Pack-out waste kits would be recommended or required in popular areas.	Pack-out waste kits would be recommended in certain areas.
Element 6: Party Size Hikers and Boaters *See comparison table 48 on page 264.* *Note: Off-trail restrictions apply to both day users and overnight users.*	On-trail (day use) party size limit of 25 On-trail (overnight use) party size limit of 15. Off-trail party size limit of 15.	On-trail (day use) party size limit of 25 On-trail (overnight use) party size limit of 15. Off-trail party size limit of 12 (day use and overnight use) except in areas with specific lower limits (see below).	On-trail (day use) party size limit of 25 On-trail (overnight use) party size limit of 15. Off-trail party size limit of 15 (day use and overnight use).	On-trail (day use) party size limit of 25 On-trail (overnight use) party size limit of 12. Off-trail party size limit of 8. (day use and overnight use)	On-trail (day-use) party size limit of 20. On-trail (overnight use) party size limit of 10. Off-trail party size limit of 8.
Element 6: Party Size Recreational Stock Users *See comparison table 49 on page 265.* *Note: Off-trail restrictions apply to both day users and overnight users.*	Maximum party sizes include: On-trail (day-use) – (including day rides, spot and dunnage) – 25 people; 20 stock; combined maximum of 45. On-trail – 15 people; 20 stock; combined maximum of 35 (with some lower exceptions). Off-trail – 15 people; 20 stock; combined maximum of 35.	Maximum party sizes include: Day Rides – 20 people; 20 stock; combined maximum 40. On-trail – 15 people; 20 stock; combined maximum 28. Off-trail – 12 people; 12 stock; combined maximum 14.	Maximum party sizes include: Day Rides – 25 people; 25 stock; combined maximum 50. On-trail –15 people, 25 stock; combined maximum 40. Off-trail – 15 people; 25 stock; combined maximum 40.	Maximum party sizes include: Day Rides – 15 people; 15 stock; combined maximum 30. On-trail – 12 people; 15 stock; combined maximum 20. Off-trail – 8 people; 7 stock; combined maximum 11.	Maximum party sizes include: Day Rides – 13 people; 13 stock; combined maximum 26. On-trail – 10 people; 13 stock; combined maximum 18. Off-trail – No off-trail stock use allowed.

Table 45: Summary of Alternatives by Element (continued)

[Note: See table 52 on page 279 for Element 10: Frontcountry Facilities to Support Wilderness Access and Use]

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Element 6: Party Size Area-specific Restrictions *See comparison tables 48 and 49 on pages 264 and 265.*	Temporary party-size limits of 8 (number of people and stock combined) in five off-trail areas (Darwin Canyon, Dusy Basin, Mount Whitney / Mount Langley, Sixty Lake Basin, and Sphinx Lakes).	Existing off-trail temporary party-size limits of 8 would be adopted permanently at Darwin Canyon/Lamarck Col (includes Class 1 trail area), Dusy Basin, Mount Whitney / Mount Langley (includes Class 1 trail area), Sixty Lake Basin, and Sphinx Lakes. Upper Goddard Canyon/Martha Lake would have a party-size limit consistent with the off-trail party size (12 people, 12 stock, combined maximum of 14). Combined party size of 8 (people and stock) for day rides into Sixty Lake Basin. Trail closed to stock beyond a point 1.8 miles from the junction of the JMT and the Sixty Lake Basin Trail. Combined party size of 8 (people and stock) for day rides above Penned Up Meadow on the Class 1 trail into Miter Basin.	Existing temporary party-size limits would be removed (party size of 8). A party-size limit of 4 would be implemented for camping at North Dome.	Existing temporary party-size limits would be removed and replaced with a wilderness-wide off-trail party size of 8.	Existing temporary party-size limits would be removed and replaced with a wilderness-wide off-trail party size of 8. Consider more restrictive party size for day-use in specific highly visited areas (Lakes Trails, Mist Falls, Monarch Lake, and potentially other areas).
Element 6: Party Size – General Area-specific Restrictions – Redwood Canyon	Redwood Canyon: maximum of 10 stock and maximum hiker party size of 10 people.	A party-size limit of 10 people or 10 people with 10 stock (combined maximum of 20) would be retained for Redwood Canyon.	A party-size limit of 10 people or 10 people with 10 stock (combined maximum of 20) would be retained for Redwood Canyon.	A party-size limit of 8 people or 8 people with 8 stock (combined maximum of 16) would be implemented for Redwood Canyon.	A party-size limit of 6 people or 6 people with 6 stock (combined maximum of 12) would be implemented for Redwood Canyon.
Element 6: Party Size – General Area-specific Restrictions – Milestone Basin	Milestone Basin maximum of 8 stock, by special permit only.	N/A: Closed to stock.	Same as alternative 1.	N/A: Closed to stock	N/A: Closed to stock.
Element 7: Camping/Campsites Allowable camping relative to wilderness boundary or trailhead – *See first allowable campsite tables 8, 9, and 19 on pages 68, 69, and 116.*	Camping would continue to be prohibited within 1 mile of any road and generally within 4 miles of a developed area or trailhead complex.	Camping would be prohibited within specified distances from each trailhead and 1 mile from any frontcountry development.	Same as alternative 2.	Same as alternative 2.	Same as alternative 2.
Element 7: Camping/Campsites Close-in Camping Areas	None	Allow camping in specific close-in areas (e.g., Colony Mill Trail, Don Cecil Trail, and North Dome).	Same as alternative 2.	No camping in specific close-in areas (e.g., within 2 miles of either trailhead on the Colony Mill Trail; on the entire Don Cecil Trail).	Same as alternative 2.
Element 7: Camping/Campsites Existing Designated Campsites	Designated camp area exists at Bearpaw Meadow and designated campsites exist at Emerald and Pear lakes and Paradise Valley.	Existing designated sites at Emerald and Pear lakes, lower Paradise Valley, and the designated camp area at Bearpaw Meadow would be retained.	Same as alternative 2.	All existing designated sites at Emerald and Pear lakes, Paradise Valley, and the camp area at Bearpaw Meadow would be removed.	Existing designated sites at Emerald and Pear lakes, Paradise Valley, and the camp area at Bearpaw Meadow would be removed.
Element 7: Camping/Campsites New Designated Campsites	No additional designated campsites would be established.	Additional designated sites or camp areas could be established at selected high-use areas, including but not limited to: Dusy Basin, Guitar Lake, Kearsarge Lakes Basin, Middle and Upper Rae Lakes, and Woods Creek Crossing.	Additional designated sites would be established in selected popular areas, including but not limited to Dusy Basin, Evolution Valley, Guitar Lake, JMT, Kearsarge Lakes Basin, Middle and Upper Rae Lakes, Mineral King Lake Basins, PCT, Redwood Canyon, and Woods Creek Crossing.	No new designated sites would be established at this time.	Same as alternative 4.

Table 45: Summary of Alternatives by Element (continued)

[Note: See table 52 on page 279 for Element 10: Frontcountry Facilities to Support Wilderness Access and Use]

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Element 7: Camping/Campsites Universally Accessible Sites	None	One or more universally accessible campsites closer to the trailhead would be considered (Potential location to consider – near the confluence of Bubbs Creek and South Fork Kings River).	Same as alternative 2.	None	None
Element 7: Camping/Campsites Stock Users	No camps would be designated for the exclusive use of stock users with the exception of Upper and Lower Funston Meadows. No other camps are designated for the exclusive use of stock users.	In specific high-use locations, stock users may be required to camp in designated stock camps (e.g., Big Pete Meadow, Rock Creek Crossing, and Woods Creek Crossing). These sites would be stock user only camps. Upper and Lower Funston would no longer be designated stock camps.	In specific, high-use locations, stock users may be required to camp in designated stock camps, These sites would be stock user only camps.	There would be no designated stock camps.	Same as alternative 4.
Element 7: Camping/Campsites Night Limits	Visitors are limited to 14 consecutive nights at a single location, 21 consecutive nights per trip, and 63 total nights per year except for the specific areas below.	Visitors would be limited to 14 consecutive nights at a single location, 25 consecutive nights per trip, and 75 total nights per year except for the specific areas below.	Visitors would be limited to 7 consecutive nights at a single location, 20 consecutive nights per trip, and 60 total nights per year except for the specific areas below.	Visitors would be limited to 10 consecutive nights at a single location, 21 consecutive nights per trip, and 63 total nights per year except for the specific areas below.	Visitors would be limited to 10 consecutive nights at a single location, 21 consecutive nights per trip, and 63 consecutive nights per year except for the specific areas below.
Element 7: Camping/Campsites Area-specific Night Limits	2-night limit at Charlotte Lake, Hamilton Lake, Kearsarge Lakes, Paradise Valley, and Redwood Canyon. 1-night limit at Rae Lakes, per lake.	3-night limit at Emerald and Pear lakes (combined) and at Soldier Lake. 2-night limits at Charlotte Lake, Colony Mill Trail, Crabtree area, Don Cecil Trail, Dusy Basin, Guitar Lake, the JMT from Woods Creek Crossing to Vidette Meadow, Kearsarge Lakes Basin, North Dome, Paradise Valley, and Redwood Canyon. 1-night limit at Hamilton Lake and 1-night limit per lake at Rae Lakes.	2-night limit at Charlotte Lake, Colony Mill Trail, Crabtree area, Don Cecil Trail, Dusy Basin, Emerald and Pear lakes (combined), Guitar Lake, Hamilton Lake, Kearsarge Lakes Basin, North Dome, Paradise Valley, Redwood Canyon, and Soldier Lake. 1-night limit per lake at Rae Lakes, at any one location on the JMT between Vidette Meadow and Woods Creek Crossing.	4-night limit at Crabtree area and Soldier Lake. 3-night limit at Charlotte Lake, Colony Mill Trail, Emerald and Pear lakes (combined), Guitar Lake, the JMT from Woods Creek Crossing to Vidette Meadow (at any one location), North Dome, and Redwood Canyon. 2-night limits at Dusy Basin, Hamilton Lake, Kearsarge Lakes Basin, Paradise Valley, and Rae Lakes (per lake).	4-night limits at Colony Mill Trail, Crabtree area, Guitar Lake, and the JMT from Woods Creek Crossing to Vidette Meadow. 3-night limits at Don Cecil Trail, Dusy Basin, Emerald and Pear lakes (combined), Kearsarge Lakes Basin (combined), Paradise Valley (whole valley), Redwood Canyon, and Rae Lakes (per lake). 2-night limit at Hamilton Lake.
Element 8: Stock Use Access and Travel On-trail *See tables 47a through 47f starting on page 246 for specific trail mileages.*	On-trail: Currently nearly all maintained wilderness trails in the parks are open to stock (637 of 653 miles). Stock travel is also permitted on 77 miles of informal and abandoned trails. (Note: Not all trails open to stock are maintained to stock standards)	On-trail: Stock travel would be allowed on 650 of 691 miles of maintained trails.	On-trail: Stock travel would be allowed on 671 of 714 miles of maintained trails.	On-trail: Stock travel would be allowed on 527 of 643 miles of maintained trails.	On-trail: Stock travel would be allowed on 665 of 702 miles of maintained trails.
Element 8: Stock Use Access and Travel On-trail Camping Access	Approximately 598 miles of maintained and unmaintained trails are open to camping with stock.	Approximately 530 miles of maintained trails would be open to camping with stock.	Approximately 565 miles of maintained trails would be open to camping with stock.	Approximately 377 miles of maintained trails would be open to camping with stock. by all user groups (private, commercial, and administrative) with an additional 72 miles of maintained trails open to overnight travel by private stock or administrative stock parties only (closed or day-use only for commercial stock).	Approximately 555 miles of maintained trails would be open to camping with stock.

Table 45: Summary of Alternatives by Element (continued)

[Note: See table 52 on page 279 for Element 10: Frontcountry Facilities to Support Wilderness Access and Use]

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Element 8: Stock Use Access and Travel Off-trail	Off-trail: Travel more than 0.5 mile from trails open to camping with stock is allowed in four areas of the parks: on the Hockett Plateau, along the western side of the Kern River watershed south from the Chagoopa Plateau, on the Monarch Divide including Hotel Creek, and in the Roaring River area. Travel is allowed up to 0.5 mile from trails and routes to reach campsites.	Off-trail: Travel more than 0.5 mile from trails open to camping with stock would be allowed in four areas of the parks: on the Monarch Divide, in the Roaring River area, on the Hockett Plateau, and along the western side of the Kern River watershed south from the Chagoopa Plateau. In other areas open to camping with stock, travel would be allowed up to 0.5 mile from trails and routes in areas where they are allowed to camp and up to 100 yards from day-use trails.	Off-trail: Travel more than 0.5 mile from trails open to camping with stock would be allowed in four areas of the parks: on the Monarch Divide, in the Roaring River area, on the Hockett Plateau, and along the western side of the Kern River watershed south from the Chagoopa Plateau. In other areas open to camping with stock, travel would be allowed up to 0.5 mile from trails and routes in areas where they are allowed to camp and up to 100 yards from day-use trails.	Off-trail: Travel more than 0.5 mile from maintained trails open to camping with stock would be allowed for private stock parties in four areas of the parks: on the Hockett Plateau (except for Tar Gap), on the Monarch Divide (except for Kennedy Canyon), in the Roaring River drainage (except for Elizabeth and Colby passes), and along the western side of the Kern River watershed south from the Chagoopa Plateau (except for Lower Big Arroyo and Willow Meadow Cutoff). In other areas open to camping with stock, travel would be allowed up to 0.5 mile from trails and routes in areas where they are allowed to camp, and up to 100 yards from day-use trails.	Off-trail: Travel more than 0.5 mile from trails open to camping with stock would be prohibited. In areas open to camping with stock, travel would be allowed up to 0.5 mile from trails and routes in areas where they are allowed to camp. Stock would be allowed to travel up to 100 yards from day-use trails.
Element 8: Stock Use Grazing *See table 17 on page 114 for more specific information*	Grazing is generally allowed in areas open to camping with stock (within 0.5 mile of maintained trails open to camping with stock, along designated unmaintained routes, or in off-trail travel areas). Grazing is not allowed in those areas open only to travel.	Grazing would generally be allowed in areas open to camping with stock (within 0.5 mile of maintained trails open to camping with stock or in off-trail travel areas). Grazing would not be allowed in those areas open only to travel.	Grazing would generally be allowed within 0.5 mile of maintained trails open to camping with stock. Grazing would generally be prohibited in areas open to off-trail travel with the following exceptions: Ansel Lake, Chagoopa Treehouse Meadow, Crytes Lakes, Laurel Creek Basin, Long Meadow (Ferguson Creek), Sugarloaf Creek Confluence, and West Fork Ferguson Creek. Grazing would not be allowed in those areas open only to travel.	No administrative, private, or commercial grazing would be allowed. Visitors and park staff traveling with stock would be required to carry feed for their animals and confine them on durable non-vegetated surfaces in camp.	Grazing would generally be allowed within 0.5 mile of maintained trails open to camping with stock. Grazing would not be allowed in those areas open only to travel.
Element 8: Stock Use Stock Use Structures	There are 52 existing hitch rails and 54 existing drift fences, pasture fences, and gates in the parks' wilderness managed under the SUMMP.	23 hitch rails would be removed and 29 hitch rails would be retained. 12 fences/gates would be removed and 42 would be retained.	14 hitch rails would be removed and 38 would be retained. 5 fences/gates would be removed, 49 would be retained, and 1 new fence with a gate would be constructed.	All hitch rails not associated with administrative facilities would be removed. All drift fences and gates would be removed. Groups traveling with stock would be required to hold their stock while camping (e.g., set up high lines) on durable, non-vegetated surfaces.	28 hitch rails would be removed and 24 would be retained. A total of 18 fences and gates would be removed, 36 fences/gates would be retained, and 1 gate would be added.
Element 9: Administrative Structures Ranger Stations	Ranger Stations: 15 Patrol Cabins: 3	Ranger Stations: Retained: 14 Removed: 1 Patrol Cabins: Retained: 3 Removed: 0	Ranger Stations: Retained: 15 Removed: 0 Patrol Cabins: Retained: 3 Removed: 0	Ranger Stations: Retained: 8 Removed: 7 Patrol Cabins: Retained: 1 Removed: 2	Ranger Stations: Retained: 11 Removed: 4 Patrol Cabins: Retained: 3 Removed: 0

Table 45: Summary of Alternatives by Element (continued)

[Note: See table 52 on page 279 for Element 10: Frontcountry Facilities to Support Wilderness Access and Use]

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Element 9: Administrative Structures Administrative Pastures	Stock pastures associated with ranger stations are located at Hockett Meadow, Kern, Redwood Meadow, and Roaring River. Facilities such as hitching rails are associated with structures at Hockett Meadow, Quinn, and Redwood Meadow.	Existing administrative pastures and associated structures would be retained in their current location (Hockett Meadow, Kern, Redwood Meadow, and Roaring River).	Same as alternative 2.	Existing administrative pastures and associated facilities would be removed (Hockett Meadow, Kern, Redwood Meadow, and Roaring River).	The existing administrative pasture (and fence) at Redwood Meadow would be removed. The Hockett Meadow and Kern pastures would be reduced in size. The administrative pasture at Roaring River would be retained.
Element 9: Administrative Structures Crew Camps	There would continue to be 15 established and long-term trail crew camps within Kings Canyon National Park and 10 established and long-term trail crew camps within Sequoia National Park. Other project crew camps (for administration of wilderness) would continue to be established as needed on case-by-case basis.	Existing trail crew camps would be retained, but the number of installations would be reduced to 1 at each camp. Other project crew camps would be established as needed on case-by-case basis.	The number of trail crew camps in Kings Canyon National Park would be increased to 20. The number of trail crew camps in Sequoia National Park would be increased to 15. Other project crew camps (for administration of wilderness) would be established as needed on case-by-case basis.	Trail crews would conduct trail maintenance through use of mobile operations; there would be no long-term established camps. Short-term project crew camps (for administration of wilderness) would be established as needed on case-by-case basis.	Same as alternative 4.
Element 9: Administrative Structures Other Administrative Facilities	The Redwood Canyon Cabin and associated infrastructure is operated under a Memorandum of Understanding with a non-governmental organization for the purposes of research.	Use of the Redwood Canyon Cabin would be authorized by permit for activities appropriate for the administration of wilderness. The footprint of the facility would be reduced and the external installations (e.g., privy, equipment storage boxes, woodshed) would be removed.	The Redwood Canyon Cabin would be retained as research support with reduced affiliated infrastructure. Use would include park staff, cooperators, research organizations, and universities (non-park staff would be required to obtain a permit). The supporting infrastructure (e.g., water system, tables, etc.) would be removed, and the area rehabilitated.	Use of the Redwood Canyon Cabin by researchers would be terminated within 1 year of WSP approval. The cabin and all associated installations would be removed over a two-year period after WSP approval. Future research activities in Redwood Canyon could continue, but without the use of the cabin or associated permanent infrastructure.	Use of the Redwood Canyon Cabin by researchers would be terminated within two years of WSP approval. The cabin and all associated installations would be removed within three years of WSP approval. Future research activities in Redwood Canyon could continue but without the use of a permanent structure.
Element 10: Frontcountry Facilities *Refer to table 52 on page 279 for details.*					
Element 11: Commercial Services in Wilderness *See appendix B*	Commercial service levels and types would continue to be managed to provide high-quality visitor experiences while protecting wilderness resources.	Commercial services would be allowed but would be restricted in specific popular areas and areas with other limiting factors (e.g., Mount Whitney Management Area)	There would be increased opportunities for provision of commercial services (types and use levels of services).	Overall the types, levels, and areas in which commercial services are allowed would be notably reduced compared to alternative 1.	Overall the types, levels, and areas in which commercial services are allowed would be reduced commensurate with reduced use.
Element 11: Commercial Services in Wilderness Bearpaw Meadow High Sierra Camp	The Bearpaw Meadow High Sierra Camp would continue to be operated by a concessioner of the parks.	Commercial services would be provided at the Bearpaw Meadow High Sierra Camp as in alternative 1.	The Bearpaw Meadow High Sierra Camp would be retained and would continue to be operated by a concessioner. Some expansion (season of use and/or size of facilities) would be considered provided it can be accomplished within the existing footprint and would not cause additional adverse impacts on resources.	The Bearpaw Meadow High Sierra Camp, including any historic elements, would be removed and the area rehabilitated.	The Bearpaw Meadow High Sierra Camp would be reduced in size and its season of operation would be shortened.
Element 11: Commercial Services in Wilderness Pear Lake Ski Hut	The Pear Lake Ski Hut would continue to be operated during winter months as a ski hut (lodging facility) by a cooperating association under a cooperative agreement.	Commercial services would be provided at the Pear Lake Ski Hut as in alternative 1.	Use of the Pear Lake Ski Hut would continue through a cooperating association or as a concession-operated facility.	Use of Pear Lake Ski Hut would be discontinued.	Use of Pear Lake Ski Hut would be discontinued.

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COMPARISON OF ALTERNATIVES BY SELECTED KEY ELEMENTS

The following tables provide a detailed comparison of selected key elements of the alternatives, including Element 1: Visitor-use levels — Permits and Quotas; Element 2: Trails (specifically trail length by class and use); Element 6: Party Size; and Element 11: Frontcountry Facilities to Support Wilderness Access and Use.

Element 1: Visitor-use Levels

Table 46: Trailhead Quotas by Alternative

Trailhead Name	Use Level*	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Lewis & Hotel Creeks	L	25	25	27	15	10
Copper Creek	H	20	20	22	20	14
Woods Creek/Paradise	H	25	25	27	25	18
Bubbs Creek	H	25	25	27	25	18
Summit Meadow (Don Cecil)	L	No camping	8	10	No camping	4
Don Cecil (Cedar Grove)	L	No camping	8	10	No camping	4
Redwood Canyon	H	15	15	17	15	11
Sugarloaf	H	25	25	27	25	18
Belle Canyon	L	25	25	27	15	10
J.O. Pass	L	15	15	17	12	10
Twin Lakes	H	30	30	32	30	21
Lakes Trail (destination quota – per lake – Emerald and Pear)	H	25	25	27	25	18
Wolverton/Alta	H	25	25	27	25	18
Bearpaw Meadow High Sierra Camp (18 pillow limit)	H	No quota	18	18	Camp closed	13
HST	H	30	30	32	30	21
North Fork Kaweah	L	No quota	15	17	12	10
Colony Mill Rd. (E)	L	No quota	8	10	8	4
Colony Mill Rd. (W)	L	No quota	8	10	8	4
Middle Fork Kaweah	L	25	25	27	15	10
Paradise Ridge	L	15	15	17	12	10
Atwell	L	25	25	27	15	10
Timber Gap	H	25	25	27	25	18
Sawtooth/Glacier	H	20	20	22	20	14
Tar Gap	L	25	25	27	15	10
Mosquito	L	25	25	27	15	10

Table 46: Trailhead Quotas by Alternative (continued)

Trailhead Name	Use Level*	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Eagle	H	20	20	22	20	14
White Chief	L	25	25	27	15	10
Franklin	H	30	30	32	30	21
Franklin-Farewell	L	No quota	15	17	12	10
Ladybug	L	15	15	17	12	10
Garfield	L	15	15	17	12	10

*Use Levels are defined as H (high) or L (low: places with 10 or fewer people [overnight permits] on average during busy season).

Element 2: Trails

Table 47a: Summary Miles of Trails by Class and Stock Use Regulations under Alternative 1

Stock Access Allowed	Unmaintained	Maintained	Total
Open to camping	60.8	520.8	581.7
Open to camping by special permit	1.4	0.5	1.9
Open to camping by walking parties with burros or llamas; travel only for parties with horses or mules	3.3	11.5	14.7
Open to travel only	11.1	104.3	115.3
Closed to stock travel		15.7	15.7

Table 47b: Miles of Trails by Class and Stock Use Regulations under Alternative 2

Stock Access Allowed	Class 1	Class 2	Class 3	Total
Open to camping	74.8	232.4	219.2	530.3
Open to camping by walking parties with burros or llamas; travel only for parties with horses or mules		0.9	2.8	3.7
Open to travel only	13.0	43.2	63.6	118.4
Closed to stock travel	18.9	12.5	9.2	40.7

Table 47c: Miles of Trails by Class and Stock Use Regulations under Alternative 3

Stock Access Allowed	Class 1	Class 2	Class 3	Total
Open to camping	18.0	132.3	411.7	562.0
Open to camping by special permit	2.6			2.6
Open to travel only	12.6	11.8	82.0	106.4
Closed to stock travel	24.2		18.7	42.8

Table 47d: Miles of Trails by Class and Stock Use Regulations under Alternative 4

Stock Access Allowed	Class 1	Class 2	Class 3	Total
Open to camping	2.6	183.1	190.9	376.6
Open to camping by private and administrative; travel only commercial		0.5	15.6	16.1
Open to camping by private and administrative; closed commercial	45.4	2.6	7.8	55.9
Closed to commercial; travel only private and administrative	6.6	6.2	4.4	17.1
Open to travel only	0.2	22.3	38.8	61.3
Closed to stock travel	60.4	41.7	14.1	116.1

Table 47e: Miles of Trails by Class and Stock Use Regulations under Alternative 5

Stock Access Allowed	Class 1	Class 2	Class 3	Total
Open to camping	56.5	198.8	298.2	553.6
Open to camping by walking parties with burros or llamas; travel only for parties with horses or mules		0.9		0.9
Open to travel only	11.9	24.4	73.7	110.0
Closed to stock travel	15.5	3.2	18.6	37.2

The following table includes a listing of the wilderness trail segments in the parks, showing the trail class and design use for each segment. For alternative 1, the trail class listed reflects the trail development level as it existed on the ground as of 2013. The "Trail Name" is a unique name given to each trail segment, and is not necessarily the most commonly used name for that segment. For instance, "Rae Lakes" is part of the PCT, the JMT, and the Rae Lakes Loop, and is also often called Glen Pass. The segment names were chosen to avoid double-naming. To clarify what a given name refers to, beginning and end points are referenced. The table is organized by major river drainage, then alphabetically by trail name.

In table 47f, the classification for each trail segment is included, as is the type of use allowed. "Stock" refers to trails open to all uses, including stock. "Hiking" refers to trails where only hiking is allowed (no stock). "Mixed" means that portions of the trail may be open to all uses, but portions are open for hiking only. Note that the table use does not fully describe use restrictions on the trail. For example, a hiking trail may also be day use only, or a stock trail may be burros and llamas only.

Table 47f: Trail Classification and Design Use for All Alternatives

Trail Name	Miles	Beginning	End	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
EAST FORK KAWEAH WATERSHED								
Aspen Flat	0.40	Crystal Creek	Aspen Flat	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Atwell-Hockett	9.74	Atwell Campground	Hockett Meadow	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Cahoon Rock	2.58	Hockett Meadow Junction	Cahoon Rock	1,2 Stock	1,2 Stock	2,3 Stock	1,2 Stock	1,2 Stock
Eagle Lake	1.41	Eagle-Mosquito Junction	Eagle Lake	2 Stock	2 Stock	3 Stock	2 Hiking	2 Stock
Eagle-Mosquito Lakes	0.93	White Chief Jct	Eagle-Mosquito Junction	2 Stock	2 Stock	3 Stock	2 Hiking	2 Stock
Evelyn Lake	1.05	Cahoon Rock Jct	Evelyn Lake	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Farewell Gap	2.65	Franklin Pass Junction	Farewell Gap	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Farewell/Franklin Lakes	2.65	Aspen Flat Junction	Franklin Pass Junction	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Franklin Pass - Franklin Lakes	4.78	Franklin Pass Junction	Franklin Pass	3 Hiking	3 Stock	3 Stock	3 Stock	3 Stock
Hockett-Sand Meadow	0.85	Hockett Mdw	Sand Meadow Junction	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Mineral King Valley	0.41	Disney Prkg-road end trailhead	Aspen Flat Junction	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Monarch Lakes	3.33	Timber Gap Jct	Lower Monarch Lake	3 Stock	2 Hiking	3 Hiking	2 Hiking	3 Hiking
Mosquito Lakes	1.58	Eagle-Mosquito Junction	Mosquito Lakes	2 Stock	2 Stock	3 Stock	2 Hiking	2 Stock
Paradise Ridge	3.31	Atwell Mill CG Trailhead	Top of Paradise Ridge	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Sawtooth Pass West	1.51	Monarch Lakes	Sawtooth Pass	Informal	1 Hiking	1 Hiking	1 Hiking	1 Hiking

Table 47f: Trail Classification and Design Use for All Alternatives (continued)

Trail Name	Miles	Beginning	End	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Tar Gap	6.95	Trailhead Cold Springs CG	Atwell Hockett trail	2 Stock	2 Stock	3 Stock	2 Hiking	3 Stock
Timber Gap	1.02	Sawtooth Prkg Trailhead	Timber Gap	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
White Chief	2.41	Disney Prkg-road end trailhead	White Chief	2 Stock	2 Stock	3 Stock	2 Hiking	2 Stock
KERN WATERSHED								
Big Five-Little Five Lakes	4.38	Lost Canyon	Little Five Lakes	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Bighorn Plateau	4.14	Tyndall Creek	Wallace Creek	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Blackrock Pass - Little Five Lakes	1.58	Little Five Lakes	Blackrock Pass	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Chagoopa Plateau	11.00	Big Arroyo Patrol Cabin	Upper Funston Mdw	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Cottonwood Pass	5.00	Rock Creek Junction	Park Boundary	2 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Coyote Lake	2.22	Coyote Pass/Coyote Lakes Junction	Park Boundary	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Coyote Pass	5.31	Kern Station	Coyote Pass	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Crabtree - Rock Creek	3.30	Lower Crabtree Mdw	Rock Creek	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Crabtree Lakes	1.78	Lower Crabtree Mdw	Crabtree Lakes	2 Stock	1 Stock	2 Stock	Abandon	2 Stock
Crabtree Sand Flats	0.80	Crabtree Sand Flats	Crabtree Ranger Station Jct	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Forester Pass South	5.02	Forester Pass	Tyndall Creek	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Forgotten Creek	3.46	Siberian Pass Creek	Funston Lake	Unmaint	Abandon	Abandon	Abandon	Abandon

Table 47f: Trail Classification and Design Use for All Alternatives (continued)

Trail Name	Miles	Beginning	End	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Franklin Pass - Upper Rattlesnake	2.44	Forester Lake Junction	Franklin Pass	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Funston Lake	5.10	Siberian Pass	Funston Lake	Unmaint	1 Stock	1 Stock	1 Stock	1 Stock
John Dean Cutoff	2.54	Upper Kern	Tyndall Ranger Station	Unmaint	1 Stock	1 Stock	Abandon	1 Stock
Kern Canyon	9.37	Upper Funston	Junction Meadow (Kern)	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Kern Kaweah	7.82	Junction Meadow (Kern)	Colby Pass	2 Stock	2 Stock	2 Stock	1 Hiking	2 Stock
Lake South America	5.34	Tyndall Cutoff	Upper Kern Canyon	1 Stock	1 Stock	2 Stock	Abandon	2 Stock
Little Five - Big Arroyo	2.64	Little Five Lakes	Big Arroyo Patrol Cabin	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Lost Canyon	5.12	Soda Creek	Columbine Lake	2 Stock	2 Stock	3 Stock	1-2 Mixed	2-3 Stock
Lower Big Arroyo	6.14	Big Arroyo Patrol Cabin and HST jct	Soda Creek/Willow Meadow Junction	1 Stock	Abandon	Abandon	Abandon	Abandon
Lower Crabtree	0.67	Crabtree Sand Flats	Lower Crabtree Meadow	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Lower Kern	8.52	South Boundary of Kern Station	HST at Upper Funston Meadow	3 Stock	3 Stock	3 Stock	2 Stock	3 Stock
Lower Kern Bridge	0.26	Lower Kern RS	Kern Bridge	3 Stock	3 Stock	3 Stock	2 Stock	3 Stock
Lower Rattlesnake	7.77	Jct of Kern Trail	Forester Lake Junction	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Lower to Upper Crabtree Meadows	1.09	Crabtree Ranger Station	Lower Crabtree Mdw	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Lower Whitney Creek Use	0.75	Lower Crabtree Mdw	Lower Whitney Creek	2 Stock	2 Stock	2 Stock	2 Stock	2 Stock
Milestone Basin	0.50	Upper Kern Jct	Milestone Basin	2 Stock	Abandon	1 Stock	Abandon	Abandon

Table 47f: Trail Classification and Design Use for All Alternatives (continued)

Trail Name	Miles	Beginning	End	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Miter Basin	2.30	Upper Rock Creek	11,300' Elevation	Unmaint	1 Stock	1 Stock	1 Stock	1 Stock
Moraine Lake	3.68	Sky Parlor Meadow	Upper Chagoopa Plateau	2 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Mount Langley	1.45	Army Pass Junction	Summit Mount Langley	Informal	1 Hiking	1 Hiking	1 Hiking	1 Hiking
Mount Whitney	7.05	Crabtree Station	Mt Whitney Summit	3 Mixed	3 Mixed	3 Mixed	3 Mixed	3 Mixed
New Army Pass	2.64	Upper Rock Creek	New Army Pass	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Rattlesnake - Soda Creek	2.92	Forester Lake Junction	Soda Creek	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Rock Creek	3.54	Rock Creek	Cottonwood Pass Jct	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Rock Creek Lake	3.12	Cottonwood Pass Jct	Soldier Lake	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Sandy Meadow	3.34	Wallace Ck	Crabtree Sand Flats	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Sawtooth Pass East	1.04	Columbine Lake	Sawtooth Pass	Informal	1 Hiking	1 Hiking	1 Hiking	1 Hiking
Shepherd Pass	3.38	JMT-PCT Tyndell Ck	Shepherd Pass	2 Stock	2 Stock	3 Stock	1 Hiking	2 Stock
Shotgun Pass	1.81	Shotgun/Upper Rattlesnake Jct	Shotgun Pass	1 Stock	1 Stock	2 Stock	Abandon	1 Stock
Siberian Pass	0.70	Siberian Junction	Siberian Pass	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Siberian Pass Creek	2.01	Pacific Crest Trail	Funston Lake Route	Unmaint	Abandon	Abandon	Abandon	Abandon
Soda Creek	4.29	Lower Big Arroyo	Upper Soda Creek	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Soldier Lake	0.26	Upper Rock Creek	Soldier Lake	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock

Table 47f: Trail Classification and Design Use for All Alternatives (continued)

Trail Name	Miles	Beginning	End	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Trail Crest	0.15	Trail Crest Trail	Park Boundary	3 Hiking	3 Hiking	3 Hiking	3 Hiking	3 Hiking
Tyndall Ranger Station	0.59	Pacific Crest Trail	Tyndall Ranger Station	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Upper Big Arroyo	3.38	Kaweah Gap	Big Arroyo Patrol Cabin	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Upper Big Five Lakes	1.66	Lower Big Five Lake	Upper Big Five Lake	2 Stock	2 Stock	2 Stock	Abandon	1 Stock
Upper Crabtree Meadow	0.19	JMT-PCT Junction	Crabtree Ranger Station	2 Stock	2 Stock	2 Stock	2 Stock	2 Stock
Upper Kern Canyon	4.44	HST Wallace Ck	Tyndall Cut-off	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Upper Kern -Tyndall Cutoff	2.93	Upper Kern	JMT-PCT Tyndall Ck	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Upper Milestone Basin	2.13	Milestone Basin Trail	Milestone Lakes	Unmaint	Abandon	1 Stock	Abandon	Abandon
Upper Rock Creek	1.73	Soldier Lake	Junction with PCT	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Upper Soldier Lake	2.00	Soldier Lake	Junction with Mt Langley Trail	Abandon	1 Hiking	1 Hiking	Abandon	Abandon
Wallace Creek	4.11	Junction Meadow (Kern)	JMT-PCT Wallace Ck Jct	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Wallace Lakes	2.53	PCT Junction	Wallace Lakes	Unmaint	1 Stock	1 Stock	1 Stock	1 Stock
Willow Meadow Cut-off	4.69	Soda Creek	Rattlesnake Creek	1 Stock	1 Stock	2 Stock	Abandon	2 Stock
Wright Lakes	1.90	PCT Junction	Wright Lakes	Unmaint	1 Stock	1 Stock	Abandon	1 Stock
MARBLE FORK KAWEAH WATERSHED								
Admiration Point	0.70	Colony Mill Road	Admiration Point overlook	2 Stock	2 Hiking	3 Stock	1 Stock	3 Stock

Table 47f: Trail Classification and Design Use for All Alternatives (continued)

Trail Name	Miles	Beginning	End	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Hump	0.73	Lakes Trail Jct	Heather Lake	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
JO Pass	1.79	Jct off Twin Lk Trail	JO Pass	2 Stock	2 Stock	3 Stock	2 Hiking	2 Stock
Lakes	2.94	Wolverton Prkg Trailhead	Pear Lake	3 Mixed	3 Mixed	3 Mixed	3 Mixed	3 Mixed
Little Baldy	0.20	Baldy Saddle Gen Hwy	Little Baldy Dome	2 Stock	2 Hiking	3 Stock	2 Hiking	3 Hiking
Marble Falls	2.73	Potwisha Campground	Marble Falls, Marble Fork	2 Hiking	2 Hiking	3 Hiking	2 Hiking	2 Hiking
Old Colony Mill Road	2.48	North Fork Road	Crystal Cave Road	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Pear Lake Ranger Station	0.34	Pear Lake Trail	Pear Lake Ranger Station	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Pear Lake Ski	2.50	Wolverton Prkg Trailhead	Pear Lake	2 Snowshoe	2 Snowshoe	2 Snowshoe	2 Snowshoe	2 Snowshoe
Silliman Pass South	2.61	JO Pass/Twin Lakes jct	Silliman Pass	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Sunset Rock	0.35	Museum area	Sunset Rock	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Tokopah Falls	0.36	Lodgepole CG trailhead	Tokapah Falls	3 Stock	3 Hiking	3 Hiking	3 Hiking	3 Hiking
Twin Lakes	3.51	Trailhead Lodgepole CG	JO/Twin Lakes Junction	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
MIDDLE FORK KAWEAH WATERSHED								
Alta - Panther Gap	1.94	Giant Forest	Alta Meadow/Peak Jct	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Alta Meadow	1.70	Panther Gap Junction	Alta Meadow	2 Stock	2 Stock	2 Stock	2 Stock	2 Stock
Alta Peak	1.81	Alta Meadow Junction	Alta Peak Summit	2 Stock	2 Stock	2 Stock	2 Stock	2 Stock

Table 47f: Trail Classification and Design Use for All Alternatives (continued)

Trail Name	Miles	Beginning	End	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Alta-High Sierra Cut-off	1.99	Cut-off between Alta & HST	Cut-off between Alta and HST	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Bearpaw Cut-off	1.55	Middle Fork Kaweah	Little Bearpaw Meadow	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Bearpaw Meadow	0.34	HST	Redwood/Bearpaw Trail	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Blackrock Pass - Pinto Lake	7.76	Timber Gap Jct	Blackrock Pass	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Bobcat Point	0.20	High Sierra Trail	Sugar Pine Trail	3 Hiking	3 Hiking	3 Hiking	3 Hiking	3 Hiking
Cliff Creek	3.25	Redwood Mdw	Blackrock Pass Junction	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Crescent Mdw-Bearpaw	10.40	Crescent Meadow Trailhead	Bearpaw	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Elizabeth Pass South	3.72	Over the Hill Junction	Elizabeth Pass	2 Stock	2 Stock	3 Stock	2 Hiking	2 Stock
Granite Creek	3.30	Redwood Mdw-Bearpaw Trail	Granite Creek lake	Unmaint	Abandon	Abandon	Abandon	Abandon
Hamilton Lakes	3.81	Bearpaw	Hamilton Lakes	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Kaweah Gap	4.06	Hamilton Lakes	Kaweah Gap	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Kaweah Middle Fork Cut-off	0.91	Redwood Mdw-Bearpaw Trail	Middle Fork Kaweah Bridge	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Lone Pine Creek	1.92	Elizabeth Pass Junction	Tamarack Lake	2 Stock	2 Stock	2 Stock	2 Hiking	2 Stock
Middle Fork Kaweah	11.32	Moro Creek	Middle Fork Bridge	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Over the Hill	1.47	High Sierra Trail	Elizabeth Pass South Trail	2 Stock	2 Stock	3 Stock	2 Hiking	2 Stock
Paradise Creek	2.02	Buckeye Flat CG	2 miles up from Middle Fork	2 Stock	2 Hiking	2 Stock	2 Hiking	2 Hiking

Table 47f: Trail Classification and Design Use for All Alternatives (continued)

Trail Name	Miles	Beginning	End	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Paradise Ridge-Redwood Mdw	5.94	Redwood Mdw	Paradise Gap	2 Stock	2 Stock	2 Stock	2 Stock	2 Stock
Potwisha-Hospital Rock	1.52	Potwisha Dump station	Hospital Rock Picnic Area	3 Stock	2 Hiking	3 Hiking	2 Hiking	2 Hiking
Redwood Mdw Cut-off	0.89	Middle Fork Kaweah	Redwood Mdw	2 Stock	2 Stock	2 Stock	2 Stock	2 Stock
Redwood Mdw-Bearpaw	4.64	Bearpaw	Redwood Mdw	2 Stock	2 Stock	3 Stock	2 Stock	2-3 Stock
Timber Gap Cliff Creek	2.91	Cliff Creek	Timber Gap	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Twenty-Seven Switchback Cut-off	0.91	High Sierra Trail	Over the Hill Trail	2 Stock	2 Stock	2 Stock	2 Hiking	2 Stock
Wolverton Cutoff	1.04	Alta Trail	High Sierra Trail	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
MIDDLE FORK KINGS WATERSHED								
Blue Canyon	6.19	Kettle Ridge Entrance	Blue Canyon Meadow	1 Stock	1 Stock	2 Stock	Abandon	1 Stock
Cartridge Pass	10.43	Middle Fork Kings River	Muro Blanco Trail	Unmaint	Abandon	Abandon	Abandon	Abandon
Cataract Creek	1.54	PCT Near Deer Meadow	Amphitheater Lakes	Unmaint	Abandon	Abandon	Abandon	Abandon
Dusy Basin	3.49	Lip of Dusy Basin	Bishop Pass	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Dusy Switchbacks	2.77	Dusy Switchbacks/PCT Junction	Lip of Dusy Basin	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Granite Pass North	5.21	Northern State Lakes Loop Junction	Granite Pass	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Horseshoe Lakes	0.95	Spur Trail	Horseshoe Lakes	1 Stock	1 Stock	2 Stock	Abandon	2 Stock
Kennedy Canyon	8.12	Outlet of Volcanic Lakes Crossing	Kennedy Pass	1 Stock	1 Stock	2 Stock	1 Hiking	2 Stock
Lower LeConte Canyon	3.48	Palisade Creek Crossing	Dusy Switchbacks/PCT Junction	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock

Table 47f: Trail Classification and Design Use for All Alternatives (continued)

Trail Name	Miles	Beginning	End	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Lower Middle Fork Kings	10.82	Crown Creek Crossing	Simpson Junction	2 Stock	2 Stock	2 Stock	1 Stock	1 Stock
Palisade Creek	6.11	Palisade Creek Crossing	Outlet of Palisade Lakes	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Palisade Lakes	3.69	Outlet of Palisade Lakes	Mather Pass	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
State Lakes Loop	4.23	North State Lakes Junction	South State Lakes Junction	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Tehipite Switchbacks	4.59	Gnat Meadow Entrance	Crown Creek Crossing	2 Stock	2 Stock	2 Stock	1 Stock	1 Stock
The Bitch	5.93	Simpson Meadow Junction	Northern State Lakes Loop Junction	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Upper Blue Canyon	1.00	Blue Canyon Meadow	Blue Canyon Lakes	Unmaint	1 Stock	1 Stock	Abandon	1 Stock
Upper LeConte Canyon	7.34	Dusy Switchbacks/PCT Junction	Muir Pass	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Upper Middle Fork Kings	8.09	Simpson Junction	Palisade Creek Junction	2 Stock	2 Stock	2 Stock	2 Stock	2 Stock
Volcanic Lakes	1.90	Granite Pass North Trail	Outlet of Volcanic Lakes Crossing	2 Stock	1 Stock	2 Stock	1 Stock	2 Stock
NORTH FORK KAWEAH WATERSHED								
Big Baldy	2.06	Big Baldy Trailhead	Top of Big Baldy	3 Stock	3 Stock	3 Stock	3 Hiking	3 Stock
Big Baldy Ski	2.06	Big Baldy Trailhead	Top of Big Baldy	2 Snowshoe	2 Snowshoe	2 Snowshoe	2 Snowshoe	2 Snowshoe
Buena Vista	0.86	Buena Vista Trailhead	Top of Buena Vista Peak	3 Stock	3 Stock	3 Stock	3 Hiking	3 Stock
Dorst/Lost Grove	2.06	Muir Grove Trail/Lost Grove Trail Junction	Lost Grove	1 Hiking	1 Hiking	1 Hiking	1 Hiking	1 Hiking
Hidden Springs	13.87	North Fork Kaweah Trailhead	Hidden Spring	1-2 Stock	1 Stock	2 Stock	1 Stock	1 Stock

Table 47f: Trail Classification and Design Use for All Alternatives (continued)

Trail Name	Miles	Beginning	End	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Little Baldy	1.35	Baldy Saddle Gen Hwy	Little Baldy Dome	2 Stock	2 Hiking	3 Stock	2 Hiking	2 Hiking
Muir Grove	2.53	Dorst CG Trailhead	Muir Grove	3 Stock	2 Hiking	3 Stock	2 Hiking	3 Hiking
Old Colony Mill Road	7.28	North Fork Road	Crystal Cave Road	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
Redwood Canyon	2.14	Redwood Saddle Trailhead	Hart Tree Junction on Redwood Creek	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Redwood Canyon Big Springs	3.62	Redwood Canyon/Hart Tree Junction	Big Springs	2 Stock	2 Stock	2 Stock	1 Hiking	2 Stock
Redwood Canyon Hart Tree	4.76	Upper Hart Junction	Lower Hart Junction	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Redwood Canyon Sugar Bowl	4.42	Redwood Saddle Trailhead	Sugarbowl Junction along ridge	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
SAN JOAQUIN WATERSHED								
Evolution Basin	6.44	Lamarck Col/PCT Junction	Muir Pass	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Evolution Valley	7.43	Goddard Canyon Junction	Lamarck Col Junction	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Goddard Canyon	5.08	Goddard Canyon Junction	Hell for Sure/Martha Lake Junction	2 Stock	2 Stock	3 Stock	1 Mixed	2 Stock
Hell for Sure Pass	3.70	Hell for Sure/Martha Lake Junction	Hell for Sure Pass	1 Stock	1 Stock	2 Stock	1 Hiking	2 Stock
Lake 11,106	1.56	McClure Meadow	Lake 11106	Unmaint	1 Stock	1 Stock	1 Stock	1 Stock
Lamarck Col	3.29	Lamarck Col/PCT Junction	Lamarck Col	Informal	1 Hiking	1 Hiking	1 Hiking	1 Hiking
Lower Goddard Canyon	3.54	Piute Creek Entrance	Goddard Canyon Junction	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Martha Lake	2.8	Hell for Sure/Martha Lake Junction	Martha Lake	Unmaint	1 Stock	1 Stock	1 Stock	1 Stock

Table 47f: Trail Classification and Design Use for All Alternatives (continued)

Trail Name	Miles	Beginning	End	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
McGee Canyon	2.71	PCT above McClure Meadow	Lower McGee Lakes	Unmaint	Abandon	Abandon	Abandon	Abandon
SODA SPRINGS CREEK WATERSHED								
Farewell Gap	0.42	Quinn Mdw	North Boundary	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
South Fork Meadows	1.08	Sand Mdw-Hockett Lakes Jct	Windy Gap Jct	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Windy Gap	1.99	Blossom Lk Jct	Quinn Mdw (Rander Station)	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Windy Ridge	0.86	Tuohy Gap	Blossom Lake Jct	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
SOUTH FORK KAWEAH WATERSHED								
Blossom Lake	2.71	Hunter Creek Junction	Blossom Lk	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Cyclone Meadow	1.73	Windy Ridge/Cyclone Meadow Jct	Windy Ridge	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Hockett Lakes	0.72	South Fork Crossing	Hockett Lakes Junction	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Hockett Lakes Cutoff	1.00	Hockett Lakes Junction	South Fork Meadows	2 Stock	Abandon	3 Stock	Abandon	2 Stock
Hockett-Sand Meadow	0.29	Hockett Mdw	Sand Meadow Junction	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Hockett-South Fork Crossing Cutoff	0.98	Sand Meadow Junction	Hockett Lakes Junction	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Hockett-South Fork Meadow	0.89	Sand Meadow Junction	South Fork Meadows	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Ladybug	1.73	South Fork Campground Trailhead	Whiskey Log Junction	2 Stock	2 Stock	3 Stock	2 Hiking	3 Stock
South Fork Kaweah	9.73	South Fork Campground Trailhead	South Fork Kaweah Crossing	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock

Table 47f: Trail Classification and Design Use for All Alternatives (continued)

Trail Name	Miles	Beginning	End	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
South Fork Meadows	0.19	South Fork Meadows	South Fork Kaweah Trail	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Touhy	1.94	South Fork Crossing	South Boundary	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Tuohy Cutoff	1.92	South Fork Mdw	Tuohy Gap Jct	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Wet Meadow	0.68	Quinn Mdw	Boundary at Wet Mdw	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Whiskey Log	1.26	Ladybug Trail	Cedar Creek	2 Stock	2 Stock	2 Stock	2 Hiking	2 Stock
Windy Gap	2.17	Hunter Creek Junction	Quinn Meadow (RS)	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Windy Ridge	4.64	Tuohy Gap	Blossom Lake-Windy Ridge Junction	2 Stock	Abandon	3 Stock	Abandon	3 Stock
SOUTH FORK KINGS WATERSHED								
Avalanche Pass - Sphinx	5.00	Sphinx Junction	Avalanche Pass	2 Stock	2 Stock	2 Stock	1 Stock	2 Stock
Avalanche Pass Roaring River	5.80	Avalanche Pass/Cloud Canyon Junction	Avalanche Pass	2 Stock	2 Stock	2 Stock	1 Stock	2 Stock
Baxter Pass	4.57	Baxter Pass/PCT	Baxter Pass	1 Stock	1 Hiking	1 Hiking	1 Hiking	1 Hiking
Bell Canyon - Comanche Cutoff	1.53	Seville Lake Junction	Comanche Junction	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Bell Canyon Entrance	1.46	Bell Canyon Entrance	Seville Lake Junction	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Bench Lake	2.00	Bench Lake/PCT Junction	Bench Lake	2 Stock	2 Stock	2 Stock	1 Stock	2 Stock
Beville Lake	0.07	Silliman Pass/Beville Lake Trail Junction	Beville Lake	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Bubbs Creek	6.20	Sphinx Junction	Junction Meadow (East Lake Jct)	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock

Table 47f: Trail Classification and Design Use for All Alternatives (continued)

Trail Name	Miles	Beginning	End	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Bubbs Creek Switchbacks	1.42	Bailey Bridge Junction (north side)	Sphinx Junction	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Bullfrog Lake	2.29	Bullfrog/PCT Junction	Kearsarge Lakes/Bullfrog Junction	3 Hiking	3 Stock	3 Hiking	3 Hiking	3 Stock
Cedar Grove Overlook	0.46	Cedar Grove Overlook/Hotel Creek Junction	Cedar Grove Overlook	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Cedar Grove Sand Flats	1.73	Roads End	Bailey Bridge Jct	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Charlotte Lake	1.64	Charlotte Lake/PCT Junction	Charlotte Creek Stock Camps	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Cloud Canyon	6.17	Roaring River Ranger Station	Creek Crossing @ Grand Palace	3 Stock	3 Stock	3 Stock	2 Stock	3 Stock
Colby Pass North	4.05	Creek Crossing @ Grand Palace	Colby Pass	2 Stock	2 Stock	2 Stock	2 Hiking	2 Stock
Deadman Canyon	5.81	Roaring River Ranger Station	Creek between Lower and Upper Ranger	3 Stock	3 Stock	3 Stock	2 Stock	3 Stock
Don Cecil	3.50	Cedar Grove Bike Path	Summit Mdw	3 Stock	2 Stock	3 Stock	2 Stock	3 Stock
East Lake	2.75	Junction Meadow	East Lake Drift Fence	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Elizabeth Pass North	3.62	Creek between Upper and Lower Ranger	Elizabeth Pass	2 Stock	2 Stock	2 Stock	2 Hiking	2 Stock
Frypan Entrance	0.40	Park Boundary @ Wildman Meadow	Kennedy Pass Trail	2 Stock	2 Stock	2 Stock	2 Stock	2 Stock
Glen Pass South	1.90	Kearsarge Pass/PCT Junction	Glen Pass	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Granite Basin	3.18	Lip of Granite Basin (benchmark)	Granite Pass	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Granite Lake	0.52	Granite Basin Trail	Granite Lake	1 Stock	1 Stock	1 Stock	1 Stock	1 Stock

Table 47f: Trail Classification and Design Use for All Alternatives (continued)

Trail Name	Miles	Beginning	End	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Grouse Lake	0.63	Copper Creek Trail	Grouse Lake	Unmaint	1 Stock	1 Stock	1 Stock	1 Stock
Grizzly Lake	0.36	Park Boundary	Kennedy Pass Trail	2 Stock	2 Stock	2 Stock	2 Stock	2 Stock
Hotel-Creek	2.56	Hotel Creek Trailhead	Hotel/Lewis Junction	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Junction Meadow Switchbacks - Bubbs	2.27	Junction Meadow on Bubbs	Vidette Meadow Junction	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Kanawyers Gap	3.30	Kanawyers Gap	Comanche Junction	2 Stock	2 Stock	3 Stock	Abandon	2 Stock
Kearsarge Lakes	0.57	Bullfrog Lake/Kearsarge Lakes Junction	Kearsarge Lakes	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Kearsarge Pass	2.87	Kearsarge Pass/PCT Junction	Kearsarge Pass	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Kennedy Pass South	3.75	Frypan Meadow	Kennedy Pass	2 Stock	2 Stock	2 Stock	1 Hiking	2 Stock
Lake Reflection	1.09	East Lake Drift Fence	Lake Reflection	Abandon	1 Stock	1 Stock	Abandon	Abandon
Lost Lake	0.70	Lost Lake Junction	Lost Lake	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Lower Copper Creek Switchbacks	3.69	Roads End Cedar Grove	Lower Tent Mdw crossing	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Lower Lewis Creek	0.91	Lewis Creek Trailhead	Hotel/Lewis Junction	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Lower Sixty Lake Basin	1.65	First Lake in Sixty Lake Basin	Lower Sixty Lake Basin	1 Hiking	1 Hiking	1 Hiking	Abandon	1 Hiking
Mist Falls	3.16	Bailey Bridge Jct	Lower Paradise Camping	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Paradise Valley	3.30	Lower Paradise Valley Camping	South Fork Bridge @ Upper Paradise	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Pinchot Pass North	3.83	South Fork Kings Crossing	Pinchot Pass	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock

Table 47f: Trail Classification and Design Use for All Alternatives (continued)

Trail Name	Miles	Beginning	End	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Pinchot Pass South	7.38	Woods Creek Crossing	Pinchot Pass	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Rae Lakes	4.93	Dollar Lake Outlet	Glen Pass	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Ranger Lake	0.14	Silliman Pass/Ranger Lake Junction	Ranger Lake	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Sawmill Pass	3.22	Sawmill Pass/PCT Junction	Sawmill Pass	1 Stock	1 Stock	2 Stock	1 Hiking	2 Stock
Seville Lake	1.14	Seville Junction	Seville Lake	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Seville Lake Boy Scout	1.27	Bell Canyon Entrance	Seville Lake	Informal	-	1 Hiking	-	-
Silliman Pass North	4.90	Seville Junction	Sillman Pass	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
South Side Cedar Grove Sand Flats	1.88	Bailey Bridge Jct	Red Bridge @ Roads End	3 Stock	3 Stock	3 Hiking	3 Hiking	3 Hiking
Sphinx Lakes	2.08	Screwball Meadow	Sphinx Lakes	Unmaint	Abandon	1 Hiking	Abandon	Abandon
Sugarloaf Entrance	2.22	Sugarloaf Entrance	Comanche Junction	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Sugarloaf Valley	7.45	Comanche Junction	Roaring River Ranger Station Junction	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Taboose Pass	2.36	Taboose Pass/PCT Junction	Taboose Pass	2 Stock	2 Stock	2 Stock	2 Stock	2 Stock
Upper Basin	5.74	South Fork Kings Crossing	Mather Pass	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Upper Bubbs Creek - Forester Pass North	4.95	Center Basin/PCT Junction	Forester Pass	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Upper Copper Creek Switchbacks	3.26	Lower Tent Meadow crossing	Lip of Granite Basin (benchmark)	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Upper Lewis Creek	4.06	Hotel/Lewis Junction	Frypan Meadow	2 Stock	2 Stock	2 Stock	2 Stock	2 Stock

Table 47f: Trail Classification and Design Use for All Alternatives (continued)

Trail Name	Miles	Beginning	End	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Upper Sixty Lake Basin	1.42	Sixty Lake/PCT Junction	Outlet of first lake in Sixty Lake Basin	2 Stock	2 Stock	2 Stock	1 Stock	2 Stock
Vidette Meadow	3.05	Vidette Meadow Junction	Center Basin/PCT Junction	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Vidette Switchbacks	1.74	Vidette Meadow Junction	Kearsarge Pass/PCT Junction	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Woods Creek	5.10	South Fork Kings Bridge	Woods Creek Crossing	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
Woods Creek Crossing - Dollar Lake	3.96	Woods Creek Crossing	Dollar Lake Outlet	3 Stock	3 Stock	3 Stock	3 Stock	3 Stock
TULE WATERSHED								
Summit Lake	0.39	Windy Ridge	Summit Lake	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Touhy	1.05	South Fork Crossing	South Boundary	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock
Windy Ridge	1.45	Tuohy Gap	Blossom Lk Jct	2 Stock	2 Stock	3 Stock	2 Stock	2 Stock

Unmaint – "Designated Unmaintained Route"
Informal - Trail created by use, never maintained
Abandoned - Trail that once was maintained, but maintenance has been discontinued
Where more than one Trail Class or Design Use is shown, the trail segment has mixed class or design use.

Element 6: Party Size

Table 48: Party Size Maximum for Hikers and Boaters

Type of Trip	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
On-trail (day use)	25	25; consider future more restrictive party size for day-use in specific areas (e.g., Mist Falls, Watchtower, Monarch Lakes).	25	25; consider more restrictive party size for day-use in specific areas.	20; consider more restrictive party size for day-use in specific highest use areas (Lakes Trails, Mist Falls, Monarch Lake, and potentially other areas).
On-trail (overnight use)	15	15*	15*	12	10
Off-trail (overnight and day-use)	15	12; except in areas with specific lower limits (see below).	15*	8	8
Area-specific	Temporary off-trail party-size limits of 8 people would be adopted permanently at Darwin Canyon/Lamarck Col (includes Class 1 trail area); Dusy Basin, Mount Whitney/Mount Langley (includes Class 1 trail area), Sixty Lake Basin, and Sphinx Lakes.	Existing temporary off-trail party-size limits of 8 people would be adopted permanently at Darwin Canyon/Lamarck Col (includes Class 1 trail area); Dusy Basin, Mount Whitney/Mount Langley (includes Class 1 trail area), Sixty Lake Basin, and Sphinx Lakes.	Existing temporary party-size limits of 8 people would be removed. A party-size limit of 4 would be implemented for camping at North Dome.	Existing temporary party-size limits would be removed (maximum party size of 8 in specific locations), and replaced with a wilderness-wide off-trail party size of 8.	Existing temporary party-size limits would be removed (maximum party size of 8 in specific locations), and replaced with a wilderness-wide off-trail party size of 8.
Redwood Canyon	Redwood Canyon: 10 people per party	There would be a 10-person maximum party size for Redwood Canyon.	Same as alternative 2.	There would be an 8-person maximum party size for Redwood Canyon.	There would be a 6-person maximum party size for Redwood Canyon.

*consistent with neighboring USFS

Table 49: Party Size Limits for Stock Parties

Type of Stock Trip	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
On-trail (day-use or day-rides)	Day rides, spot and dunnage – 25 people; 20 stock; combined maximum of 45.	Day Rides – 20 people; 20 stock; combined maximum 40.	Day Rides – 25 people; 25 stock; combined maximum 50.	Day Rides – 15 people; 15 stock; combined maximum 30.	Day Rides – 13 people; 13 stock; combined maximum 26.
On-trail (camping)	15 people; 20 stock; combined maximum of 35 (with some lower exceptions per BMP/SUMMP)	15 people; 20 stock; combined maximum 28.	15 people, 25 stock; combined maximum 40.	12 people; 15 stock; combined maximum 20.	10 people; 13 stock; combined maximum 18.
Off-trail (all use) in areas specifically designated for off-trail stock use	15 people; 20 stock; combined maximum of 35. (with some lower exceptions per BMP/SUMMP)	12 people; 12 stock; combined maximum 14.	15 people; 25 stock; combined maximum 40.	8 people; 7 stock; combined maximum 11.	No off-trail stock
Area-specific Stock Party Size Limits	Temporary limits would continue in five specific areas where there is a maximum party size of 8 (people, stock, or combination): Darwin Canyon, Dusy Basin, Mount Whitney/ Mount Langley, Sixty Lake, and Sphinx Lakes	Upper Goddard Canyon/Martha Lake would have a party-size limit consistent with the off-trail party size (12 people, 12 stock, combined maximum of 14). Sixty Lake Basin would be open to travel 1.8 miles from the junction of the JMT to the Sixty Lake Basin Trail, and would be closed to stock use beyond this point. There would be a combined party-size maximum of 8 (people and stock) for day rides above Penned Up Meadow on the Class 1 trail into Miter Basin.	None other than those listed below.	None other than those listed below.	Existing temporary party-size limits would be removed (maximum party size of 8 in specific locations), and stock would not be allowed off- trail.

Table 49: Party Size Limits for Stock Parties (continued)

Type of Stock Trip	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Redwood Canyon	Redwood Canyon: maximum of 10 stock and maximum hiker party-size of 10 people.	A party-size limit of 10 people or 10 people with 10 stock (combined maximum of 20) would be retained for Redwood Canyon.	Same as alternative 2.	A party-size limit of 8 people or 8 people with 8 stock (combined maximum of 16) would be implemented for Redwood Canyon.	A party-size limit of 6 people or 6 people with 6 stock (combined maximum of 12) would be implemented for Redwood Canyon.
Milestone Basin	Milestone Basin maximum of 8 head of stock by special permit only.	Closed to stock.	Maximum of 8 head of stock in Milestone Basin by special permit only.	Closed to stock.	Closed to stock.

Element 8: Stock Use

Table 50: Stock Use Comparison of Alternatives

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
On-trail Travel *See tables 47a through 47f starting on page 246 for specific trail mileages.*	Currently nearly all maintained wilderness trails in the parks are open to stock (637 of 653 miles). Stock travel is also permitted on 77 miles of informal and abandoned trails. (Note: Not all trails currently open to stock are maintained to stock standards)	Stock travel would be allowed on 650 of 691 miles of maintained trails.	Stock travel would be allowed on 671 of 714 miles of maintained trails.	Stock travel would be allowed on 527 of 643 miles of maintained trails.	Stock travel would be allowed on 665 of 702 miles of maintained trails.
On-trail – Camping with Stock	Approximately 598 miles of maintained and unmaintained trails are open to camping with stock.	Approximately 530 miles of maintained trails would be open to camping with stock.	Approximately 565 miles of maintained trails would be open to camping with stock.	Approximately 377 miles of maintained trails would be open to camping with stock by all user groups (private, commercial, and administrative) with an additional 72 miles of maintained trails open to overnight travel by private stock or administrative stock parties only (closed or day-use only for commercial stock).	Approximately 555 miles of maintained trails would be open to camping with stock.

Table 50: Stock Use Comparison of Alternatives (continued)

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Off-trail Travel	Travel is allowed up to 0.5 mile from trails and routes to reach campsites. Travel more than 0.5 mile from trails open to camping with stock is allowed in four areas of the parks: on the Hockett Plateau, along the western side of the Kern River watershed south from the Chagoopa Plateau, on the Monarch Divide including Hotel Creek, and in the Roaring River area.	In areas open to camping with stock, travel would be allowed up to 0.5 mile from trails. Travel more than 0.5 mile from trails would be allowed in four areas of the parks: on the Monarch Divide, in the Roaring River area, on the Hockett Plateau, and along the western side of the Kern River watershed south from the Chagoopa Plateau. .	In areas open to camping with stock, travel would be allowed up to 0.5 mile from trails. Travel more than 0.5 mile from trails would be allowed in four areas of the parks: on the Monarch Divide, in the Roaring River area, on the Hockett Plateau, and along the western side of the Kern River watershed south from the Chagoopa Plateau.	In areas open to camping with stock, travel would be allowed up to 0.5 mile from trails. Travel more than 0.5 mile from trails would be allowed for private stock parties in four areas of the parks: on the Hockett Plateau (except for Tar Gap), on the Monarch Divide (except for Kennedy Canyon), in the Roaring River drainage (except for Elizabeth and Colby passes), and along the western side of the Kern River watershed south from the Chagoopa Plateau (except for Lower Big Arroyo and Willow Meadow Cutoff).	In areas open to camping with stock, travel would be allowed up to 0.5 mile from trails. Travel more than 0.5 mile from trails would be prohibited.

Table 50: Stock Use Comparison of Alternatives (continued)

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Grazing: General	Grazing is generally allowed in areas open to camping with stock (within 0.5 mile of maintained trails open to camping with stock, along designated unmaintained routes, or in off-trail travel areas). Grazing is not allowed in those areas open only to stock travel.	Grazing would generally be allowed in areas open to camping with stock (within 0.5 mile of maintained trails open to camping with stock or in off-trail travel areas). Grazing would not be allowed in those areas open only to stock travel.	Grazing would generally be allowed within 0.5 mile of maintained trails open to camping with stock. Grazing would generally be prohibited in areas open to off-trail travel with the following exceptions: Ansel Lake, Chagoopa Treehouse Meadow, Crytes Lakes, Laurel Creek Basin, Long Meadow (Ferguson Creek), Sugarloaf Creek Confluence, West Fork Ferguson Creek. Grazing would not be allowed in those areas open only to stock travel.	No administrative, private, or commercial grazing would be allowed. Visitors and park staff traveling with stock would be required to carry feed for their animals and confine them on durable non-vegetated surfaces in camp.	Grazing would generally be allowed within 0.5 mile of maintained trails open to camping with stock. Grazing would not be allowed in those areas open only to stock travel.
Grazing: Areas with High Historic Use	The meadows closed to grazing by the 1986 SUMMP due to popular use and resource concerns would remain closed to grazing.	The meadows closed to grazing by the 1986 SUMMP due to high use and resource concerns would remain closed to grazing with one exception: Tom Sears Meadow would be reopened to grazing.	The meadows closed to grazing by the 1986 SUMMP due to high use and resource concerns would remain closed to grazing.	N/A	The meadows closed to grazing by the 1986 SUMMP due to high use and resource concerns would remain closed to grazing with one exception: Tom Sears Meadow would be reopened to grazing.

Table 50: Stock Use Comparison of Alternatives (continued)

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Grazing: Network of Ungrazed Meadows	The meadows closed to grazing by the 1986 SUMMP to provide a network of ungrazed meadows would remain closed to grazing.	The meadows closed to grazing by the 1986 SUMMP to provide a network of ungrazed meadows would remain closed to grazing. 7 additional meadows along the JMT and HST would be closed to grazing to expand the network of meadows closed to grazing for scientific and social value.	The meadows closed to grazing by the 1986 SUMMP to provide a network of ungrazed meadows would remain closed to grazing. 7 additional meadows along the JMT and HST would be closed to grazing to expand the network of meadows closed to grazing for scientific and social value.	N/A	The meadows closed to grazing by the 1986 SUMMP to provide a network of ungrazed meadows would remain closed to grazing.
Grazing: Additional Closures	9 additional meadows with high use and resource concerns would continue to be closed to grazing under the superintendent's authority to enact visitor-use restrictions.	10 additional meadows with high use and resource concerns would be closed to grazing. McClure Meadow would be closed to grazing until Evolution and Colby Meadows reach capacity. Grazing would be open to by private parties only at 3 meadows.	11 additional meadows with high use and resource concerns would be closed to grazing.	N/A	12 additional meadows with high use and resource concerns would be closed to grazing.

Table 50: Stock Use Comparison of Alternatives (continued)

Topic	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Exceptions for Parties with Burros or Llamas	Grazing would be open to grazing by backpacking parties with burros or llamas but closed to grazing by parties with horses or mules in four areas of the parks.	Grazing would be open to grazing by backpacking parties with burros or llamas but closed to grazing by parties with horses or mules in 4 areas of the parks.	Grazing would be open to grazing by backpacking parties with burros or llamas but closed to grazing by parties with horses or mules in 2 areas of the parks.	NA	Grazing would be open to grazing by backpacking parties with burros or llamas but closed to grazing by parties with horses or mules in 2 areas of the parks.
Head and/or Night Limits	Head and/or night limits are in place for 16 areas.	Head and/or night limits would be in place for 12 areas.	Head and/or night limits would be in place for 19 areas.	NA	Head and/or night limits would be in place for 11 areas.
Stock Facilities *See also tables 51a and 51b starting on page 272*	There are 52 existing hitch rails and 54 existing drift fences, pasture fences, and gates in the parks' wilderness managed under the SUMMP.	23 hitch rails would be removed and 29 hitch rails would be retained. 12 fences/gates would be removed and 42 would be retained.	14 hitch rails would be removed and 38 would be retained. 5 fences/gates would be removed, 49 would be retained, and one new fence with a gate would be constructed.	All hitch rails not associated with administrative facilities would be removed. All drift fences and gates would be removed. Groups traveling with stock would be required to hold their stock while camping (e.g., set up high lines) on durable, non-vegetated surfaces.	28 hitch rails would be removed, and 24 would be retained. A total of 18 fences and gates would be removed, 36 fences/gates would be retained, and one gate would be added.

Table 51a: Stock Facilities – Drift Fences and Gates to be Retained, Removed, or Added under Each Alternative

[No grazing would be allowed under alternative 4, thus all drift fences and gates associated with recreational use would be removed.]

Name	Alternative 2	Alternative 3	Alternative 5	Justification
Kings Canyon National Park (listed approximately north to south)				
Goddard Canyon (Cony Camp)	Retain	Retain	Remove	Keeps stock from returning to trailhead. Pole across San Joaquin second bridge considered, but there have been issues with visitor safety.
Evolution Meadow	Retain	Retain	Remove	Keeps stock from drifting to the San Joaquin. Keeps stock at Evolution Meadow out of Goddard Canyon meadows before opening date.
Third Bridge (on San Joaquin)	Do not add	Do not add	Add	Adding a pole gate across the bridge would replace fence below Evolution Meadow. Keeps stock out of backpacker camps at the San Joaquin. Keeps stock out of Goddard Canyon meadows before opening date.
McClure Meadow	Retain	Retain	Retain	Keeps stock out of upper Evolution Creek meadows before opening date.
Big Pete Meadow	Retain	Retain	Retain	Keeps stock from going between Little Pete and Big Pete. Helps protect closed portion of Big Pete from overuse.
Dusy Creek (east of LeConte Ranger Station)	Retain	Retain	Retain	Keeps stock that came over Bishop Pass from returning to trailhead. Prevents grazing and other impacts of drifting stock in Dusy Basin.
Ladder Camp	Retain	Retain	Remove	Keeps stock from going up canyon. Allows for stock grazing in wet years when other meadows have late opening dates.
Grouse Meadow	Do not add	Add	Do not add	Adding a fence would keep stock from drifting from Ladder Camp to Grouse Meadow if it is closed to grazing under alternatives 2 and 3.
Stillwater Meadow	Remove	Retain	Remove	Keeps stock from going down canyon from Deer Meadow. Could be replaced by a temporary fence as needed to facilitate use.
Simpson Meadow (base of Granite Pass trail)	Retain	Retain	Retain	Keeps stock from returning to the Monarch Divide from Simpson Meadow.
Fallen Moon (between East and West Fork Dougherty Creek)	Retain	Retain	Retain	Keeps stock from crossing between East and West Forks of Dougherty Creeks.
Shorty's Meadow (lower)	Retain	Retain	Retain	Keeps stock in Dougherty Creek from grazing Shorty's Meadow before the opening date. Prevents stock from drifting over Granite Pass.
Shorty's Meadow (upper)	Remove	Remove	Remove	Keeps stock in Shorty's Meadow from going over Granite Pass. Could be replaced with a temporary fence as needed to facilitate use.

Table 51a: Stock Facilities – Drift Fences and Gates to be Retained, Removed, or Added under Each Alternative (continued)

[No grazing would be allowed under alternative 4, thus all drift fences and gates associated with recreational use would be removed.]

Name	Alternative 2	Alternative 3	Alternative 5	Justification
Kings Canyon National Park (listed approximately north to south) – (continued)				
Granite Basin Lip (between Granite and Copper creeks)	Retain	Retain	Retain	Keeps stock from returning to the trailhead from Monarch Divide.
Castle Domes Meadow	Retain	Retain	Retain	Keeps stock from returning to trailhead. Prevents grazing and other impacts of drifting stock in Paradise Valley.
Woods Creek Crossing	Retain	Retain	Retain	Keeps stock out of Castle Domes Meadow before opening date. Helps management of grazing capacity at Woods Creek Crossing and Castle Domes Meadows.
Baxter Creek	Retain	Retain	Retain	Prevents grazing and other impacts of drifting stock in closed meadows and camps on south side of Woods Creek Crossing.
White Fork	Remove	Remove	Remove	Keeps stock from returning to Woods Creek Crossing from upper Woods Creek. Nearby camps no longer used by visitors.
Charlotte Lake (lower meadow)	Retain	Retain	Retain	Keeps stock that came over Kearsarge Pass from returning to trailhead. Prevents grazing and other impacts of drifting stock in the closed meadows at Charlotte Lake, Bullfrog Lake, and Kearsarge Lakes.
Upper Bubbs (Upper Vidette Meadow)	Retain	Retain	Retain	Keeps drifting stock from grazing the closed Vidette meadows.
Junction Meadow - Bubbs	Retain	Retain	Retain	Keeps stock out of the wetter portion of Junction Meadow before the opening date. Keeps stock from returning to trailhead.
East Lake	Retain	Retain	Retain	Keeps stock from grazing the closed lakeshore areas at East Lake.
West Side Roaring River (upper) (0.25 miles below Roaring River Ranger Station	Retain	Retain	Retain	Prevents stock from impacting sensitive areas below fence. Keeps stock from returning to Sugarloaf.
West Side Roaring River (lower) (1 mile below Roaring River Ranger Station)	Remove	Remove	Remove	Redundant to the West Side Roaring River (upper) fence. Not needed.
Roaring River Bridge (pole gate on bridge at ranger station)	Retain	Retain	Retain	Keeps stock from drifting from Scaffold Meadow to the West Side Roaring River area.
JR Pasture	Retain	Retain	Retain	Important for administrative stock use.
Lackey Pasture	Retain	Retain	Retain	Important for administrative stock use.
Scaffold Meadow	Retain	Retain	Remove	Keeps stock from leaving Scaffold Meadow and returning to Sugarloaf or over Avalanche Pass.

Table 51a: Stock Facilities – Drift Fences and Gates to be Retained, Removed, or Added under Each Alternative (continued)

[No grazing would be allowed under alternative 4, thus all drift fences and gates associated with recreational use would be removed.]

Name	Alternative 2	Alternative 3	Alternative 5	Justification
Kings Canyon National Park (listed approximately north to south) – (continued)				
Grasshopper	Remove	Retain	Remove	Keeps stock from traveling up canyon from Scaffold and Grasshopper meadows. Rarely used.
Cement Table	Retain	Retain	Retain	Keeps stock from drifting below Cement Table Meadow.
Big Wet	Retain	Retain	Retain	Keeps stock from drifting below Big Wet Meadow.
Grand Palace Hotel	Retain	Retain	Remove	Keeps stock from drifting below Grand Palace Hotel Meadow. Rarely used by visitors, used regularly for administrative stock.
Austin Camp (east) (on cutoff to Cloud Canyon)	Remove	Remove	Remove	Keeps stock from traveling between Deadman and Cloud Canyons. Route no longer passable.
Austin Camp (west)	Retain	Retain	Retain	Keeps stock from drifting below Austin Camp Meadow.
Grave	Retain	Retain	Retain	Keeps stock from drifting below Grave Meadow.
Lower Ranger	Retain	Retain	Retain	Keeps stock from drifting below Ranger Meadow.
Upper Ranger	Retain	Retain	Remove	Keeps stock from drifting below Upper Ranger Meadow. Rarely used.
Comanche	Retain	Retain	Retain	Keeps stock from returning to trailhead.
Sequoia National Park (listed approximately west to east)				
Redwood	Retain	Retain	Retain	Protects upper meadow from overuse.
Cold Springs	Remove	Retain	Remove	Keeps stock from going down canyon from Cold Springs Camp. Could be replaced by a temporary fence as needed to facilitate use. Rarely used by visitors, used regularly for administrative stock.
Crabtree	Retain	Retain	Retain	Keeps stock from drifting between Whitney Creek and Rock Creek. Prevents stock from returning to trailhead.
Rock Creek	Retain	Retain	Retain	Keeps stock from drifting up canyon to the closed Rock Creek #2 meadow.
High Sierra Gate (Kern Bridge camp)	Retain	Retain	Retain	Keeps stock from going up to Chagoopa Plateau from Kern Bridge Camp.
Upper Funston	Retain	Retain	Retain	Keeps stock from drifting between Kern Bridge Camp and Upper Funston. Helps to manages capacity at these two meadows. Prevents stock at Upper Funston from going up to Chagoopa Plateau.

Table 51a: Stock Facilities – Drift Fences and Gates to be Retained, Removed, or Added under Each Alternative (continued)

[No grazing would be allowed under alternative 4, thus all drift fences and gates associated with recreational use would be removed.]

Name	Alternative 2	Alternative 3	Alternative 5	Justification
Sequoia National Park (listed approximately west to east) – (continued)				
Rattlesnake Creek Confluence	Retain	Retain	Retain	Keeps stock from drifting from Upper Funston down the Kern canyon or up to Rattlesnake Canyon.
Laurel Creek	Remove	Retain	Remove	Keeps stock from drifting between 21" Camp and Lower Funston. Rarely used.
Lower Funston	Remove	Retain	Remove	Keeps stock from drifting between the Kern Ranger Station area from Lower Funston. Rarely used.
River Pasture (Rattlesnake Camp/River Pasture)	Remove	Remove	Remove	Keeps stock from crossing park boundary on the east side of the Kern River. Very rarely used.
Lewis Camp (north)	Retain	Retain	Retain	Keeps stock from leaving the park from meadows north of Lewis Camp.
Lewis Camp (south)	Retain	Retain	Retain	Important for administrative stock use.
Kern Ranger Station	Retain	Retain	Retain	Important for administrative stock use.
Rattlesnake Canyon #1 (Cow Camp)	Retain	Retain	Retain	Keeps stock from going between the Kern Canyon and Rattlesnake Canyon.
Rattlesnake Canyon #2 (Cow Camp)	Remove	Retain	Remove	One of two fences that keep stock from drifting between Cow Camp and Middle Rattlesnake Meadows.
Rattlesnake Canyon #3 (Middle Rattlesnake Meadows)	Remove	Retain	Remove	One of two fences that keep stock from drifting between Cow Camp and Middle Rattlesnake Meadows. Could be replaced by a temporary fence as needed to facilitate use and keep stock out of upper canyon before opening date.
Rattlesnake Canyon #4 (Middle Rattlesnake Meadows)	Retain	Retain	Retain	Keeps stock from returning to trailhead from Rattlesnake Canyon.
Hockett Pasture	Retain	Retain	Retain	Important for administrative stock use.

Table 51b: Hitch Rails to be Retained or Removed under Each Alternative

Location	# of Rails	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Justification
Kings Canyon National Park						
Darwin Meadow proper, old stock camp	1	Remove	Remove	Remove	Remove	Low use area; alternative places / methods to tie stock are feasible.
Fallen Moon camp	1	Remove	Retain	Remove	Remove	Primarily administrative camp; alternative places/ methods to tie stock are feasible.
Lackey Pasture	2	Retain both	Retain both	Remove both	Retain 1 of 2	Higher use area; protects local resources.
Roaring River Ranger Station	3	Retain 2 of 3	Retain 2 of 3	Remove all 3	Retain 1 of 3	Moderate use area; protects local resources.
Scaffold Meadow	1	Retain	Retain	Remove	Retain	Higher use area; protects local resources.
Trail crew camp 0.1 mi southeast of Roaring River Ranger Station	1	Remove	Remove	Remove	Remove	Administrative camp; alternative places/ methods to tie stock are feasible.
Grand Palace Hotel stock camp	1	Remove	Retain	Remove	Remove	Primarily administrative camp; moderate use area; protects local resources.
Stock camp above drift fence and below Cement Table Meadow	1	Retain	Retain	Remove	Retain	Moderate use area; protects local resources.
Sugarloaf Creek confluence	1	Remove	Remove	Remove	Remove	Low use area; alternative places /methods to tie stock are feasible.
Sugarloaf Meadow stock camp	1	Retain	Retain	Remove	Retain	Moderate use area; protects local resources.
Sequoia National Park						
Bearpaw Meadow Ranger Station	1	Retain	Retain	Remove	Retain	Moderate use area; protects local resources.
Redwood Meadow	1	Retain	Retain	Remove	Retain	Moderate use area; protects local resources.

Table 51b: Hitch Rails to be Retained or Removed under Each Alternative (continued)

Location	# of Rails	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Justification
Sequoia National Park – (continued)						
Redwood Meadow	2	Retain 1 of 2	Retain 1 of 2	Remove both	Retain 1 of 2	Moderate use area; protects local resources.
Stock trail terminus 0.5 mi below Crabtree Lakes	1	Retain	Retain	Remove	Retain	Moderate use area; protects local resources.
Bridge Camp; west side of Kern River across from hot spring	1	Retain but reduce size	Retain but reduce size	Remove	Retain but reduce size	Moderate use area; protects local resources.
Irene's Camp north of Kern Ranger Station	1	Retain	Retain	Remove	Retain	Moderate use area; protects local resources.
Kern Ranger Station	1	Retain	Retain	Remove	Retain	Moderate use area; protects local resources.
Kern Ranger Station	1	Retain	Retain	Remove	Retain	Moderate use area, protects local resources.
Lower Funston Meadow primary stock camp	1	Remove	Retain	Remove	Remove	Low to moderate use area; alternative places / methods to tie stock are feasible.
Upper Funston Meadow primary stock camp	1	Retain	Retain	Remove	Retain	Moderate use area; protects local resources.
Upper Funston Meadow secondary stock camp	1	Remove	Retain	Remove	Remove	Low use area; alternative places / methods to tie stock are feasible.
Forester Lake stock camp on east side	1	Remove	Remove	Remove	Remove	Low use area; alternative places / methods to tie stock are feasible.
Lower Lost Canyon trail crew camp	2	Remove both	Remove 1 of 2	Remove both	Remove both	Low use area; alternative places / methods to tie stock are feasible.
Rattlesnake Creek at Cow Camp	1	Remove	Remove	Remove	Remove	Primarily administrative camp, alternative places / methods to tie stock.
Evelyn Lake stock camp	1	Remove	Retain	Remove	Remove	Low use, alternative places / methods to tie stock.
Hockett Meadow stock camp	1	Remove	Retain	Remove	Remove	Low to moderate use, alternative places / methods to tie stock are feasible.

Table 51b: Hitch Rails to be Retained or Removed under Each Alternative (continued)

Location	# of Rails	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Justification
Sequoia National Park – (continued)						
Hockett Pasture	1	Remove	Remove	Remove	Remove	Low to moderate use area; alternative places /methods to tie stock are feasible.
Hockett Pasture trail crew camp	2	Retain 1 of 2	Retain 1 of 2	Remove both	Retain 1 of 2	Primarily administrative use; low to moderate use area; protects local resources.
Hockett Pasture trail crew camp	2	Retain 1 of 2	Retain 1 of 2	Remove both	Remove both	Primarily administrative use; low to moderate use area; protects local resources.
Hockett Ranger Station	2	Retain	Retain	Remove	Retain	Moderate use area in administrative area to facilitate patrol actions.
Hockett Ranger Station	1	Retain	Retain	Remove	Retain	Moderate use at ranger station.
Junction of South Fork Kaweah and Tuohy Creek stock camp	2	Retain 1 of 2	Retain 1 of 2	Remove both	Remove both	Low to moderate use area; protects local resources (Oreonana population).
Lower South Fork Meadow at Hidden Camp	2	Retain 1 of 2	Retain both	Remove both	Retain 1 of 2	Low to moderate use area; protects local resources.
Quinn Ranger Station	2	Retain 1 of 2	Retain 1 of 2	Remove both	Retain 1 of 2	Primarily administrative use; low to moderate use area; protects local resources.
Slim's Meadow	3	Retain 1 of 3	Retain 2 of 3	Remove all 3	Retain 1 of 3	Primarily administrative use with alternative places / methods to tie stock are feasible.
South Fork Meadow at Rock Camp	2	Retain	Retain	Remove both	Retain	Higher use area; protects local resources.
South Fork Pasture at Upper Camp	1	Retain	Retain	Remove	Remove	Moderate use area; protects local resources. Possibly reduce in size.
Summit Lake at stock camp	1	Retain	Retain	Remove	Retain	Moderate use area; protects local resources.

Element 10: Frontcountry Facilities to Support Wilderness Access and Use

Table 52: Summary of Frontcountry Facilities by Alternative

Facility or Area	Alternative 1 No-action/Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
The types and levels of commercial services that may be performed in wilderness are discussed in detail in the END (appendix B). Commercial service providers would be permitted to use some frontcountry facilities, but other facilities would only be used by non-commercial or administrative entities.					
Kings Canyon National Park Cedar Grove Pack Station	Cedar Grove Pack Station would continue to operate under concession authority based on a contractual relationship with the park.	The Cedar Grove Pack Station would continue to be operated under concession authority based on a contractual relationship with NPS with approved use types and levels.	Same as alternative 2.	The concessioners' wilderness operations originating from the Cedar Grove Pack Station would be reduced.	Same as alternative 2.
	No stock camping facilities are provided.	Stock camping sites would be developed at the Cedar Grove Pack Station primarily for private users. Holding pen/corral space, hitch rail(s), adequate parking and turnaround space for stock trailers, campfire pit, picnic tables, restrooms, food-storage boxes, and water would be installed.	Same as alternative 2.	Stock camping sites would be developed at the Cedar Grove Pack Station for private users.	Same as alternative 2.

Table 52: Summary of Frontcountry Facilities by Alternative (continued)

Facility or Area	Alternative 1 No-action/Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Sequoia, Middle Fork Kaweah Trailhead (Potwisha and Buckeye Flat Campgrounds, no change).	The small dirt parking area with food-storage boxes would be maintained at the trailhead.	The NPS would provide improved parking and turnaround space for stock trailers and a hitch rail; no other stock amenities would be provided. Commercial service providers would be allowed to use this trailhead. No camping for stock or backpackers would be provided or allowed.	Same as alternative 2.	Same as alternative 2, but use by commercial service providers would not be allowed to access wilderness from this area.	Same as alternative 2.
Sequoia – Mineral King	Mineral King has public campgrounds at Atwell Mill and Cold Springs. There is a large dirt parking lot with signs and food-storage boxes at the Atwell-Hockett trailhead for stock users and backpackers. There are currently no amenities for camping with stock at either campground.	A portion of the Atwell Mill Campground would be adapted to accommodate stock camping in two or three sites. Facilities may include a holding pen, hitch rail(s), table, campfire pit, picnic table, and stock trailer parking. The sites would be maintained through an agreement between the NPS and a cooperating partner. Commercial service providers would be allowed to use the Atwell / Hockett trailhead.	Same as alternative 2.	No facilities would be developed to support stock use at the Atwell Mill Campground in Mineral King.	Same as alternative 4.

Table 52: Summary of Frontcountry Facilities by Alternative (continued)

Facility or Area	Alternative 1 No-action/Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
	The Mineral King administrative corrals, in east Mineral King Valley, would continue to have stock facilities including buildings, corrals, and stock-support equipment. Existing facilities would continue to be used for park administrative purposes, and occasionally by holders of CUAs and private users to stage trips.	The Mineral King administrative corrals in east Mineral King Valley would continue to be used for park administrative purposes at the existing location or at a new location in the Mineral King area. There would be no concessions operations at the Mineral King Pack Station. Existing facilities at Mineral King administrative corrals in east Mineral King Valley would continue to be used for the parks' administrative purposes at the existing or at a new location. Existing stock facilities could be modified to allow for short-term public camping or staging and/or short-term camping by CUA holders.	The Mineral King Pack Station and administrative corrals would continue to be used for park administrative purposes at the existing location or at a new location in the Mineral King area. If a market and financial viability study/analysis determines that a concessions contract is feasible, per the Concessions Management Act and NPS policies, the Mineral King Pack Station could be operated as a contracted concessions service in its current location or at a new location at Mineral King.	Existing facilities at Mineral King administrative corrals in east Mineral King Valley would continue to be used in their existing or in a new location for park administrative purposes. Stock facilities would be modified or constructed to allow for short-term public use (e.g., staging and/or short-term camping). No commercial services would be authorized to use this facility.	All facilities at Mineral King administrative corrals and pack station in east Mineral King Valley would be removed and the area would be restored to natural conditions. A limited area for trailhead parking and stock turnaround below the corral site would be retained. Commercial service providers would be allowed to use the Mineral King Valley trailheads.

Table 52: Summary of Frontcountry Facilities by Alternative (continued)

Facility or Area	Alternative 1 No-action/Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
North Fork Kaweah Trailhead	The small dirt parking lot at the North Fork Kaweah trailhead would continue to be maintained. A primitive campground may be added.	Improved parking and turnaround space for stock trailers and additional hitch rail(s) would be provided. Commercial service providers would be allowed to use this trailhead. No camping for stock or backpackers would be provided.	Improved parking and turnaround space for stock trailers and additional hitch rail(s) would be provided. Commercial service providers would be allowed to use this trailhead. A small (two-site) primitive trailhead campground (i.e., no water) for stock users and backpackers would be constructed.	At the North Fork Kaweah trailhead improved parking and turnaround space for stock trailers and additional hitch rail(s) would be provided. Commercial service providers would not be authorized to use this trailhead.	Same as alternative 2.
South Fork Kaweah Trailhead	The facilities include a small parking area at the trailhead and a small rustic campground (10 sites, non-potable water, vault toilets, and food-storage boxes).	The South Fork Kaweah trailhead would be slightly modified to improve parking and turnaround space for stock trailers near the trailhead, and a hitching post would be provided. Use would be primarily for private users, with limited commercial use (and managed via permit conditions) and administrative users.	The South Fork Kaweah trailhead would include improved campsite(s) for stock users in the campground and improved parking and turnaround space for stock trailers at the trailhead. The trailhead would be primarily for private users, with limited commercial (managed via CUA permit conditions) and administrative users.	The South Fork Kaweah trailhead would be modified to improve parking and turnaround space for stock trailers at the trailhead. Only private and administrative users would have access to this trailhead; commercial service providers would not be authorized to use this area.	Same as alternative 2.

Table 52: Summary of Frontcountry Facilities by Alternative (continued)

Facility or Area	Alternative 1 No-action/Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Sequoia – Wolverton Area	The Wolverton area facilities, including a parking lot, trailhead, and administrative stock facilities, would continue to be maintained. There would continue to be limited short-term use by commercial-service providers under CUAs to stage resupply trips for the Bearpaw Meadow High Sierra Camp.	The facilities would continue to be used for park administrative purposes. The facilities would be available for short-term use by private parties and CUA holders, but there would be no permanent occupation of this facility by a commercial pack station for the purposes of conducting wilderness trips.	Same as alternative 2.	Stock facilities at Wolverton would remain in place at the current location, but they would be modified to allow for public use by private parties. There would be no commercial services provided at the facility through a concessions contract, but the facilities would continue to be used by private parties and for administrative purposes.	Stock facilities at Wolverton would remain in place at their current location, but they would be modified to allow for public use by private parties and for short-term use by commercial service providers. There would be no long-term commercial use of the facility by a resident pack station concession. The facilities would continue to be used for parks administrative purposes.

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Table 53: Summary of Impacts

Resource	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Wilderness Character Untrammeled Quality	Impacts on the untrammeled quality would be of a limited intensity and duration, and wilderness would in general remain dominated by natural processes.	Impacts on the untrammeled quality would be of a limited intensity and duration, and wilderness would in general remain dominated by natural processes.	Impacts on the untrammeled quality would be of a limited intensity and duration, and wilderness would in general remain dominated by natural processes.	Impacts on the untrammeled quality would be of a limited intensity and duration, and wilderness would in general remain dominated by natural processes.	Impacts on the untrammeled quality would be of a limited intensity and duration, and wilderness would in general remain dominated by natural processes.
Wilderness Character Natural Quality	The natural quality of wilderness would continue to be preserved.	The natural quality of wilderness would continue to be preserved. Overall visitor-use levels would remain similar to current use levels; on a wilderness-wide scale this alternative would have few detectable effects on the natural quality of wilderness. However, site-specific changes would result in improvement of this quality that would be detectable at a local scale. These local effects result from changes in the way that campfires, food storage, human waste, camping, and hiker and stock use, and commercial services are managed.	The natural quality of wilderness would continue to be preserved. Daily trailhead quotas would be increased; however, on a wilderness-wide scale this alternative would result in few detectable impacts on the natural quality of wilderness. Localized improvements on the natural quality could occur as a result of changes in the way that trails, campfires, food storage, human waste, camping, and hiker and stock use, and commercial services are managed.	The natural quality of wilderness would continue to be preserved. This alternative would result in few detectable effects on the natural quality of wilderness. The local improvements result from changes in food storage, human waste, and campsite management. The more substantial effects would result from the changes in campfire restrictions, elimination of grazing, and lower levels of commercial services.	The natural quality of wilderness would continue to be preserved. Under alternative 5, overall visitor-use levels would be reduced; however, on a wilderness-wide scale this alternative would have few detectable effects on the natural quality of wilderness. The local improvements would result from changes in campfire, food storage, human waste, camping, stock-use, and commercial services.
Wilderness Character Undeveloped Quality	The level of development related to visitor management would remain constant. There would be no change to the undeveloped quality.	Alternative 2 would result in a decrease in privies and food-storage boxes resulting in a slight improvement to the undeveloped quality.	Alternative 3 would result in more development in wilderness and therefore would result in adverse effects on the undeveloped quality.	Alternative 4 reduces development more than any other alternative, resulting in beneficial effects on the undeveloped quality.	Alternative 5 would result in a decrease in privies and food-storage boxes resulting in a slight improvement to the undeveloped quality.
Wilderness Character Opportunities for Solitude or Primitive and Unconfined Recreation	Under current conditions, the parks' wilderness provides outstanding opportunities for solitude and primitive and unconfined recreation, except at a few locations where visitor densities are relatively high and impacts on solitude occur. There would be no change to opportunities for solitude or primitive and unconfined recreation.	Alternative 2 would continue to provide outstanding opportunities for solitude and primitive and unconfined recreation in many areas, but in a few areas additional management controls would reduce the unconfined aspect, and slightly improve the solitude aspect.	Alternative 3 would result in improvements to opportunities for primitive and unconfined recreation in many areas, but in a few areas additional management controls would reduce the unconfined aspect. Alternative 3 would allow for increased overall wilderness use, reducing the opportunity for solitude, particularly in popular areas.	Alternative 4 would result in site-specific improvements in opportunities for solitude and primitive and unconfined recreation in many areas, but additional management controls would reduce the unconfined aspect.	Alternative 5 would result in improvement to opportunities for solitude and decrease opportunities for primitive and unconfined recreation throughout wilderness due to decreases in the number of visitors allowed in the wilderness.
Wilderness Character Other Features of Value	This alternative does not provide for a focused assessment of trails and other historic features, thus, until such assessment is undertaken under another program or project, the historic features may not be adequately protected. There would be no changes to scientific study.	One historic feature, the Mission 66-era ranger station at Bearpaw Meadow, would be removed. There are no changes proposed for scientific activities.	One historic feature, the Mission 66-era ranger station at Bearpaw Meadow, would be removed. There are no changes proposed for scientific activities.	One historic district and three historic features (the Bearpaw Meadow High Sierra Camp, Redwood Meadow, and Tyndall Creek ranger stations, and the Simpson Meadow Patrol Cabin) would be removed. There would be no changes to scientific study.	One historic district would be reduced in size. The Mission 66-era Bearpaw Meadow Ranger Station would be removed. There would be no changes to scientific study.

Table 53: Summary of Impacts Table (continued)

Resource	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Soils	The effects of current visitor and administrative activities are not currently posing recognizable threats to soils. There would be no change under this alternative.	In general, this alternative seeks to maintain visitation into the parks' wilderness. Therefore, the impacts from continued visitor use would be similar to current conditions as described under alternative 1. Additional beneficial effects could result from removal of some installations, and establishment or restoration of trails. Adverse impacts could occur from installation of new privies and the establishment of campsites. Impacts would be localized and not measurably different from current conditions.	In general, this alternative would allow for increased visitation in wilderness. As a result, adverse impacts on soils may increase slightly in localized areas from an increase in visitors, stock, and development wilderness-wide.	This alternative seeks to maintain or slightly reduce visitation into the parks' wilderness. As a result, adverse impacts on soils may decrease slightly overall from reduced use. Beneficial effects would occur from a decrease in the number of stock, the elimination of grazing wilderness-wide, and the removal of installations. Adverse effects would result from the establishment of stock hold and feed areas. Beneficial and adverse effects would be localized and slight; and would not result in a measurable change on a wilderness-wide scale.	Visitor use would be reduced from current levels. Fewer visitors could result in fewer effects from visitor use overall, such as the development of social trails and new campsites. Beneficial effects would occur from a decrease in the number of stock and hikers and the removal of installations. Beneficial and adverse effects would be localized and slight; and would not result in a measurable change.
Water Quality	No changes to the management of parks' wilderness would occur. Humans and stock appear to have had little impact on water quality or on the overall health of the aquatic ecosystem when compared to environments with very little use. Some measurable impacts have occurred, especially near the most heavily visited locations; however, the impacts remain below accepted thresholds of health or ecological concern. It is likely that the prevailing environmental conditions would persist under this alternative.	Under alternative 2, visitor use would remain at about the same levels. Therefore, the impacts from continued visitor use would be similar to current conditions as described under alternative 1. The prohibition of grazing in selected meadows may result in a small, beneficial effect on water quality.	Alternative 3 provides for increased visitor use levels in certain areas. Studies indicate that visitors have some small adverse impact on water quality, and it is reasonable to assume that additional users will likely result in more impacts, but the impacts should remain small and would remain below accepted thresholds of health or ecological concern.	Alternative 4 provides for a slight decrease in visitor use levels in certain areas. A reduction in users may result in small beneficial effects, but at a scale too small to measure. This alternative would likely result in some beneficial effects on water quality in the areas which had been open to grazing.	Alternative 5 provides for a reduction of visitor use levels wilderness wide. Wilderness visitors have a small, but adverse impact on water quality. A reduction in users would likely result in small, beneficial effects, but likely at a level below any detectable limits.
Vegetation Wetlands and Meadows	Impacts from human traffic would remain similar to current levels and insignificant at the landscape scale. The extent and severity of trampling, grazing, and nonnative species impacts due to stock use would be expected to remain comparable to current levels. Stock parties would have access to 64% of the meadow area; 51% of meadow area would be open to grazing The amount of grazing would be similar to current levels. Grazing capacities would be adopted in popular destinations. Grazing intensity outside of these areas would be a function of variable annual stock use patterns and productivity.	Impacts from human traffic would remain similar to current levels and insignificant at the landscape scale. The extent and severity of trampling, grazing, and nonnative species impacts due to stock use would be reduced from current levels. Stock parties would have access to 54% of the meadow area; 48% of meadow area would be open to grazing. The amount of grazing would be similar to current levels. The intensity of grazing in named forage areas (and therefore the extent and severity of impacts) would be limited by grazing capacities.	Impacts from human traffic would increase but remain insignificant at the landscape scale. There would be a decrease in the extent but an increase in the severity of trampling, grazing, and nonnative species impacts due to stock use as higher use would be concentrated in fewer destinations. Stock parties would have access to 55% of the meadow area in the parks; 37% of all meadow area would be open to grazing. The amount of grazing would be greater than current levels. The intensity of grazing in named forage areas (and therefore the extent and severity of impacts) would be limited by grazing capacities.	Impacts from human traffic would remain similar to current levels and insignificant at the landscape scale. The extent and severity of impacts due to stock use would be greatly reduced. Parties traveling with stock would continue to have access to 44% of the meadow area in the parks. Total stock use would decrease relative to current levels. Grazing would be prohibited throughout the park; therefore, grazing impacts would be eliminated. Trampling impacts would be nearly eliminated. Nonnative species impacts due to stock use would be expected to decrease, with a chance for increased impacts due to a greater amount of carried feed used.	Impacts from human traffic would decrease and remain insignificant at the landscape scale. The extent and severity of trampling, grazing, and nonnative species impacts would decrease with lower overall stock use and fewer areas open to grazing. Stock parties would have access to 43% of the meadow area; 37% of meadow area would be open to grazing. The amount of grazing would be less than current levels. The intensity of grazing in named forage areas (and therefore the extent and severity of impacts) would be limited by grazing capacities.
Vegetation High-elevation Long-lived Trees	Campfires would be prohibited in 439,515 acres while being allowed in 44,212 acres of high-elevation conifer habitat that supports the four subalpine long-lived tree species.	Campfires would be prohibited in 442,096 acres while being permitted in 35,857 acres of high-elevation conifer habitat that supports the four subalpine or upper montane long-lived tree species (whitebark pine, foxtail pine, limber pine, and Sierra juniper).	Campfires would be prohibited in 543,965 acres while being permitted in 13,126 acres of high-elevation conifer habitat that supports the four subalpine long-lived tree species.	Campfires would be prohibited in 837,806 total acres of the parks or 100% of wilderness. It would include all areas of high-elevation conifer habitat where the four long-lived tree species occur within the parks. This would include a wide range of vegetation types distributed throughout wilderness from low to high elevations.	Campfires would be prohibited in 412,530 total acres of the parks, while being permitted in 37,144 acres of high-elevation conifer habitat that supports the four subalpine long-lived tree species.

Table 53: Summary of Impacts Table (continued)

Resource	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Vegetation Alpine Vegetation	Direct removal of alpine vegetation would continue to occur infrequently. Trampling of alpine vegetation along trail corridors, at popular destinations, and in alpine meadows would continue, particularly in areas of concentrated visitor use and where grazing occurs. Under current use levels and patterns, vegetation in untrailed alpine areas would remain largely undisturbed. Approximately 64% of mapped alpine vegetation areas would be closed to stock, which would serve to protect these areas from potential grazing and trampling impacts.	Impact types would be the same as described for alternative 1. If visitor use increases in off-trail areas, impacts on alpine vegetation could increase in extent and severity. Impacts would be reduced by limiting certain areas to pass through or day-use and by closing certain trails and meadows to stock access completely. Under this alternative 70% of the mapped alpine vegetation areas would be closed to stock, providing increased protection from potential grazing and trampling impacts.	Impact types would be similar to alternative 1; however, the increased use levels and use patterns would likely increase trampling impacts on alpine vegetation, particularly in popular areas and around new food-storage boxes. Impacts along trails would continue, and if visitor use increases in off-trail areas, impacts on alpine vegetation could increase in extent and severity. Under this alternative, 69% of the mapped alpine vegetation areas would be closed to stock, providing increased protection from potential grazing and trampling impacts.	Impacts on alpine vegetation would be similar to alternative 1, but could be reduced by limitations on visitor use, which could result in reduced use in off-trail areas. Trampling in alpine meadows by stock would largely cease due to grazing restrictions. However, the areas used for holding and feeding stock could be subject to increased trampling impacts. Under this alternative, 76% of the mapped alpine vegetation areas would be closed to stock, providing increased protection from potential grazing and trampling impacts.	Impacts on alpine vegetation would be expected to decrease relative to current conditions, as a result of overall decreased visitor use. There could continue to be trampling impacts associated with grazing where it occurs. Under this alternative, 83% of the mapped alpine vegetation areas would be closed to stock, providing increased protection from potential grazing and trampling impacts.
Vegetation Plants of Conservation Concern	Direct removal and trampling of the plants of conservation concern by visitors would be expected to be infrequent under current levels and patterns of use. Although species in the meadows and uplands may suffer incidental trampling by visitors traveling through meadows or on cross-country routes, this would not be expected to result in population level impacts. Localized impacts from stock use could affect plants of conservation concern. There is no evidence that current use levels and patterns are resulting in population level impacts on these species.	Impacts on vascular plants and mosses of conservation concern would be similar to alternative 1. Restrictions and closures of certain areas to stock grazing and access would reduce the potential for impacts from trampling and grazing. Because grazing intensity in meadows would be managed through the implementation of site-specific grazing capacities, impacts on these species would continue to be localized and would not be expected to result in large-scale losses or declines that could lead to the listing of any of the species.	The potential for trampling of the plants of conservation concern by hikers could rise with the increased visitor use. Species in the meadows and uplands may be subject to incidental trampling by visitors traveling through meadows or on cross-country routes, although this would not be expected to result in population level impacts. Localized impacts from stock use and grazing could affect plants of conservation concern. Because grazing intensity in meadows would be managed through the implementation of site-specific grazing capacities, impacts on these species would continue to be localized and would not be expected to result in large-scale losses or declines that could lead to the listing of any of the species.	The potential for impacts on plants of conservation concern would be reduced due to the reduction in overall use and the elimination of grazing.	The potential for impacts on plants of conservation concern would be reduced as a result of reduced visitor use, smaller party sizes, and the elimination of cross-country travel by stock. Because grazing intensity in meadows would be managed through the implementation of site-specific grazing capacities, impacts on these species would continue to be localized and would not be expected to result in large-scale losses or declines that could lead to the listing of any of the species.
Vegetation Nonnative Plants	Disturbance associated with visitor use, including off-trail travel and grazing, would remain the same, and there would be no change in the use of unprocessed hay and hay cubes. Thus there would continue to be the potential for the introduction and spread of nonnative species in popular areas of the wilderness and those frequented by stock.	The overall probability of nonnative introductions would be approximately the same as current conditions. However, beneficial effects would occur from slightly less off-trail stock travel and grazing, and the required use of processed (i.e., weed-seed free) feed. Although the probability of nonnative introductions would be less than current conditions, the spatial distribution of impacts would be similar to current conditions.	The overall probability of nonnative introductions would be approximately the same as current conditions. A slight reduction in off-trail travel and grazing, coupled with requirements for processed feed would mitigate some of the impacts from increased visitor and stock use and administrative activities. More meadows would have a lowered risk of nonnative plant introduction, as they would be closed to stock access.	The extent of disturbed land would be lowered due to reduced visitor and group sizes, and a reduction in facility maintenance. Overall, propagule pressure, the probability of nonnative introduction into wetlands, and the spatial distribution of impacts would be substantially lower than current conditions due to the elimination of grazing and a reduction in off-trail stock travel.	Similar to alternative 4, there would be beneficial effects on native plant communities due to reduced visitor use wilderness wide.

Table 53: Summary of Impacts Table (continued)

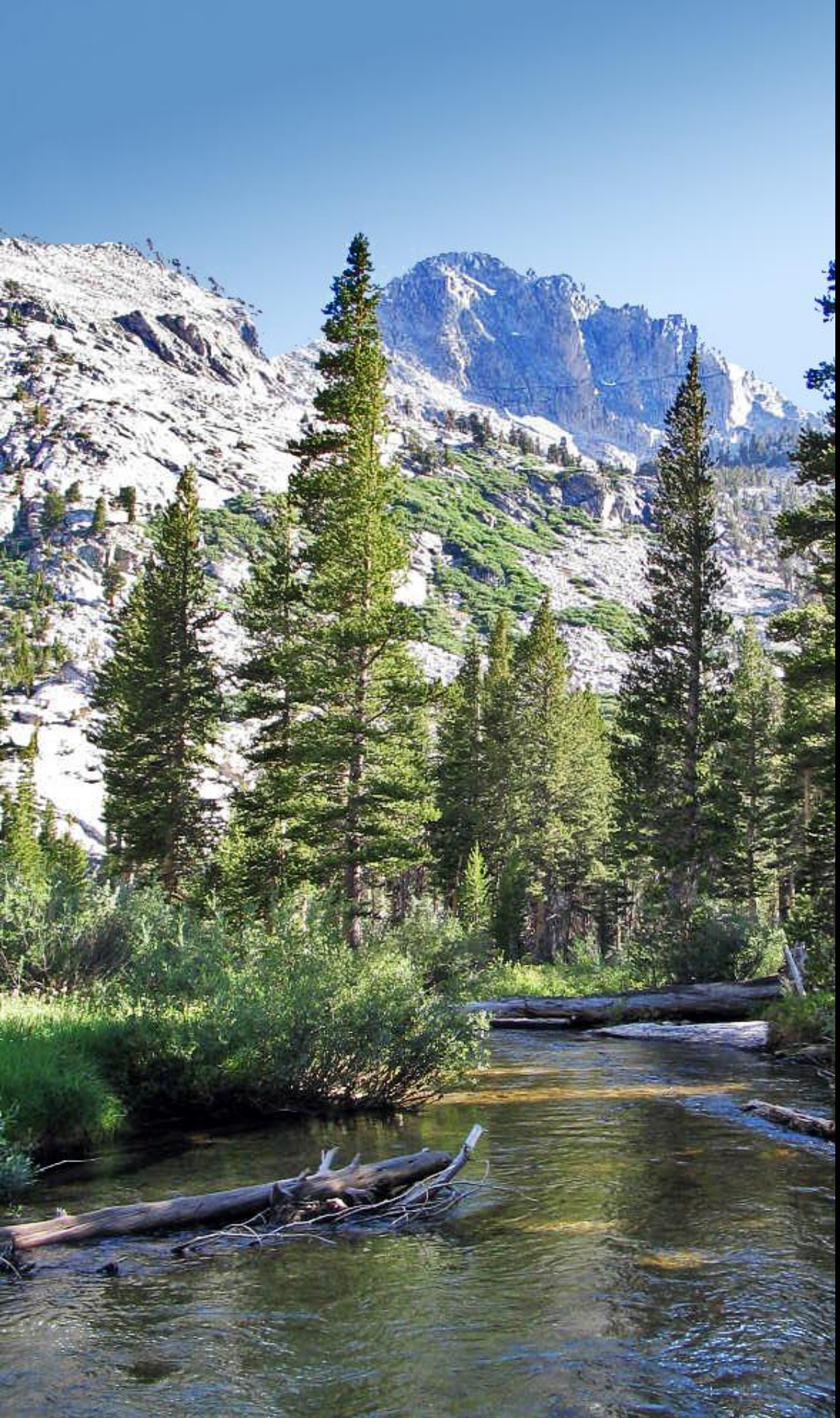
Resource	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Wildlife Black Bear	Under alternative 1, bears would continue to have benign encounters with people throughout wilderness, which would lead to habituation, which is often a precursory behavior to food-conditioning that occurs when bears associate people with food. Incidents would continue to remain relatively rare and bear population dynamics in wilderness would be dominated by natural processes.	Because the visitor use levels would be similar to present levels, there would be little change in undesirable bear behavior under this alternative. However, the removal of nearly half of the existing food-storage boxes and establishing new campsites could increase habituation and food-conditioning, leading to adverse impacts. If proper food storage is regularly practiced, increases in human/bear conflicts as a result of this action would be expected to be minimal.	Potential increases in human/bear encounters (and thus, increased habituation and food-conditioning) would result from increased visitor use and additional established campsites. These impacts would be mitigated by adding 35 new food-storage boxes, moving existing food-storage boxes to more appropriate locations, and increasing portable food container requirements. Overall, the change in impacts from current conditions would be minimal.	Reduced visitor use could result in a reduction of bear-human encounters. Beneficial effects from reducing visitor use, however, would be outweighed by the adverse impacts of removing all food-storage boxes. There would likely be a net increase in food-conditioned bears because a percentage of visitors would likely not properly store their food.	Beneficial effects from reducing visitor use would be outweighed by the adverse impacts of removing all food-storage boxes. There would likely be a net increase in food-conditioned bears because a percentage of visitors would likely not properly store their food.
Wildlife Birds	In wilderness, brown-headed cowbird abundance and parasitism would continue to be uncommon and impacts on native bird species would continue to be minimal because of the lack of development although there could be potential for localized problematic areas near ranger stations or other highly visited sites. Brown-headed cowbird abundance and parasitism rates could be relatively high near frontcountry developments (e.g., campgrounds, picnic areas, administrative and stock facilities, etc.), particularly for species restricted to lower elevations, and could limit population growth.	Additional meadow closures and decreases in stock party sizes could cause a reduction in available brown-headed cowbird habitat, limiting their impact on native bird species in wilderness. However, any increase in the use of supplemental feed products could increase habitat and food sources for the cowbird, potentially increasing opportunities for nest parasitism. Increased development in frontcountry sites may cause a slight increase in brown-headed cowbird abundance at these sites. However, the impacts on native bird species from brown-headed cowbird parasitism are not expected to increase substantially from current conditions.	Increased stock party sizes, establishment of stock campsites, and any increase in the use of supplemental feed products could increase habitat quality for brown-headed cowbirds, thus increasing the potential for parasitism of host species. Slight beneficial effects on native bird species would occur from reducing stock grazing in off-trail areas, reducing brown-headed cowbird habitat.	The closure of all meadows to grazing could contribute to reduced habitat quality for brown-headed cowbirds and could result in a decrease in parasitism to host species near these sites, relative to alternative 1. This would result in a beneficial effect on native birds. However, adverse impacts could result from use of supplemental feed carried into wilderness and the development of frontcountry sites, as described for alternative 2.	Abundance of brown-headed cowbirds would likely be reduced by the reduced stock party sizes, removal of stock campsites, and the reduced number of meadows open to grazing. However, adverse impacts could result from the use of supplemental feed carried into wilderness and the development of frontcountry sites, as described for alternative 2.
Wildlife Invertebrates	Invertebrates would continue to be adversely affected by human and stock trampling, stock grazing, and stock fording of streams. The impact intensity would be scale dependent. Wilderness-wide, impacts would be undetectable; however, on a localized scale, measureable impacts would continue to occur.	Similar visitor use levels would result in impacts similar to those described under alternative 1. The closure of additional meadows to grazing would result in beneficial effects on invertebrates at these sites. These beneficial effects are anticipated to be minimal.	Increased visitor use would provide increased opportunities for invertebrates to be affected by trampling; however, the difference in impacts would not be measurable relative to alternative 1. Additional areas would be closed to grazing, providing beneficial effects on invertebrates in the newly closed meadows when compared to current conditions. These beneficial effects are anticipated to be minimal.	Reduced visitor use levels would result in a slight beneficial effect on invertebrates, but the effects would be similar to those described under alternative 1. The closure of all meadows to grazing would result in beneficial effects on invertebrates at these sites. These beneficial effects are anticipated to be minimal.	Reduced visitor use levels would result in a slight beneficial effect on invertebrates, but the effects would be similar to those described under alternative 1. The closure of additional meadows to grazing and off-trail stock travel would result in beneficial effects on invertebrates. These beneficial effects are anticipated to be minimal.
Special-status Species Yosemite Toad	Visitors would continue to encounter Yosemite toads in wilderness, which could result in disturbance and/or trampling. Disturbance would not have an impact on toad populations. The small amount of potential trampling that may affect Yosemite toads under this alternative would be expected to result in no effect on their populations. Under this alternative stock use and grazing would continue to be managed to prevent unacceptable habitat degradation; therefore, while there may be adverse impacts on individual toads, the potential for population-wide effects is small.	As in alternative 1, the potential for disturbance to Yosemite toads from visitor encounters and trampling would continue to occur. However, additional stock access restrictions, and the elimination or reduction in grazing in known toad habitat would reduce the potential of trampling and habitat degradation, and would be expected to result in a beneficial effect on Yosemite toads.	With an increase in use, there is an increased potential for visitors to disturb or trample Yosemite toads. However, additional stock access restrictions, and the elimination or reduction in grazing in known toad habitat would reduce the potential of trampling and habitat degradation, and would be expected to result in a beneficial effect on Yosemite toads.	As in alternative 1, the potential for disturbance to Yosemite toads from visitor encounters and trampling would continue to occur, but would be reduced with reduced visitor access in toad habitat. Additional stock access restrictions and the elimination of grazing in known toad habitat would reduce the potential of trampling and habitat degradation, and would be expected to result in a beneficial effect on Yosemite toads.	With decreased use overall, the potential for disturbance to Yosemite toads from visitor encounters and trampling would be reduced from current levels. Additional stock access restrictions, and the elimination or reduction in grazing in known toad habitat would reduce the potential for trampling and habitat degradation, and would be expected to result in a beneficial effect on Yosemite toads.

Table 53: Summary of Impacts Table (continued)

Resource	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Special-status Species Mountain Yellow-legged Frog	Visitors would continue to encounter mountain yellow-legged frogs in wilderness, which could result in disturbance and/or trampling of frogs. Disturbance would not have an impact on frog populations. Trampling could adversely impact individual frogs, but would not have an impact on frog populations. The degradation of mountain yellow-legged frog habitat could occur in high use areas or near trails, but given the few locations where frog populations inhabit areas near trails, the potential for habitat degradation has been shown to be small.	The potential for visitors to disturb or trample mountain yellow-legged frogs would be similar as described under alternative 1. Additional stock access and grazing restrictions would protect frogs and frog habitat, and thus would be expected to result in beneficial effects.	With increased use, there is an increased potential for visitors to disturb or trample mountain yellow-legged frogs. However, additional stock access and grazing restrictions would protect frogs and frog habitat, and thus would be expected to result in beneficial effects.	The potential for visitors to disturb or trample mountain yellow-legged frogs would be similar as described under alternative 1. Additional stock access restrictions and the elimination of grazing would protect frogs and important frog habitat, and thus would be expected to result in beneficial effects.	The potential for visitors to disturb or trample mountain yellow-legged frogs would be reduced from alternative 1 due to reduced visitor use. Additional stock access and grazing restrictions would protect frogs and important frog habitat, and thus would be expected to result in beneficial effects.
Special-status Species Sierra Nevada Bighorn Sheep	Visitors would continue to encounter Sierra Nevada bighorn sheep in wilderness, which could result in disturbance. There is no evidence of adverse impacts on bighorn sheep from hikers and stock use under current use levels; therefore, these disturbances would not be of biological importance.	There could be an increased frequency of bighorn sheep/human encounters if new Class 1 trails are established in bighorn sheep habitat. However, such trails could concentrate visitor use and benefit bighorn sheep by making human activity more predictable. Reducing stock party sizes and areas open to grazing could benefit bighorn sheep in portions of their habitat. These beneficial effects are anticipated to be minimal. There could be short-term adverse effects from project activities in bighorn sheep habitat.	Trailhead quotas could increase on trails that intersect bighorn sheep habitat and new Class 1 trails could be established in bighorn sheep habitat; these actions could result in an increase in bighorn sheep-human interactions. It is probable that adverse impacts of increased bighorn-human interactions would continue to remain below the level of biological significance, and new Class 1 trails could concentrate use and benefit bighorn sheep by making human activity more predictable. Reducing areas open to grazing could benefit bighorn sheep in portions of their habitat. These beneficial effects are anticipated to be minimal. There could be short-term adverse effects from project activities in bighorn sheep habitat.	There would be beneficial effects on bighorn sheep because trailhead quotas would be reduced, stock would be allowed to travel on fewer trails, and party size would be reduced. Overall the effects would be beneficial and long-term; however, the beneficial effects are anticipated to be minimal. There could be short-term adverse effects from project activities in bighorn sheep habitat.	There would be beneficial effects on bighorn sheep from decreased visitor use and closures of areas to stock, specifically off-trail areas. Overall the effects would be beneficial and long-term; however, the beneficial effects are anticipated to be minimal. There could be short-term adverse effects from project activities in bighorn sheep habitat.
Cultural Resources	Cultural resources in wilderness would continue to be protected. There would be no adverse effects on cultural resources.	Most cultural resources in wilderness would continue to be protected. The ranger station at Bearpaw Meadow would be removed, resulting in an adverse impact on an historic resource. The level of impact could be somewhat mitigated through documentation strategies developed in consultation with the CA SHPO.	Most cultural resources in wilderness would continue to be protected. The ranger station at Bearpaw Meadow would be removed, resulting in an adverse impact on an historic resource. The level of impact could be somewhat mitigated through documentation strategies developed in consultation with the CA SHPO.	Most cultural resources in wilderness would continue to be protected. The removal of Bearpaw Meadow High Sierra Camp, including the ranger station, and the ranger stations or patrol cabins at Redwood Meadow, Simpson Meadow, and Tyndall would result in an adverse impact on those historic resources. The level of impact could be somewhat mitigated through documentation strategies developed in consultation with the CA SHPO.	Most cultural resources in wilderness would continue to be protected. The removal of the ranger station at Bearpaw Meadow would result in an adverse impact on an historic resource The level of impact could be somewhat mitigated through documentation strategies developed in consultation with the CA SHPO.

Table 53: Summary of Impacts Table (continued)

Resource	Alternative 1 No-action / Status Quo	Alternative 2 Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)	Alternative 3 Provide More Opportunities for Primitive Recreation	Alternative 4 Emphasize Undeveloped Quality and Non-commercial Recreation	Alternative 5 Emphasize Opportunities for Solitude
Socioeconomics	There would be little change from current conditions. At the regional level, the effects on socioeconomics related to the parks' wilderness visitation and operations would be both beneficial and adverse.	Similar to alternative 1; however, the more direct consequences of the restrictions placed in the busiest areas of wilderness (i.e., reductions in quotas for specific busy trails, limits on commercial services in the Mount Whitney Management Area, and limits on grazing), could result in lower use and the redistribution of use geographically and could adversely affect individuals or businesses. Alternative 2 allows for near current levels in use supported by commercial services, including stock-based use, providing potential economic benefits for some commercial service providers and supporting businesses. Alternative 2 would result in beneficial and adverse impacts over the long term.	Increased visitor use may result in long-term increases in the economic and social benefits from increased spending by wilderness visitors at local stores, motels and hotels, and other tourism-related businesses and attractions. Alternative 3 allows for increased use supported by commercial services, including stock-based use, providing potential economic benefits for some commercial services providers and supporting businesses. Alternative 3 would result in beneficial effects over the long term.	This alternative may result in limited economic and social effects. The decreased use could reduce income and increase costs for outfitters, adversely affecting the long-term economic viability of some outfitters, potentially to the point that one or more outfitters may choose to forego pursuit of Commercial Use Authorizations. Such a decision could have indirect effects in one or more gateway communities. Individual outfitters and guides could be affected differentially by changes associated with this alternative.	Same as alternative 4.
Visitor Use and Experience	Alternative 1 provides a positive visitor experience for the majority of visitors throughout the parks' wilderness. In the most popular areas, visitor experience could be adversely or beneficially impacted due to the condition of the wilderness (campsite conditions), the existence of facilities, and the availability of commercial services to support visitor use.	Alternative 2 would continue to provide a positive experience for the majority of visitors throughout the parks' wilderness, with localized improvements occurring in selected areas. However, some visitors may not be able to travel in the area of their choice due to new restrictions on access and stock use, campfire limits, and reductions in commercial services in the Mount Whitney Management Area. Visitor-related facilities would be reduced, resulting in both adverse and beneficial effects on the visitor experience, depending on their expectations.	Alternative 3 would continue to provide a positive experience for the majority of visitors throughout the parks' wilderness. However, increased use in the most popular areas and increased level of restrictions would result in adverse effects on the visitor experience when compared with the other alternatives. Visitor –related facilities would be increased, resulting in both adverse and beneficial effects on the visitor experience, depending on their expectations.	Under alternative 4, certain uses would be limited. Campfires would not be allowed. All food-storage boxes would be removed. Grazing would be prohibited. There would be decreased opportunities wilderness-wide for visitors to use commercial service providers. The increased restrictions and decreased visitor-related facilities would result in both adverse and beneficial effects on the visitor experience depending on their expectations.	Under alternative 5, visitor access would be limited to the lowest amount when compared with the other alternatives. There would be reduced opportunities for visitors traveling with stock due to off-trail restrictions. There would be fewer visitor-related facilities. There would be decreased opportunities wilderness-wide for visitors to use commercial service providers. Overall this alternative would result in both adverse impacts to those visitors who are unable to gain access to the wilderness, and beneficial effects on those visitors who gain access and experience wilderness.
Park Operations	There would be no change to current operations.	There would be cost and work associated with the removal of facilities, but a reduction in long-term expenditures with reduced maintenance requirements. After initial changes to the wilderness-related programs, this alternative would result in impacts that are not substantially different from the no-action alternative.	There would be cost and work associated with the installation of new facilities, and long-term maintenance requirements. After initial changes to the wilderness-related programs, this alternative would result in impacts that are not substantially different from the no-action alternative.	There would be cost and work associated with the removal of facilities, but a reduction in long-term expenditures with reduced maintenance requirements. There would be long-term costs associated with having to buy feed to allow the continued use of administrative stock. For other wilderness-related programs, this alternative would result in impacts that are not substantially different from the no-action alternative.	There would be cost and work associated with the removal of facilities, but a reduction in long-term expenditures with reduced maintenance requirements. Fewer visitors in wilderness would likely result in a decrease in administrative activities resulting from wilderness management.



Chapter 3

Affected Environment

ON THE PREVIOUS PAGE
Bubbs Creek near Vidette Meadow
Photo Courtesy of Rick Cain

CHAPTER 3: AFFECTED ENVIRONMENT

The Affected Environment chapter describes the resources that could be affected as a result of implementation of any of the alternatives. These descriptions provide an account of baseline conditions of the resources, against which potential effects of the proposed actions are compared. The resource topics and their organization in this chapter correspond to the resource impact discussions in "Chapter 4: Environmental Consequences." Description of the general wilderness setting has been included to provide the background information necessary to understand the parks' resources and environmental setting.

The following resources/topics are included in this chapter: wilderness character; soils; water quality; vegetation (wetland and meadows, high-elevation long-lived tree species, alpine vegetation, plants of conservation concern, and nonnative species); wildlife (black bears, birds, and invertebrates); special-status species; cultural resources (historic structures and districts, cultural landscapes, and ethnographic resources and landscapes); socioeconomics; visitor use; and park operations.

WILDERNESS CHARACTER

INTRODUCTION TO WILDERNESS CHARACTER

Sequoia and Kings Canyon National Parks protect 865,964 acres of the central and southern Sierra Nevada, of which nearly 97% is designated or managed as wilderness. The Wilderness Act Section 2 (a) directs wilderness managing agencies to administer wilderness areas "for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness."

However, wilderness character is not specifically defined in the 1964 Wilderness Act, nor is its precise meaning made clear in the legislative history. Managers therefore, needed a framework for monitoring and preserving wilderness character as the act requires. Scholars, on behalf of wilderness-managing agencies, have looked to the definition of wilderness contained in Section 2 (c) of the Wilderness Act, examined the writings of the framers of the Wilderness Act, and developed a framework based on four qualities of wilderness character that unify all wilderness areas regardless of size, location, or any other feature (Landres et al. 2005; Landres et al. 2008). These four defining qualities of wilderness are 1) untrammeled, 2) natural, 3) undeveloped, and 4) having outstanding opportunities for solitude or a primitive and unconfined type of recreation.

The legislative and administrative direction and the conditions to be preserved in specific wilderness areas are established at the time of designation by Congress. Therefore, each wilderness is unique in terms of how the four qualities of wilderness character are expressed and managed. The legislative history of a wilderness may inform managers about why Congress designated that area and the special values or special features, purposes, and places within it (NPS 2014a). This uniqueness means that change in wilderness character must be understood in the context of the particular area and its history and legislative origins.

In 2012, the parks initiated a wilderness character assessment, using the four qualities of wilderness character as a framework. This assessment describes what is unique and special about this wilderness and examines the current state of the wilderness areas within the parks. The assessment narrative also identifies important scenic, cultural, educational, or other features that contribute significantly to and are

unique to the parks' wilderness character, often referred to as the fifth or "other" quality of wilderness character (note the assessment did not detail the full extent of this quality). Information for the wilderness character assessment was derived from surveys, interviews, and a workshop with current and past employees of the parks who have extensive experience in the parks' wilderness. It also considered and incorporated public comments from scoping, wilderness visitor surveys and previous wilderness planning efforts. The following is summarized from the wilderness character assessment (Frenzel and Fauth 2014), unless otherwise noted.

UNTRAMMELED

The Wilderness Act states that wilderness is "an area where the earth and its community of life are untrammeled by man" and that "generally appears to have been affected primarily by the forces of nature." The uncommon but intentionally chosen word "untrammeled," often mistaken for "untrampled," describes something that is unconstrained, not limited or restricted. The untrammeled wilderness is one in which ecological systems and their biological and physical components are autonomous and free from human intervention. Human actions that restrict, manipulate, or control the natural world within wilderness degrade the untrammeled quality. The untrammeled quality is distinct from the natural quality. The former is negatively impacted by purposeful human manipulation of natural processes, whereas the latter can be positively or negatively affected by human actions that are purposeful or accidental. In many cases in managed wildernesses, actions that are taken to improve the natural quality through some form of ecological restoration degrade the untrammeled quality by intervening in natural processes.

Attributes of the Untrammeled Quality — Unbridled natural forces predominate in the parks' wilderness. Cases of human intervention affecting the untrammeled quality of wilderness are limited. While most of the physical features, flora, and fauna within wilderness are unimpeded by human intervention, the NPS does authorize manipulation of some natural processes. In general, management intervention in the parks' wilderness is undertaken to restore or preserve ecosystems in a natural, resilient, or sustainable state to support native biodiversity.

One form of trammeling in the parks is the removal of nonnative species from wilderness. This includes restoration of selected high-elevation aquatic ecosystems by removing introduced nonnative trout, which are aquatic predators that cause profound changes in food webs and threaten native species. The NPS also actively targets 19 introduced plant species for removal using combinations of hand pulling, tarping, and applying herbicides. Large-scale plant removal from wilderness has been focused on species that displace native plants in two mid- to low-elevation areas: the Roaring River and lower Kern River drainages.

Another type of trammeling occurs when there is intervention in the behavior or lives of native plants and animals. In the parks' wilderness, these include management of human/bear conflicts through hazing, and rarely, capturing or killing bears that pose unacceptable safety threats. The act of capturing, collaring, and tagging animals for research also diminishes the untrammeled quality of wilderness (the collar or tag diminishes the undeveloped quality). The most notable species in this regard are the federally endangered Sierra Nevada bighorn sheep, Sierra Nevada yellow-legged frog, and the northern distinct population segment of the mountain yellow-legged frog. Other scientific activities permitted in the parks that affect the untrammeled quality of wilderness include capturing animals to take blood or tissue samples, harvesting seeds, installation of enclosures, and relocating animals.

The untrammeled quality is also affected when areas of wilderness are restored. Wilderness rangers have obliterated and restored hundreds of campsites in order to direct use away from sensitive areas and to reduce and concentrate the signs of human occupation. Park trail crews restore braided trails and trails through meadows. Large projects to reroute trails and restore meadows have recently been completed at

Taboose Pass, Bubbs Creek, and Cloud Canyon. The NPS has also stabilized eroding meadows heavily impacted by historical grazing by cattle and sheep in the Roaring River area and other locations.

Interference in natural energy flows and disturbance processes is also a trammeling of wilderness. In the East Fork Kaweah watershed, there are four dams in 112 acres of designated potential wilderness additions. The dams regulate water flow for downstream hydroelectric generation.

The most widespread interference in disturbance processes within the parks is the management of fire. Periodic fire ignited by lightning and Native Americans was historically an important agent that structured vegetation and played an important role in the reproduction of sequoias and other species, especially at the middle elevations of the park. Fire regimes in the parks changed significantly beginning in the 1860s with European American settlement and reductions in Native American populations (Caprio and Swetnam 1995). From 1904 through 1968, NPS policy was to extinguish all fires within the parks. This practice began to change in the 1960s, but from 1980 to 2008, 43% of the 791 lightning ignitions recorded in wilderness were suppressed or controlled. In the same period, there were 66 prescribed fire ignitions in wilderness that burned more than 30,000 acres. Both suppression of lightning-ignited fires and ignition of prescribed fires contribute to impacts on the untrammeled quality of the parks' wilderness.

Unauthorized trammeling may also affect wilderness character. Within Sequoia and Kings Canyon National Parks, unauthorized trammeling is almost entirely due to illegal marijuana cultivation. These operations introduce nonnative species, divert water flows, disturb animal behavior and life cycles, and introduce thousands of pounds of foreign chemicals such as fertilizers, herbicides, and pesticides into park ecosystems. These operations are most prevalent in the lower elevations of the Kaweah River drainage and have notable, but localized effects.

NATURAL

An undegraded natural wilderness quality shows minimal effects of modern civilization upon ecological systems and their biological and physical components.

Attributes of the Natural Quality — The wilderness in the parks comprises distinctive and varied natural landforms. It includes rugged 14,000-foot peaks and steep canyons rivaling the Grand Canyon in depth. The headwaters of four major river systems (South Fork San Joaquin, Kings, Kaweah, and Kern) are protected within wilderness (figure 23 on page 297). The Kern River is the only river in the Sierra that runs parallel to the axis of the Sierra Nevada, with the rain shadow caused by the Great Western Divide resulting in a distinctive, dry environment in the Kern River drainage in which unique species assemblages exist. Cave and karst formations are another outstanding physical feature of the parks' wilderness. The parks contain more than 250 known caves, many within designated or proposed wilderness. The parks' wilderness contains the longest cave in California (Lilburn), uncommon high-elevation caves (White Chief), caves that support endemic species found nowhere else, and caves with outstanding and undisturbed mineral formations.

The subalpine and alpine areas are also distinctive natural elements of the parks' wilderness. Relative to the rest of the central and southern Sierra Nevada region, the parks contain a disproportionately large fraction of high-elevation habitats; more than 50% of park land is above 9,800 feet, while only 11% of the entire region is above that elevation. These high-elevation lands are a valuable conservation resource. They are less affected by polluted air and are less invaded by nonnative species. Lying at the southern end of the great Cascade/Sierra mountain range, the parks support not only species found at the southern end of their ranges, but also species from adjacent desert and Great Basin biogeographic provinces plus a host of endemics. The combination of location, large size, and diversity of habitats contributes to great numbers of species in the parks. The parks contain more than 334 native vertebrate species, including 9

amphibian species, 23 reptile species, 5 fish species, 84 mammal species, and approximately 212 bird species (Austin et al. 2013 lists 203 bird species that are confirmed to maintain a presence in the parks, while Schwartz et al. 2013 lists 212 bird species). Native plant taxa include more than 1,200 vascular plant species. Of the vertebrate and plant taxa present in California, 15% have been observed in Sequoia and Kings Canyon National Parks. In addition to overall diversity, the parks' wilderness is also notable in the number of endemic species it protects. This is especially pronounced in caves, where 35 invertebrate species have been found that exist only within single cave systems or watersheds in the parks. The parks are also home to 11 taxa of plants that exist only within 5 miles of the park boundary, as well as 39 taxa considered endemic to the southern Sierra Nevada.

Below the White Chief area near Mineral King

The regional endemics include two very visible and characteristic tree species – giant sequoias (*Sequoiadendron giganteum*) and foxtail pines (*Pinus balfouriana* ssp. *australis*). Approximately 65% of sequoia groves in the parks lie within designated wilderness. The subspecies of foxtail pine found in the parks exists only in the Sierra Nevada; it grows no farther north than the Middle Fork of the Kings River in Kings Canyon National Park and reaches its southern limit just south of the Sequoia National Park boundary. These two globally significant tree taxa form distinctive forests in the parks' wilderness. Subalpine woodlands of whitebark pine (*Pinus albicaulis*) in the parks' wilderness are notable because they have been largely unaffected by the blister rust and bark-beetle outbreaks that have decimated whitebark pine in the Rocky Mountains.

In addition, terrestrial food webs are largely intact within the parks' wilderness. For example, most of the historically present vertebrate predators — with some exceptions including the grizzly bear (*Ursus arctos horribilis*) and wolverine (*Gulo gulo*) — still exist in the parks.

A particularly valuable aspect of the parks' natural quality is the presence of large biophysical gradients. Tracts of wilderness crossed only by footpaths stretch from foothills and canyons starting at 1,400 feet in elevation to Mount Whitney, the tallest peak in the contiguous United States at 14,494 feet. This represents the greatest elevation range of any protected area in the lower 48 states. Only one road (Generals Highway) completely divides the westernmost wilderness segment from the remainder; only two seasonally used roads (one to Mineral King and another to Cedar Grove) penetrate the deeper canyons of the western slope; and no road crosses the crest of the Sierra Nevada. The large size and continuity of this wilderness protect important wildlife corridors and bird-migration routes between high-elevation protected areas of the southern Sierra and relatively undeveloped areas to the east of the parks, as well as a major corridor along the Sierra Crest connecting the Tehachapi Mountains and the central Sierra Nevada.

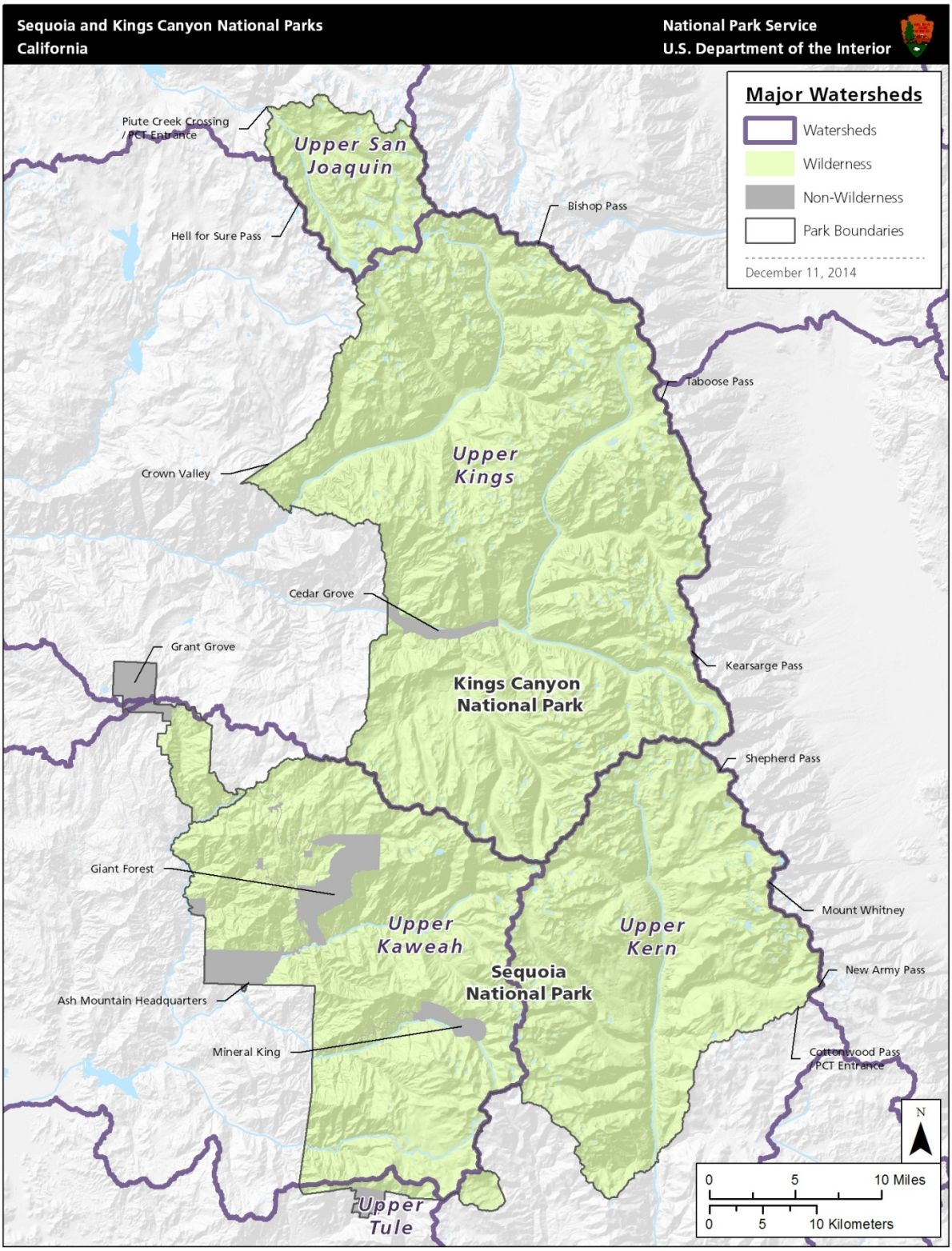


Figure 23: Major Watersheds in Sequoia and Kings Canyon National Parks

Due to this lack of human-caused landscape fragmentation, and because the parks' wilderness abuts wilderness in the Inyo, Sierra, and Sequoia national forests, the parks' wilderness is at the heart of a contiguous area of wildlands that provide the highest level of natural resource protection for roughly 25% of the southern Sierra Nevada. This large size and great diversity of habitats is likely to be important in the long term as species ranges shift in response to climate change. The vast area can also provide habitat for species with large home ranges that may be affected by California's increasing population and the resulting fragmentation of undeveloped lands.

Many of the agents that degrade natural conditions in wilderness originate outside of the parks. These agents include airborne pollutants and contaminants such as nitrogen, sulfur, heavy metals, pesticides, and herbicides that are concentrated along the western side of Sequoia. In a study of western national parks, Sequoia and Kings Canyon National Parks ranked highest in contamination of air, vegetation, snow, and water by semivolatile organic compounds. Fish from the Kaweah River drainage contained high levels of dieldrin (DDT – dichloro-diphenyl-trichloroethane), and mercury that pose health risks to humans and other animals. Changes in global climate beginning in the 1970s have had several impacts in the Sierra Nevada including increased temperatures, a greater proportion of precipitation falling as rain, earlier snow melt and peak water flows, and a loss of glaciers and permanent snowfields. Climate is strongly suspected to have increased drought stress and mortality rates of trees at mid-elevations and is probably responsible for shifts in some small mammal and bird ranges in the Sierra Nevada.

Illegal marijuana cultivation degrades the natural quality of wilderness by introducing thousands of pounds of fertilizers, herbicides, and pesticides into the parks. Growers also clear vegetation, divert water, and kill native animals. Marijuana cultivation has been especially problematic in the low- to mid-elevation portions of the parks' wilderness, though recent information shows it to be on the decline.

Introduced organisms are a serious threat to the natural quality of the parks' wilderness. These include pathogens such as the chytrid fungus that infects mountain yellow-legged frogs and the blister rust that weakens five-needled pine species. More than 200 nonnative plant taxa have been observed in the park; these are most abundant in the lowest elevations, but are present across the middle elevations of the parks as well. Austin et al. (2013) list 25 nonnative vertebrates (1 amphibian, 11 birds, 9 fish, and 4 mammals) that are either confirmed or suspected of maintaining a presence in the parks, either through a breeding population or through continued replenishment from outside park boundaries. Trout introduced to the high-elevation basins of the parks have had profound impacts on food webs and depressed populations of native species such as mountain yellow-legged frogs.

Human-caused changes in fire regimes have also decreased the natural quality of the parks' wilderness. For example, periodic fire is important to the life cycle of giant sequoia and other organisms. Fire suppression in the mid-elevations of the parks has resulted in decreases in the reproduction of sequoias and some pine species. In addition, it has resulted in increased forest density and unnaturally high fuel loads, both of which increase the probability of unnaturally large and severe stand-replacing fires.

Human presence in wilderness can also degrade its natural quality. Human and stock traffic mobilizes soil that may erode at an unnaturally high rate, may trample native vegetation, and can introduce nonnative plants. Stock grazing in the parks has averaged more than 8,000 stock nights per year from 1986 to 2011; this decreases the natural quality of park meadows and associated vegetation as no grazers larger than bighorn sheep were present before the arrival of Europeans. Human and stock waste introduce pathogens and nutrients into soils and waterways. Wild animals may become conditioned to human presence, detracting from their wild quality. For example, some bears, marmots, and coyotes regularly seek food from visitors at popular recreational destinations.

Campsite Condition—Impacts on wilderness character from visitor use can be biophysical, social, or both. Biophysical impacts can include effects on water resources, fish and wildlife, and sensitive vegetation. Social impacts, such as the number of people or groups encountered, can affect opportunities for solitude or primitive and unconfined recreation. Campsite monitoring is one way to measure visitors' effects on wilderness character, as well as effects on natural resources and visitor experience. Campsite condition is presented in this section to provide the background for assessing effects of visitor use on the natural quality of wilderness character.

In the late 1970s, in response to rapidly increasing visitor use and proliferating impacts, the condition of all campsites in the backcountry (pre-wilderness designation) of Sequoia and Kings Canyon National Parks was assessed by park research staff. All campsites were located and assigned to one of 273 different subzones (geographic nodes or concentrations of sites within travel zones). The conditions of campsites was assessed on the basis of eight parameters: 1) vegetation density, 2) vegetation composition, 3) total area of the campsite, 4) barren core area, 5) campsite development, 6) litter and duff, 7) social trails, and 8) tree mutilations. The initial survey found that there were more than 7,700 campsites in wilderness. The campsites were classified from Class 1 sites, those sites that are small and barely noticeable, to class 5 sites, those that have extreme impacts. The survey found that 37% of campsites were Class 1, 34% were Class 2, 18% were Class 3, 7% were class 4, and 4% were class 5 sites. In the late 1970s, there were 329 class 5 sites in the entire wilderness.

Campsite Classifications

Class 1 *– usually no more than a small sleep site and possibly a small fire ring with little or no sign of trampling or vegetation impact.*

Class 2 *– obvious campsites that do not appear highly worn.*

Class 3 *– well-impacted popular sites, without attributes of severe impact.*

Class 4 *– highly impacted, with some aspects of extreme impact. They often have large areas completely devoid of vegetation, litter, and duff (organic matter in various stages of decomposition on the floor of the forest).*

Class 5 *– a large, heavily used barren area, often with numerous, leveled sleep sites, fire rings, and perhaps rock walls or mutilated trees.*

(Parsons and Stohlgren 1987)

In 2006 and 2007, to ascertain trends in impacts in wilderness, the campsite survey was repeated in 120 of the 273 subzones (44% of wilderness) (NPS 2013e). A total of 2,955 sites were located during the 2006–2007 surveys. Of these, 1,795 were identified as active campsites, and another 1,160 were identified as restoration sites. Restoration sites are sites that appear to no longer be used for camping but where campsite impact is still at least marginally evident. Since the repeat sample included 44% of the subzones originally surveyed, this suggests that there are approximately 6,600 impacted sites in wilderness, of which about 4,000 are being actively used as campsites.

The 2006–2007 survey revealed that most of the campsites in wilderness were not highly impacted. Of the active campsites, 60% were rated as Class 1 campsites and 30% were rated as Class 2 sites. Only 7% of the active campsites were rated Class 3; 2% were rated as Class 4 sites; and none were rated Class 5. When restoration sites are considered, about 70% of sites were considered lightly impacted (all Class 1 campsites and most restoration sites). Only about 6% of the total number of campsites (about 350 sites in the entire wilderness) was classified as Class 3 or 4 campsites, and no sites had the extreme levels of impact found at Class 5 sites.

The most important finding of this study was that campsite conditions in the wilderness of Sequoia and Kings Canyon National Parks have improved dramatically since the late 1970s. Depending on assumptions made regarding the comparability of the two surveys, aggregate campsite impact in 2006–2007 was about one-third less than what it was in the 1970s. No other wildernesses where trends in impact have been studied have improved so dramatically.

The second fundamental finding was that the improvement that has occurred over the past 30 years was remarkably uniform. With only a few localized exceptions, conditions have improved throughout the wilderness of the parks. Impacts are not spreading or intensifying. The installation of bear-resistant food-storage boxes in the 1980s may have intensified use in the immediate vicinity of boxes. However, the sites selected for food-storage boxes were usually places that were already impacted. Given increased use of minimum impact techniques, these sites are often in better condition now than they were in the past, even if use intensity has increased. The 2012 trends analysis concluded that food-storage boxes have had no apparent effect on campsite impact at the scale of the subzone.

Despite wilderness-wide improvement, campsite impacts are not evenly distributed. They are more substantial along primary trails, particularly the John Muir Trail (JMT), and they are concentrated both in popular subzones (e.g., Rae Lakes) and within subzones at trail junctions, creek crossings and along lakeshores. However, because the most highly impacted areas are the ones that have improved the most since the 1970s, the difference between more and less impacted areas has actually decreased. In the 1970s, campsite impact decreased significantly with increases in elevation, distance from the trailhead and distance from the closest ranger station. The 2012 survey and trends analysis concluded that campsite impact no longer varies with these factors.

There are several competing potential explanations for the decrease in campsite impact since the initial survey. Visitor data show that use levels are not as high today as they were in the 1970s. It is also evident that use is more concentrated than it was in the 1970s. Although the relationship between impact and the spatial distribution of use is complex, total impact is often less where use is concentrated rather than more widely distributed. Visitor behavior has also changed. There has been widespread adoption of minimum impact techniques, including Leave No Trace©, and some of the activities with high impact potential (e.g., campfire building and traveling with large stock groups) are more tightly regulated and may be less popular with the general public.

Finally, in the period between the two surveys, there has been a concerted on-the-ground management effort by park staff to reduce campsite impacts. The strategy includes concentrating use, reducing the number and size of campsites, moving camp areas to more appropriate locations, reducing development at campsites (e.g., removing fire rings), and educating visitors on minimum-impact techniques. Specific actions taken to implement this strategy include:

- obliterating unnecessary campsites;
- eliminating sites too close to water, particularly those within 25 feet of a lake or stream;
- eliminating campsite developments, such as visitor-built tables, chairs, and rock walls;
- replacing large fire rings with smaller fire rings;
- reducing the size of large sites;
- eliminating campfire evidence where fires are illegal; and
- educating visitors about how to minimize their impact.

All of these factors have worked synergistically toward notably improved conditions in the Sequoia and Kings Canyon National Parks wilderness.

UNDEVELOPED

The Wilderness Act states that wilderness is "an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation," with "the imprint of

man's work substantially unnoticeable." The undeveloped quality of wilderness is impacted by the presence of structures and installations, and by the use of motor vehicles or motorized equipment. These developments are also prohibited by Section 4 (c) of the Wilderness Act, and are only permissible if they are "necessary to meet minimum requirements for the administration of the area" as wilderness.

The Sequoia and Kings Canyon National Parks' wilderness areas contain a variety of administrative developments. Some developments, such as radio repeaters, have little consequence to the other qualities of wilderness, and are only assessed as potential impacts on the undeveloped quality. Other developments, such as food-storage boxes or ranger stations, may concentrate visitor use or result in a less self-reliant wilderness experience. In these cases the impacts will be assessed against the natural quality and the solitude and unconfined quality as well as the undeveloped quality. Specific developments are described in the "Alternative 1: No-action / Status Quo" section of chapter 2 and in the "Park Operations" section of chapter 3.

Attributes of the Undeveloped Quality — The Wilderness Act references many ways in which humans modify and show dominance of the land: the construction and presence of roads, trails, and structures indicating habitation, and the use of various modern machines in managing wilderness lands.

Roads and trails that ease access to otherwise extremely difficult-to-access areas are developments. With the exception of the historic Colony Mill and Hidden Springs roads (now closed to vehicles) in the North Fork Kaweah River drainage, and the access road to Oriole Lake inholdings, there have been few roads of any consequence in what is now park wilderness. The maintained trail network in the parks' wilderness is relatively extensive, with approximately 650 miles of maintained trails in the 1,309 square miles of wilderness. Most trails were present in some form prior to wilderness designation, with some routes having been pioneered by American Indians centuries ago.

Buildings and structures, such as patrol cabins and ranger stations (some of which are historic), tend to be located in conjunction with primary trails such as the High Sierra Trail (HST), the John Muir Trail (JMT), and the Pacific Crest Trail (PCT). Almost all of the patrol cabins and ranger stations pre-date wilderness designation and are usually staffed for three to four months during the peak-use summer season (see figure 7 on page 85). Administrative pastures are present at one patrol cabin and three ranger stations. Administrative pastures are fenced to keep stock confined adjacent to ranger stations and to be readily available for emergency response. Administrative camps (permanent camps established for enforcement/patrols, resource management/research, and trail maintenance/project activities) may contain food-storage boxes, a fire ring, and, in some cases, a hitching rail. Administrative camps may also be used by visitors.

Other administrative installations include radio repeaters (consisting of transmitters, solar arrays, and antennas); resource-management and research installations (stream gauges, snow-measuring equipment, plot and tree markers, and other long- and short-term instrumentation and monitoring devices); and Redwood Canyon Cabin, used to hold supplies for cave research in the nearby Lilburn Cave.

The acreage in potential wilderness and inholdings serves as an indicator of the undeveloped quality of wilderness. There are two areas with inholdings in wilderness (Oriole Lake and Empire Mine) that total 27 acres. In addition, two utility easements are located in designated potential wilderness additions: 12 acres in the Middle Fork Kaweah River drainage and 21 acres in the South Fork Kings river drainage. Four reservoirs in the Mineral King area are inside 112 acres of designated potential wilderness.

Motorized transport and mechanized equipment is used regularly by the NPS to administer the parks' wilderness. Each year, crews use chainsaws to clear trails and cut firewood for crew use and wilderness ranger stations. Motorized rock drills are used to maintain trails. There has been some recent increase in

the frequency of use of primitive tools and transportation for patrols and trail maintenance. Although there is an emphasis on using primitive tools, mechanized tools may be approved, through a minimum requirement analysis, for use by trail crews and other crews administering wilderness.

Helicopters are used each year to bring supplies and tools to ranger stations, trail crews, and resource management crews. Helicopters are also used to maintain six radio repeaters. Four dams and about 15 snow-survey locations are accessed and maintained primarily through the use of helicopters within wilderness. Helicopters respond to fires, search and rescue missions, and medical emergencies in wilderness; out of the approximately 100 search and rescue and medical emergency incidents each year, one-third involve evacuation of visitors from wilderness by helicopter. On average, there are 288 hours of helicopter flight time in the parks each year, including flights within and outside wilderness. Non-emergency landings of helicopters in the parks' wilderness average 140 per year. All installations and use of mechanized equipment must first go through an MRA before being authorized (appendix I).

OPPORTUNITIES FOR SOLITUDE OR PRIMITIVE AND UNCONFINED RECREATION

The Wilderness Act states in Section 2(c) that wilderness has "outstanding opportunities for solitude or a primitive and unconfined type of recreation." Opportunities for solitude or primitive and unconfined recreation provide visitors a chance to connect with the natural world, to practice traditional skills, and to have transformative personal experiences. What constitutes solitude, primitive conditions, or unconfined recreation depends on the perceptions of individuals, and impacts on these experiential dimensions can be difficult to evaluate. Management focuses on the Wilderness Act's mandate to provide outstanding opportunities and the WSP/FEIS assesses impacts on these opportunities that may result from the plan alternatives.

Opportunities for solitude or primitive and unconfined recreation can be affected by encounters with other visitors or by changes in management that alter visitor recreation behavior. For example, infrastructure like food-storage boxes may reduce opportunities for primitive recreation by eliminating the need for visitors to manage their own food storage. Ranger stations may concentrate visitor use, increasing encounter frequencies in those areas. The WSP/FEIS will assess impacts on the opportunity for solitude from visitor encounters and the attractions that increase visitor encounters, and will assess the impact of management activities on opportunities to experience primitive and unconfined recreation.

There is great variability in visitor density in the parks' wilderness, and this variability depends on both the time and location of a visitor's trip. While there are certain times and places where visitors may experience frequent encounters with other visitors, those that choose less popular destinations or less popular times of the week or times of the year will easily find solitude in the parks' wilderness.

Attributes of the Opportunities for Solitude or Primitive and Unconfined Recreation Quality — The Sequoia and Kings Canyon National Parks wilderness areas provide opportunities for visitors to engage in a variety of primitive recreation activities, such as backpacking, hiking, climbing, fishing, rafting, kayaking, skiing, and riding and packing with stock. Backpacking along the approximately 650 miles of maintained trails is the most common form of primitive recreation. Granite monoliths, cliffs, and numerous 13,000- and 14,000-foot mountain peaks offer climbing and mountaineering opportunities ranging in difficulty from easy walk-ups to technically demanding climbs. In the winter, there are opportunities for wilderness skiing and snowshoeing. The parks provide excellent opportunities for riding and packing with horses, mules, burros, and llamas; the Roaring River and Hockett Plateau areas in particular have had a tradition of recreational stock use for more than 120 years. This activity preserves traditional primitive skills that have been used for generations to transport people and supplies through wilderness.

Although there are approximately 650 miles of maintained trails, these trails are located in 1,309 square miles of wilderness. Some trails and trailheads are very popular, reducing opportunities for solitude in those areas. However, one of the most exceptional aspects of the parks' wilderness is the opportunity to travel through truly undeveloped and primitive areas without trails. The ability to travel off-trail adds greatly to the unconfined quality of the parks' wilderness and fosters feelings of discovery, exploration, and self-reliance. Travelers, once inside wilderness, are mostly free to change their itineraries mid-trip and select the routes or destinations they desire. This ability to freely select one's itinerary contributes notably to the sense of solitude and of being "unconfined."

The opportunity to leave the trail means that solitude may be found even during the busiest parts of the summer. Solitude is also easily experienced outside of the summer season. While an average of nearly 25,000 people visit wilderness each year, visitation declines sharply as snow covers the mountains throughout winter and spring. Visitors during these times are unlikely to encounter another person, and skiers look forward each year to the Sierra's renowned spring corn snow. Visitor encounters are discussed below.

Mt. Cotter, Kings Canyon National Park

Developments that support public recreation decrease the primitive quality of wilderness. There are 33 bridges and thousands of other human-built trail features (including causeways, boardwalks, rock walls, tunnels, laid-rock tread, etc.), historic stone shelters on Muir Pass and Mount Whitney, and hundreds of signs in wilderness that aid travelers. Other recreational developments and installations in wilderness include designated campsites, privies and restrooms (Emerald and Pear lakes), food-storage boxes, drift fences for stock, and the Bearpaw Meadow High Sierra Camp. Specific recreational developments are described in the "Alternative 1: No-action / Status Quo" section of chapter 2.

Restrictions on visitors can reduce the unconfined quality of wilderness. In the parks, regulations are established to protect natural features, preserve opportunities for solitude, and protect the primitive and undeveloped qualities of the park. Overnight visitor use is limited during the most popular time of year (late May to late September) by daily trailhead entry quotas. Party size is limited in order to keep campsites small, prevent formation of new trails in areas without constructed trails, and preserve the feeling of solitude for other groups. Campfire limitations above specified elevations protect slow-growing subalpine forests from depletion of ecologically and scientifically important downed wood. Camping along lakeshores or other water bodies is prohibited to protect water quality and fragile riparian banks and vegetation. Three popular destinations require the use of designated campsites (Emerald and Pear lakes, Bearpaw Meadow, and Paradise Valley), and areas near frontcountry trailheads are closed to camping to prevent overuse. The location, timing, and amount of grazing by stock are limited to protect meadows and large portions of off-trail areas are closed to stock travel and access. Current limits are described in the "Alternative 1: No-action / Status Quo" section of chapter 2.

Visitor Encounters — The parks' wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation. Research suggests that wilderness visitors associate wilderness areas with low visitor density as well as limited development and evidence of human occupation, limited restrictions on visitor activities or behaviors, and natural conditions (Martin and Blackwell 2013). Wilderness visitors vary in their expectation of solitude conditions, and respond in a variety of ways to perceived crowding problems, including avoiding places that have undesirable conditions (Manning 2011). However, the frequency of encounters with other people is nonetheless a relevant and useful measure of opportunities for solitude (Broom and Hall 2009).

The NPS commissioned a survey of overnight visitors to the parks' wilderness during the summer and fall of 2011 (Martin and Blackwell 2013). The survey was conducted to gain a better understanding of the characteristics of wilderness visitors, the characteristics of their visits, and their responses to things they encounter in the parks (Watson 2013). Some of these responses were compared to responses from an earlier 1990 survey (Watson et al. 1993). One focus of these studies was on visitor encounters while traveling and camping. These findings are summarized below. Other findings (e.g., visitor demographics and trip characteristics) are summarized in the "Visitor Use" section of this chapter.

The 2011 survey examined a limited list of 19 potential attributes that might define wilderness character of the parks' wilderness. The survey respondents evaluated this list on a four-point scale of one (not at all important) to four (very important). Eleven items averaged greater than three, including "a place where I can go with low density of people" (3.70), and "a place where human influences are relatively unnoticeable" (3.65) (Watson 2013). It is clear that visitors value low density as an attribute of wilderness.

A substantial portion of respondents (32.8%) reported that they avoided certain times or places due to conditions. While snow was the most commonly volunteered reason for avoiding certain places, density-related concerns – people, noise, heavy-use campsites, and crowded trails – were the second most-commonly volunteered reason for place avoidance. The busy season (before Labor Day and weekends) at the parks was the most commonly cited condition to avoid, but other specific areas identified by respondents included the JMT, Mount Whitney/Whitney Portal, Rae Lakes Loop, HST, PCT, Evolution Valley, Guitar Lake, Goddard Canyon, and Bearpaw Meadow (Martin and Blackwell 2013). These are areas that are recognized by park management as being popular areas, except perhaps Goddard Canyon.

Regardless of trip destination, the great majority of respondents did encounter at least some other people while traveling, but most respondents did not feel that these encounters detracted from their experience or that fewer encounters should occur. Approximately 98% of respondents said they noticed the presence of people along the trail, and while visitors to popular areas were more likely to notice other visitors than

those to lower-use areas (98.7% versus 95.2%), the difference was not great. The majority of visitors (63.3%) indicated that the presence of other visitors along the trail neither added nor detracted from the quality of their visit. Of the remainder, 20.7% reported that this presence of other visitors detracted from the quality of their experience while 16.0% reported that it added to their experience quality. When asked if the presence of other people should be less or the same, the great majority of visitors to both popular (77.1%) and lower-use areas (81.7%) reported that the presence of other visitors should be the same (Martin and Blackwell 2013). While visitors value low visitor density as an aspect of wilderness, they did not emphasize current encounter frequencies as a problem that needs to be addressed.

Visitor encounter frequency, however, is a common and important indicator of the quality of visitor experience in wilderness (Broom and Hall 2009) and is proposed as a visitor capacity indicator in the WSP/FEIS. Survey results suggest that there is great variability in terms of encounter frequencies reported by survey respondents. Popular areas were found to have a higher average number of group encounters per day and a higher maximum number of encounters per day, but even in popular areas some respondents encountered no other visitors on at least one day of their trip, and this was true for all of the location classes. Survey data from 1990 (Watson et al. 1993) shows that average encounters per day has gone up from 3.4 groups per day to just greater than 4 groups per day, a modest increase. In both the 1990 and 2011 surveys, visitors were asked their opinions of the perceived degree of impacts or problems in wilderness. As in 1990, while no potential problems are rated as extremely high (nothing averaging as high as 2 = small problem on a scale of 1 [no problem] to 4 [big problem]), one of the problems that rated highest was "too many people" (1.74) (Watson 2013). Visitors do not appear to consider encounter frequency to be more of a problem today than twenty years ago.

The average, minimum, and maximum encounters per day in Sequoia and Kings Canyon National Parks' wilderness, as reported by Martin and Blackwell (2013), are summarized by general location in table 54.

Table 54: Average Encounters with Groups per Day in the Sequoia and Kings Canyon National Parks Wilderness, 2011, by General Location Category within Wilderness

Types of Groups	Average Encounters per Day	Minimum Number of Encounters per Day*	Maximum Number of Encounters per Day*
All groups, all location (n=528)	4.1	0	33
Groups traveling in popular areas (n=384)	4.7	0	33
Groups traveling outside popular areas (n=139)	2.6	0	17
Groups traveling the Rae Lakes Loop (n=51)	5.3	0	30
Groups hiking the JMT (n=19)	2.9	0	10
Groups climbing Mount Whitney	4.4	0	20
Groups traveling cross country, including popular areas (n=91)	3.9	0	33
Groups traveling cross country, excluding popular areas (n=45)	2.5	0	13

*Days = total nights + 1

Encounter frequencies were also collected by NPS staff during the 2012, 2013, and 2014 summer seasons. Trails were divided into discrete segments that could be traversed by park staff in a reasonable time and which represented logical segments in between trail junctions. Staff walked these trails at a pace judged to be similar to that of wilderness visitors, and the number of encounters with other individual visitors per hour was calculated. Trail segments within a given area were grouped into "analysis areas." Within analysis areas, data was examined to identify the trail segments with the highest encounter frequencies.

These were identified as the "constraining" trail segments in terms of encounter conditions (i.e., if the constraining segment is within standard, it is highly likely that the related area segments would be within standard). Table 55 lists the analysis areas and the constraining trail segment within each one. It summarizes the mean, minimum, maximum, and 90th percentile for observed encounter frequencies with individuals on constraining trail segments within the named analysis area. The 90th percentile encounter frequency means that on 90% of sample days the observed encounter frequency was at or below the number shown in that column. Sample sizes are not large, but will increase as this data collection method is incorporated into an ongoing monitoring program. Because locations with fewer than ten sample days were omitted, this table does not include some low-use areas that will be included in the monitoring program.

Table 55: Observed Number of Encounters per Hour with Individuals: 2012–2014[1]

Analysis Area	Trail Class	Constraining Trail Segment	Sample Size[2]	Mean	Minimum	90th Percentile	Maximum
Mount Whitney	Major	Crabtree – 3	38	25.9	0	44.0	66.6
Evolution Basin	Major	McClure – 1	26	12.5	1.1	21.1	52.0
Road's End	Day- use	Cedar Grove – 1	66	13.2	0.0	43.7	62.0
Lakes Trail	Day-use & Major	Pear Lake – 4	38	8.0	0.0	15.7	34.1
Mineral King Valley	Major	Mineral King – 6	43	7.9	0.0	18.8	25.3
Crabtree Ranger Station to Trail Crest	Major	Crabtree – 2	38	8.9	0.0	16.7	45.0
Rae Lakes/JMT	Major	Charlotte Lake – 1	31	6.9	0.0	13.9	21.6
Rae Lakes Loop — Lower Portion	Major	Cedar Grove – 3	27	5.7	0.0	11.5	15.3
West side of Kearsarge Pass	Major	Charlotte Lake – 2	27	4.9	0.0	9.5	22.9
Dusy Basin	Major	LeConte – 2	48	4.6	0.0	8.5	14.4
Timber Gap Jct. to Monarch Lakes	Major	Mineral King – 2	20	4.7	1.0	9.3	15.3
Twin Lakes Trailhead to Silliman Creek	Major	Lodgepole – 1	28	3.6	0.0	9.0	14.4
HST: Hamilton Lakes to Wallace Creek	Major	Little Five – 5	15	3.5	0.0	7.7	18.0
Rock Creek	Major	Rock Creek – 5	47	2.8	0.0	9.2	16.0
Little Five	Major	Little Five – 2	22	2.7	0.0	5.3	12.8

[1] Observations made by park staff. Encounters within 25 feet only were recorded. Individuals were counted only once. Congregation points such as trail junctions and scenic vistas were omitted. Areas are listed in order by mean number of encounters, high to low.
[2] Number of sampling events.

These findings are consistent with the areas considered by management to be popular areas, and consistent with the locations identified by respondents to Martin and Blackwell (2013). The ability to experience low encounter frequencies on some days even in the highest use areas was reinforced.

OTHER FEATURES OF VALUE

All wilderness shares the four principal qualities of wilderness character: untrammeled, natural, undeveloped, and opportunities for solitude or primitive and unconfined recreation. However, the Wilderness Act also provides for protection of "ecological, geological, or other features of scientific, educational, scenic, or historical value" that contribute to wilderness character. Given that Sequoia and Kings Canyon National Parks are predominantly wilderness, it is worth highlighting two additional elements that contribute to the parks' wilderness character: 1) historic and cultural features, and 2) scientific activities.

Attributes of the Other Features Quality

Historic and Cultural Features – People have been exploring what is now the parks' wilderness for centuries. This use and exploration of the land has intrinsic wilderness character values. The parks are mandated to preserve and protect cultural resources in the parks' wilderness, including both prehistoric and historic habitations. Ethnographic evidence suggests use by several groups of American Indians. In both prehistoric and historic times, American Indians including the Western Mono, Paiute, and Tübatulabal groups travelled through the Southern Sierra Nevada. In more recent centuries, these groups included Eastern Mono (Owens Valley Paiute) groups as well as Western Mono (possibly Wobonuch) bands in addition to Yokuts groups from the floor of the Great Central Valley and the valley's eastern foothills. They navigated through the mountain landscape, hunted and harvested, and sought the best camps. Signs of their presence in wilderness are found in remnant camps and shelters, hunting blinds, and artifacts they left behind including arrow and spear points, bedrock mortars and mills, and lithic and ceramic scatters.

The arrival of Europeans in California brought many new explorers and settlers, including shepherds and ranchers, trappers and hunters, miners and loggers, and scientists. Later the U.S. Army, the Civilian Conservation Corps, the Sierra Club, and recreational travelers would follow American Indian footpaths into wilderness. Some came for economic gain, others for duty, and others for the challenge and pleasure of being in the mountains. Some, such as John Muir, also communicated their reverence for the place and successfully advocated for its preservation in its unaltered condition, and began a world-wide movement to protect large tracts of wildlands. Artifacts and features from the historic period include tree carvings, cabins, trails, camps, fences, summit registers, stone shelters on Mount Whitney and Muir Pass, and a resort on the Kern River.

Historic and cultural resources serve as reminders that humans have been part of the region's wilderness ecosystem for centuries. Some visitors have described how finding historic objects like an ancient pot or spear point, or travelling the same routes described by American Indians or historical figures, such as John Muir or Norman Clyde, added to their wilderness experience.

Scientific Activities – Protection of scientific values is one of the public purposes of wilderness, and NPS policy encourages scientific activities within wilderness, provided they are consistent with the preservation and management of wilderness. Because of its great diversity of habitats, large biophysical gradients, and its relatively undisturbed condition, the parks' wilderness is a sought-after and relevant study area for understanding landscape ecology and species niches, and their probable alteration as a result of climate change and other perturbations. Research of these types includes:

- Studies of the relationship between fire and giant sequoias conducted in the Redwood Canyon area, which has had a transformative effect on national fire policy and opened up a new area for scientific study.

- Cave research in the parks has discovered 35 invertebrate taxa new to science and contributed to a better understanding of karst systems and their importance in local hydrology.
- Studies of the growth patterns recorded in the rings of subalpine foxtail pines have provided insight into past climate patterns and may help inform predictions of future climate shifts.
- The search to understand the factors contributing to the decline of the two species of mountain yellow-legged frog (*Rana muscosa* and *R. sierrae*), and ongoing restoration efforts, is still underway in the remote sub-alpine and alpine lake basins of the two parks.
- Emerald Lake and the Tokopah Valley are the best-equipped and most thoroughly researched alpine sites in the Sierra Nevada with consistent meteorological and hydrological measurements, extensive snow-sampling programs, and 31 years of limnological analyses dating back to 1982. Research is focused on how altered climate, changing snow regime and changes in atmospheric deposition are driving biogeochemical and trophic changes in high-elevation ecosystems.

The parks' wilderness character faces a number of threats. The most challenging to deal with, and potentially the most damaging, are those that are outside of NPS control, such as air pollution and climate change. As the NPS seeks to protect the natural quality of wilderness character, it will face difficult tradeoffs with other qualities. This will require thorough and extensive analysis of values that take into account the degree and length of management impacts on the untrammeled and undeveloped qualities and to opportunities for solitude. Continued refinement of a thoughtful wilderness-character monitoring strategy will also need to determine and consider which developments were present and what the conditions of natural resources were at the time of wilderness designation. This will allow for more accurate descriptions of trends in wilderness character over time, allowing stewards to make informed and conscientious decisions.

SOILS

INTRODUCTION TO SOILS

Soil is a biologically active mixture of minerals and organic matter capable of supporting plant life. Minerals mainly in the form of sand, silt, and clay are produced from the weathering of a parent rock and move downslope under the influence of gravity where they accumulate in low areas. Accumulations of minerals that lack organic material, and which are therefore incapable of supporting biologic processes, are known as parent material. As the parent material begins to mix with organic material such as decayed vegetation, it becomes capable of storing water, air, and organisms ranging from bacteria to vertebrates. Acting together, the minerals, organic matter, and organisms transform the parent material into soil in a process known as pedogenesis. With the passage of time, soils can develop a characteristic texture and distinct horizons that are capable of supporting and nourishing vegetation.

As a group, soils form the largest terrestrial ecosystem and serve many important functions. They act as a medium for plant growth; they capture, store, and purify water; they are important modifiers of the atmosphere; and serve as a habitat for organisms; therefore, it is important to protect soils from adverse impacts.

SOILS IN SEQUOIA AND KINGS CANYON NATIONAL PARKS

Detailed soil information is largely lacking throughout the parks. Huntington and Akeson (1987) completed an extensive soil survey in the Middle and Marble forks of the Kaweah River, which included the southern side of Ash Peaks Ridge, Giant Forest, and much of the headwaters of the Marble Fork. It also included an intensive, localized soil survey of study areas around Emerald Lake, Log Meadow, and

Elk Creek. These yielded a general soil map and a reconnaissance soil map. However, there is an ongoing project to map soils in the parks, working with the United States Department of Agriculture's Natural Resource Conservation Service. Field work is expected to be completed in 2016, and final data is expected to be available by 2018. Even without comprehensive soils data, broad generalizations about park soils can be made.

Empire Mountain in the Mineral King area

Soils in the parks reflect their parent material, which has some pre-Cretaceous outcroppings but is largely comprised of Mesozoic granitic rock typical of the Sierra Nevada (Vankat and Major 1978). Soils tend to be acidic, owing to this igneous intrusive parent material. Soil characteristics in the Sierra Nevada generally are geologically controlled and some broad generalizations can be made relative to elevation.

The Soil Resource Inventory of the parks (Huntington and Akeson 1987) found that foothill soils had the most diverse range of soil orders. Mollisols (one of the 12 soil orders) were most frequently encountered, followed by Entisols, Alfisols, and Inceptisols. Mollisols and Alfisols are the most fertile and well developed soils of the parks and generally support dense vegetation such as chaparral and grasslands. Entisols and Inceptisols are the least mature of the soils found in the foothills and generally support sparse vegetation.

Mid-elevation regions of the parks are dominated by Inceptisols. Inceptisols are immature soils with few diagnostic characteristic features. Inceptisols support shrubs and mixed conifers where deeper soils fill joints in the bedrock.

High-elevation soils are sparse and separated by large areas of exposed bedrock. Recently formed, unmatured Entisols can be found in high-elevation environments along with more mature Inceptisols and Spodosols, some of which were formed and emplaced by glacial action. Some high-elevation soils classified in the 1987 Soil Resource Inventory as Inceptisols may be appropriately reclassified as Gelisols to conform to current soil taxonomy guidelines (Buol et al. 2011).

Independent of elevation, wetland soils are found distributed across the wilderness. Where the soil is saturated throughout the year and for hundreds or thousands of years, peat accumulation can occur. As organic matter accumulates in saturated, anoxic soils, peat accumulates at a rate of approximately 20 cm per thousand years (Cooper and Wolf 2006). Some of these peat-accumulating soils meet the criteria for Histosols.

In all cases, soils form a relatively thin mantle over massive bedrock intrusion, and slope steepness, runoff intensity, and vegetative cover are among the variables controlling erosion (Cooper et al. 2005).

CLIMATE CHANGE AND SOILS

With the warmer temperatures, decreasing snow pack, and increasing water deficit predicted over the next century for the Sierra Nevada by climate change models, impacts to soil are likely to change under the alternatives presented in this WSP/FEIS. As discussed above, climate is one of the key factors controlling soil production and erosion. It is possible that biological activity in high-elevation soils will increase due to increasing temperature and shorter frozen conditions. This increase could be offset by a reduction in soil moisture especially during a prolonged, dry summer. At this time, no trends have been detected in total annual precipitation data (Das and Stephenson 2013); however, increases in spring snowpack at higher elevations have been noted in the highest elevations (Andrews 2012). This coupled with the normal, highly variable precipitation and increasing temperature in California could lead to larger runoff events and erosion, especially during the January to April period. Climate trends along elevation gradients (generally west to east) are expected to vary in direction and magnitude, making it difficult to predict the magnitude or extent of impact among the proposed alternatives.

WATER QUALITY

INTRODUCTION TO WATER QUALITY

Sequoia and Kings Canyon National Parks contains the entirety of the headwaters of three major river systems: the Kings River, the Kaweah River, and the Kern River; and portions of two others, the San Joaquin River and the Tule River. According to the NPS Hydrographic and Impairment Statistics (NPS 2014c), the parks contain 1,938 miles of perennial and intermittent streams. The same dataset shows 3,028 perennial and intermittent lakes in the two parks.

The waters of alpine and subalpine environments within Sequoia and Kings Canyon National Parks are generally cold and clear, with water temperatures ranging between 59 and 68 degrees Fahrenheit, depending on sunlight exposure and depth. Water in montane and foothill areas is generally warmer. The surface waters generally have low turbidity in lakes and streams, with higher turbidity in meadows and ponds. Streams and lakes often have a high oxygen saturation (>8 milligrams per liter (mg/l)), while wet meadows often have a lower oxygen content due to decomposing vegetation and more organic material in soils. The pH of the waters at alpine and subalpine elevations in the parks is generally slightly acidic.

Surface water and groundwater quality in the parks can be affected by anthropogenic and natural factors, including air quality and climate change (NPS 2013c). Specifically, anthropogenic deposition of acids and nutrients can affect water quality, as well as natural processes occurring within the systems. Air pollution is a threat to water quality at the parks because it adds acidic compounds, nutrients, and other contaminants to park waters. Originating in granite, Sierra waters are naturally low in nutrients. There is some evidence that the addition of airborne nitrates and ammonia is causing nutrient enrichment in Sierra waters, increasing the levels of nutrients naturally found in aquatic systems. Another issue is the upwind movement of pesticides and other chemicals from agricultural areas in to the parks, as these chemicals have been found in measurable quantities in aquatic animal tissues in the parks.

Water quality conditions were assessed in surface water within the parks using the criteria set by the USEPA. Conditions for pH, neutralizing capacity, and dissolved oxygen are generally better than those set by federal standards. Nutrient levels are also generally better than those set by federal standard. Pesticide levels (DDT and dieldrin) in fish found within a few lakes exceeded the contaminant health

thresholds for fish-eating animals and for subsistence fishing. Toxic metals (mercury, lead, and zinc) were found to be at or above threshold toxicity levels for aquatic species (NPS 2013c).

There is little evidence that human and animal waste has affected water quality in the parks. Studies show detectable effects on water quality in the parks' wilderness where visitors recreate, but these effects are very small (Suk et al. 1987; Clow et al. 2011). *Giardia* and *Escherichia coli (E. coli*) are susceptible to destruction by sedimentation, insolation, UV exposure, desiccation, freeze-thaw cycles, competition, and predation, and thus are quickly eliminated from wilderness waters (Whitman 2004; Cilimburg 2000; Flint 1987). Water quality in the parks' wilderness is often better than other wilderness areas with similar use patterns, and any measurable effects on water quality are far below levels of concern for human health or ecological effects.

WATER QUALITY INDICATORS

Biological Water Quality — There are many biological indicators that can be used to assess the quality of water. Microbial contaminants such as total coliforms, *E. coli*, *campylobacter*, and *Giardia* can give some indication of soil-water interaction and can also indicate if excretory waste has been introduced to the water. Presence and abundance of insects or algae can also indicate the overall quality of the water. For many years, total coliform was used as the primary indicator of excretory waste contamination in municipal water systems. In natural settings, it is recognized that many coliforms are naturally occurring in soils, algae, and leaf litter and are unassociated with fecal waste. Furthermore, studies have found no link between total coliform and human health impacts as many coliforms are not pathogenic and pose no health concerns (USEPA 2012). With improving technology, *E. coli* has become the standard indicator for fecal contamination of water. Like other coliforms, most *E. coli* strains are harmless, but some can cause serious health effects when consumed. Because *E. coli* lives most readily in the gut of warm blooded animals, its presence in water is an accepted indicator of recent contamination by fecal waste.

Chemical Water Quality — Commonly measured chemical properties of water quality include pH, hardness, alkalinity, nitrates, dissolved oxygen, phosphates, and any number of dissolved elements. To a large extent, the chemical properties of water are a result of the soil or bedrock that the water is exposed to as it flows through and across the surface of the earth. Atmospheric deposition of natural and anthropogenic chemical compounds also impacts the chemistry of waters in seemingly pristine, remote areas. Mercury, pesticides, and fertilizers from local and global sources can be carried on air currents and deposited throughout the parks' wilderness (Landers et al. 2008). Sunscreen and bug repellant residues from swimmers and bathers have been measured in remote locations in Yosemite National Park (Clow et al. 2011) and in Sequoia and Kings Canyon National Parks (USEPA 2014). Human and stock urine and feces are often rich in nitrogen and phosphorous. These compounds can be introduced into water directly or be delivered by runoff, and act as fertilizers that can contribute to algae growth. Human and stock impacts associated with waste disposal are considered further in the "Soils" section, but their impact on water quality is discussed in the "Water Quality" section of chapter 4.

Physical Water Quality — Physical properties of water are often used as water quality indicators. Common physical water properties include temperature, turbidity, total solids, odor, color, or taste. All of these physical properties are interrelated and can be affected by natural and human processes. For instance, natural processes or human activities can start erosion, which can deliver sediment to nearby waters. Increasing sediment directly impacts water quality by increasing total solids, increasing turbidity, and affecting the odor, color, or taste of the water. Because suspended particles in the water absorb more heat, higher turbidity results in higher water temperature. Suspended particles also increase light attenuation (decrease the depth to which sunlight can penetrate), leading to altered ecological conditions and changes in biological communities. Mechanisms that lead to erosion are discussed further in the

"Soils" section, but specific impacts on water quality that result from erosion are discussed in the "Water Quality" section of chapter 4.

VEGETATION

INTRODUCTION TO VEGETATION

Extreme topographic differences and a striking elevation gradient (ranging from approximately 1,400 feet in the foothills to 14,494 feet along the Sierran Crest) create a rich tapestry of environments in the wilderness of Sequoia and Kings Canyon National Parks, from the hot, dry lowlands along the western boundary to the stark and snow-covered alpine high country.

This topographic diversity in turn supports more than 1,200 species (and more than 1,560 taxa, including subspecies and varieties) of vascular plants that make up more than 150 unique vegetation associations or plant communities. These include not only the renowned groves of massive giant sequoia, but also vast tracts of montane forests, spectacular alpine habitats, and oak woodlands and chaparral. Where soils are too saturated or shallow to support tree growth, numerous meadows can be found in the montane, subalpine, and alpine zones. Wet meadows support a remarkably diverse assemblage of grasses, sedges, and wildflowers, which provide essential habitat for many small mammals, birds, and insects. Dryland meadows, too, are an important source of food and shelter for animals of the higher elevations.

Individual species of plants and the communities they make up may be affected by visitor use and administrative activities, primarily by deliberate removal, trampling, consumption by stock, or through the introduction of nonnative invasive species. In most cases these disturbances in wilderness are generally localized, affecting individuals, but not affecting the species or habitat overall. The alternatives in the plan, however, may have an effect on several specific plant species and communities. Plants and vegetation with the potential to be affected by the alternatives, which will be further evaluated in chapter 4, include wetlands, meadows, riparian habitats, high-elevation long-lived conifers, alpine communities, and a selection of species recognized as "park sensitive." Also included is a discussion of nonnative plant species that have the potential to impact native vegetation, and how climate change may affect native plants and plant communities. Federally or state-listed plant species are discussed in the "Special-status Species" section of this chapter.

WETLANDS AND MEADOWS

Wetlands — Wetlands are ecologically productive habitats that support a rich array of both plant and animal life. They sustain a great variety of hydrologic and ecological functions vital to ecosystem integrity. These functions include flood abatement, sediment retention, groundwater recharge, nutrient capture, and a supporting environment for high levels of plant and animal diversity. Because they provide disproportionately important services relative to their area, disturbance to or modification of even small wetland areas can induce effects that are proportionally greater than elsewhere in an ecosystem (Graber 1996). Therefore, wetlands receive special protection under Executive Order 11990, "Protection of Wetlands," and section 404 of the Clean Water Act. Section 404 of the Clean Water Act assigns regulatory jurisdiction over "waters of the United States" (of which wetlands are a subset) to the U.S. Army Corps of Engineers. Under Section 404 of the Clean Water Act, the Army Corps of Engineers has jurisdiction over waters of the U.S. in the watersheds of the Kings, Kaweah, Kern, San Joaquin, and Tule River watersheds within Sequoia and Kings Canyon National Parks. These waters include traditionally navigable waters as well as their relatively permanent tributaries, and associated instream, adjacent, and abutting wetlands.

A variety of definitions have been developed for wetlands as a result of their high ecological diversity, special legal status, and their intersection with different scientific fields (NRC 1995; Tiner 1999; Mitsch and Gosselink 2007). All definitions recognize, to one degree or another, the key role of hydrologic processes in wetland formation and the resulting suite of soil and vegetation characteristics. The NPS classifies and maps wetlands using a system created by the U.S. Fish and Wildlife Service (USFWS), which is often referred to as the Cowardin classification system (Cowardin et al. 1979). Wetlands, as defined by the USFWS, are transitional lands between terrestrial and aquatic systems, where the water table is usually at or near the surface or the land is covered by shallow water (Cowardin et al. 1979). For purposes of this classification, wetlands must have one or more of the following attributes:

- The land supports predominantly hydrophytes, at least periodically. Hydrophytes are plants that grow in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.
- The substrate is predominantly undrained hydric soils. Hydric soils are wet long enough to periodically produce anaerobic conditions.
- The substrate is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al. 1979).

All wetlands within the two parks fall into one of three system types: riverine (rivers, creeks, and streams), palustrine (shallow ponds, marshes, swamps, and sloughs), or lacustrine (lakes and deep ponds). The lacustrine wetland class represents wetlands and deepwater habitats that are situated in topographic depressions or dammed river channels; that lack trees, shrubs, and emergent mosses and lichens over 60% of their area; and that are greater than eight hectares (20 acres) in size. Similar habitats totaling less than eight hectares are also included in the lacustrine system if a bedrock shoreline feature makes up all or part of the boundary.

The riverine and palustrine wetland classes represent community characteristics that can be described as riparian, which may be best described as the zone of direct interaction between land and water (Swanson et al. 1982; Gregory et al. 1991; Cushing et al. 2006). This zone consists of the plant community adjacent to a river or stream channel that serves as the interface between the river and the surrounding meadows, floodplain, and upland plant communities. Riparian areas are characterized by a combination of high species diversity, high species density, and high productivity and are found along streambanks, lakes, rivers, and other bodies of water. Commonly found riparian wetlands in the parks include deciduous broad-leaved palustrine scrub-shrub (primarily willow thickets), upper perennial riverine (permanent rivers and streams), lacustrine (lakes), open-water palustrine (ponds), and intermittent riverine (ephemeral streams). Many of the rivers and streams have riparian areas that are either forested palustrine (e.g., alder [*Alnus* sp.]) or deciduous broad-leaved palustrine scrub-shrub (e.g., spicebush [*Calycanthus* sp.] or willow [*Salix* sp.]) along their banks (NPS 2007a).

The National Wetland Inventory (USFWS 1996) for Sequoia and Kings Canyon National Parks represents wetland features in three ways: points, lines, and areas (figure 24, table 56). Lacustrine features are almost exclusively mapped as area features. Small palustrine features are represented as points, while larger ones are represented as line or area features. Riverine features may be represented as lines or areas.

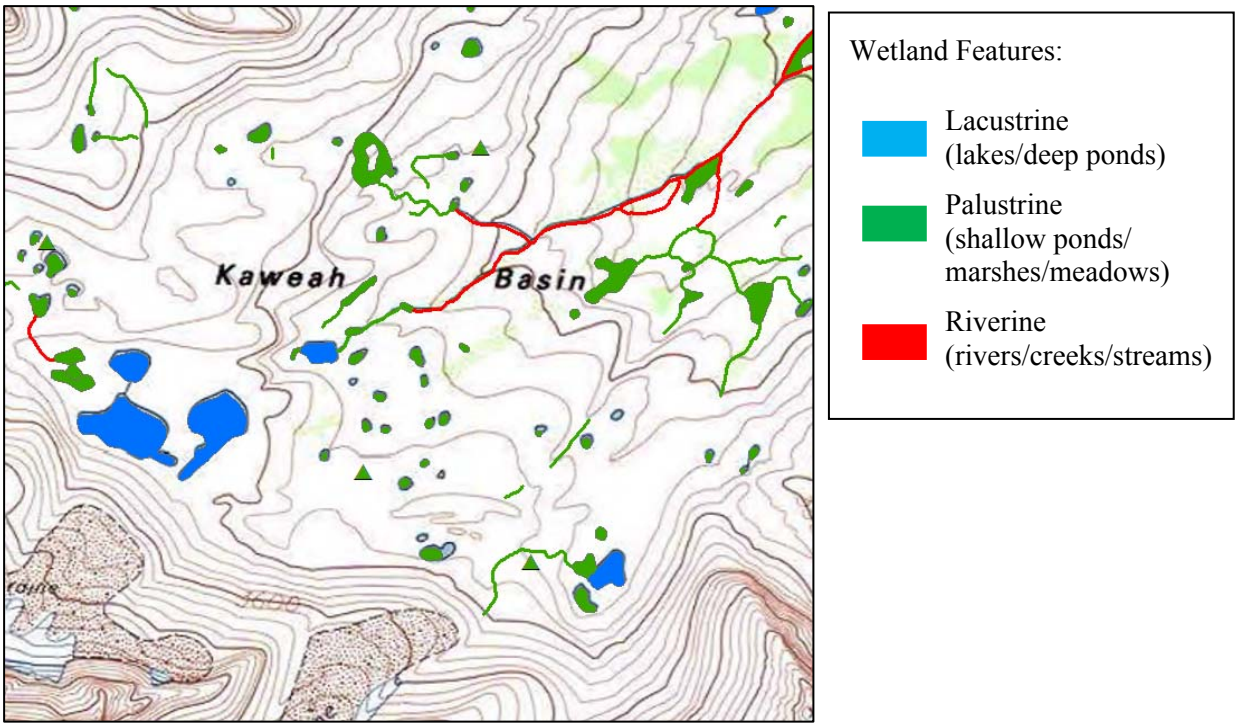


Figure 24: Wetland features in the Kaweah Basin

Table 56: Classes and Areal Extent of Wetlands According to Cowardin System in Sequoia and Kings Canyon National Parks

Cowardin System	Points (Count)	Linear Features (Miles)	Area Features (Acres)
Lacustrine	0	0.5	9643
Palustrine	285	776.8	16,387
Riverine	0	1,370.9	543
Total	285	2,148.1	26,573

Meadows — In Sequoia and Kings Canyon National Parks, as well as the Sierra Nevada as a whole, much attention has been paid to the understanding and management of meadows. Meadows are a vegetation type that can exist in both wetland and upland settings.

Wetlands and meadows overlap at the wet end of the hydrology spectrum; meadows exist in river floodplains, on streambanks, along lake margins, and at groundwater seeps and springs. Meadows also overlap with upland habitats at the dry end of the hydrology spectrum. Portions of any given meadow may be associated with lacustrine, palustrine, and riverine systems, as well as non-wetlands, reflecting the topography, hydrology, and soils that drive vegetation composition. Analysis of impacts on meadow vegetation necessarily overlaps with analysis of impacts on wetlands and uplands. They are analyzed because they are a recognizable landscape feature that is directly impacted by visitor-use activities, and because of their importance to hydrologic and ecological processes and their role in the provisioning of ecosystem services.

Managers in the Sierra Nevada have emphasized the meadow as an ecological and management unit. Weixelman et al. (2011) define and characterize Sierra Nevada meadows as follows:

> In the simplest terms, meadows are defined by hydrology, vegetation, and soil characteristics. Meadows in the Sierra Nevada and Southern Cascades in California have these characteristics in common:
>
> - A meadow is an ecosystem type composed of one or more plant communities dominated by herbaceous species.
> - It supports plants that use surface water and/or shallow groundwater (generally at depths of 3.3 feet).
> - Woody vegetation, like trees or shrubs, may exist and be dense but are not dominant.
>
> Meadows are characterized by the existence of two fundamental abiotic conditions: (1) a shallow water table (usually less than 3.3 feet) during the summer; and (2) surficial soil material that is fine-textured. Water tables are high and persistent enough to favor hydric herbaceous species and limit the establishment of trees and most shrubs. Hydrologic processes control the amount, source, and duration of water entering a meadow. Geomorphology (landform) controls where water comes from and whether it leaves the meadow system. Directional flow of water is also important.

The kinds of impacts from visitor use that are of concern may depend on the hydrology of the meadow. For this reason, it is useful to look at subsets of all meadow vegetation in the park. In addition to the overall population of meadows, impacts are considered on two subsets of meadows (dry meadows, and wet meadows/fens) in order to evaluate visitor-use impacts.

Wet Meadows and Fens — Wet meadows and fens (peat-accumulating wetlands) are a subset of meadow vegetation that exists on the wettest end of the hydrology spectrum. Most of the wet meadow and fen area corresponds to vegetation classified as intermittently to seasonally flooded meadow, semi-permanently to permanently flooded meadow, and willow/meadow shrubland, although some would be categorized as other vegetation such as willow shrublands or lodgepole pine (*Pinus contorta*) forests.

Both wet meadows and fens are classified as palustrine systems, both have water tables near the surface during the growing season, and support similar vegetation. In meadows with soils saturated through the growing season over hundreds or thousands of years, decomposition of plant material is slower than accumulation, which allows organic material (peat) to accumulate (Bartolome et al. 1990). Meadows with extensive areas of peat accumulation are considered fens, while those that are wet without significant peat accumulation are considered wet meadows. Peat accumulation is generally patchy within a given meadow, so meadow-fen complexes are common.

A wet meadow below Fin Dome

Fens are distinguished from wet meadows by the presence of organic soils, and are among the most common wetland types, globally. However, outside of boreal landscapes, they typically represent a small proportion of total wetland area and this is true in the Sierra Nevada. Fens have been classified using a variety of criteria such as vegetation, water chemistry, and hydrology (Wheeler and Proctor 2000). Fens have stable water supplies with water tables at or close to the ground surface for most of the growing season (Windell et al. 1986; Winter 2001; Chimner and Cooper 2003). While fens often exist in stream valleys as part of larger wetland complexes, they do not experience high velocity surface flows or sediment deposition from fluvial processes like riparian ecosystems. In contrast to marshes, fens do not experience deep inundation, although some microsites can have more than 0.6 feet of standing water (Cooper 1990). Using the Cowardin classification, fens are generally classified as either (1) palustrine, emergent, persistent, with a saturated water regime and organic soils, or (2) palustrine, scrub-shrub with a saturated water regime and organic soils where multi-stemmed woody species dominate. The stable groundwater-driven hydrologic regimes with the high water tables characteristic of fens retard organic matter decomposition and promote peat accumulation (Cooper 1990, Bedford and Godwin 2003, Cooper and Wolf 2006).

In the Sierra Nevada, fens develop in several geomorphic settings (Weixelman et al. 2011), associated with: open water features such as small lakes or ponds (basin fens), the base of hills or on hillslopes where ground water discharges from alluvial fans, glacial moraines, and other aquifers (sloping fens), and distinct springs (spring mound fens) (Cooper and Wolf 2006; Weixelman et al. 2011). Many wetland types have high water tables through June; however, in the Rocky Mountains, only sites with a water table within approximately 8 to 12 inches of the soil surface during July accumulate peat (Cooper 1990; Chimner and Cooper 2003). This may represent a hydrologic threshold distinguishing wet meadows from fens. Although the relatively stable hydrology of fens may buffer them against the effects of climate change in the near term, their ability to recover from disturbance to the peat body once oxidation has occurred is limited.

Wet meadows are characterized by seasonally saturated soils, but lack the perennial high water tables and organic soils of fens or the large seasonal and inter-annual water table fluctuations characteristic of marshes. Wet meadows lack deep peat soil but have significantly more organic matter than soils in drier meadows or surrounding forests. Like fens, wet meadows also fall within the palustrine system, and, depending upon their vegetation, may be placed in the emergent or scrub-shrub class (Cowardin et al. 1979). Wet meadows can be characterized as depressional, lacustrine fringe, discharge slope, or riparian,

depending on several factors such as the availability of water, soil characteristics and topography (Viers et al. 2013). Riparian and discharge slope meadows generally contain flowing surface water, while the surface water in lacustrine fringe and depressional wetlands is often standing (Viers et al. 2013).

Wet meadows typically are dominated by herbaceous perennial vegetation, such as sedges, grasses and rushes. Some riparian shrub species can also be found in wet meadows, and some wet meadows may include a dense cover of riparian shrubs (Viers et al. 2013). The dominant vegetation of wet meadows in the parks depends on many factors, but is influenced primarily by elevation and moisture regime.

Sedges and mosses are characteristic of peat-accumulating wetlands

Both wet meadows and fens are important breeding grounds for invertebrates, which are key elements of many food chains (Holmquist and Schmidt-Gengenbach 2006; Mutch et al. 2008a). They are also important destinations for park visitors, who are attracted to the open vistas, availability of water, and for those travelling with stock, the forage provided by meadow systems.

Dry Meadows — Dry meadows are those that lack surface water for a large proportion of the year. Dry meadows are typically found in upland areas within the subalpine and alpine zones of the park, and are commonly dominated by the perennial shorthair sedge (*Carex filifolia*) (Hopkinson et al. 2013). Although trampling impacts on dry meadows are not as pronounced as in wet meadows, shorthair sedge meadows are subject to reductions in productivity and shifts in species composition when grazed intensively (Cole et al. 2004).

Distribution of meadow types in Sequoia and Kings Canyon National Parks — Defined broadly, there are more than 5,300 meadows that occupy approximately 23,800 acres within the parks (USGS-NPS 2007; Hopkinson et al. 2013; Pyrooz et al. 2014). This represents slightly less than 3% of the parks' area. Meadows are most commonly found in the montane and subalpine zones (elevations between 5,000 and 9,000 feet). Most are 2.5 acres or less in area, though there are a few larger meadows that are around 250 acres in size (Hopkinson et al. 2013). The herbaceous vegetation of the meadows generally includes perennial grasses, sedges, and broadleaf herbs. These habitats may also support moss or lichens, as well as some woody vegetation (NPS 2013c).

For purposes of analysis, meadows were classified according to their hydrologic, vegetation, and soil characteristics into one of five classes. At the wet end of the spectrum, meadows that have saturated soils during most of the growing season can be classified as *fens,* which are mostly peat-accumulating, *fen/wet meadow* complexes with both peat-accumulating and non-peat-accumulating areas, or *wet meadows* with little or no peat accumulation. *Moist meadows* also have saturated soils through a portion of the growing season, but the duration is less than the three previous classes. *Dry meadows* have the shortest period of saturation, and water tables are generally far below the soil surface during the growing season.

Each meadow can also be characterized by the percentage of its area that is peat-accumulating. Multiplying the overall size of the meadow by the percentage of the meadow that is accumulating peat gives an approximate peat-accumulating area.

The breakdown of meadow area and peat-accumulating area by type is presented in table 57. *Moist meadows* contribute the most (39%) to the total area of meadows in the park, followed by *wet meadows* (33%). Meadows with significant peat accumulation contribute a relatively small area: *fen* contributes less than 1% and *fen-meadow* contributes 11%. *Dry meadows* contribute the remaining 18%.

Less than 2% (371 acres) of meadow area in the parks is peat-accumulating. The greatest amount of peat-accumulating area (91%) is in fen-meadow complexes. Fen and wet-meadow mapping classes contribute roughly equal amounts of peat-accumulating area (4% and 5% respectively).

Table 57: Distribution of Meadow Types in Sequoia and Kings Canyon National Parks

Meadow Types	Acres	% of Total	Total Peat-accumulating Area (Acres)	Peat-accumulating Area (% of Total)
Fen	24	0.1%	15	4%
Fen/wet meadow	2,575	10.8%	338	91%
Wet meadow	7,859	33.0%	19	5%
Moist meadow	9,181	38.6%	0	0%
Dry meadow	4,161	17.5%	0	0%
Grand Total	**23,800**	**100%**	**371**	**100%**

Meadows can also be characterized by whether they occur along lakeshores; there are approximately 179.6 miles of meadow edge that occur along lakeshores.

HIGH-ELEVATION LONG-LIVED TREE SPECIES

Four long-lived tree species with special resource or research value grow in the high elevations of the parks' wilderness: whitebark pine (a candidate for federal listing); foxtail pine, Sierra juniper (*Juniperus grandis*), and limber pine (*Pinus flexilis*). Three of the species are relatively common (whitebark pine, foxtail pine, and Sierra juniper) and one quite restricted (limber pine). These species, which do not survive fire well, exist where natural fire is infrequent. Given that, plus the cold, dry conditions of their subalpine habitat, their dead wood can be much older than any living tree (often two to three times older). It can persist, standing or on the ground for millennia.

This wood is a rare and valuable paleo-resource. Foxtail pine wood is particularly valuable. Foxtails can live up to 2,000 years and are climatically sensitive: their annual growth varies markedly with annual climate. As a result, they contain information on annual weather variations (showing measurable year-to-year variation in tree-ring width); long-term climate change (visible tree-line changes or stand-population dynamics and long-term growth trends in response to multi-decade climate trends); abrupt climate anomalies (e.g., frost rings associated with volcanic eruptions that impacted hemispheric temperatures); and information on past fire regimes.

Foxtail pine

Recreational effects on the forests and woodlands formed by subalpine conifers in the parks' wilderness include localized habitat degradation, primarily in the form of soil compaction, and consumption of dead and downed wood for campfires. In some high-elevation areas, fuelwood regeneration does not keep up with the depletion of wood (Davilla 1979). Where campfires have been allowed in places where available dead and downed wood is limited, damage to both live trees and snags and resulting visual or aesthetic impacts has resulted from chopping of live branches and trees. Since attaining status as a candidate for protection under the Endangered Species Act, cutting or removal of whitebark pine by park crews during trail maintenance or fire management activities has largely ceased. Recognizing the sensitivity and slow-growing nature of foxtail pine, Sierra juniper, and limber pine, cutting or removal of these long-lived trees is similarly avoided.

Less apparent than the aesthetic impacts are the subtle ecological impacts resulting from the collection of firewood, from either living trees or dead wood. Both the quantity and quality (e.g., logs versus fine branches) of dead wood are important in ecosystem dynamics (Stokland et al. 2012). Removal of coarse woody debris (more than 3 inches in diameter) can have localized adverse ecosystem effects (Harvey et al. 1979). Decaying coarse woody debris has an unusually high water-holding capacity, and accumulates nitrogen, phosphorus, and sometimes calcium and magnesium. It serves as an important site for nitrogen-fixing microorganisms and as a substrate for seedling establishment. Ectomycorrhizal fungi are concentrated in decayed wood. These organisms develop a symbiotic relationship with a plant's roots, improving the plants' ability to extract water, nitrogen, and phosphate from less fertile soils. As a result, elimination of coarse woody debris is likely to reduce site productivity, particularly on dry and infertile soils (Hendee and Dawson 2002). Wood collection also extends the area of impact around a campsite (Cole and Dalle-Molle 1982).

The following paragraphs describe foxtail pine, limber pine, and Sierra juniper at the parks. Whitebark pine is included in the "Special-status Species" section, as it is a candidate for federal listing.

Foxtail Pine — The heart of the distribution of the southern foxtail pine is found in the headwaters of the Kern River watershed in Sequoia National Park, although the species also exists at high elevations in the Kaweah and southern portions of the King River drainages. North of the Kings-Kern Divide, foxtail pine gives way to whitebark pine as the dominant high-elevation conifer, with the northernmost stands found in the Bench Lake area on the south fork of the Kings River. In the two parks, foxtail pine is found on

gentle to steep subalpine slopes of varying aspects between 8,220 and 12,560 feet. Strip bark growth form and trees with multiple crowns are seen with trees typically exceeding 1,000+ years in age. The parks contain approximately 61,260 acres of suitable foxtail-pine habitat. The open tree canopy is dominated by foxtail pine, but may also include red fir (*Abies magnifica*), Sierra juniper, whitebark pine, lodgepole pine, limber pine, Jeffrey pine (*Pinus jeffreyi*), or western white pine (*Pinus monticola*).

Limber Pine — Limber pine has a restricted distribution in the parks, limited to isolated trees and small stands found almost exclusively in the Kern watershed, where it grows on moderate to steep southwest to northeast facing slopes between 7,320 and 11,620 feet. A total of 1,344 acres of limber pine has been mapped in the two parks (NPS 2007b). The tree canopy of this seldom-encountered type is characterized by the presence of limber pine, but may include red fir, whitebark pine, foxtail pine, lodgepole pine, Jeffrey pine, and/or western white pine. In stands near the Sierra Crest east of the Kern Canyon, the canopy is most frequently codominated by foxtail pine; west of the Kern, lodgepole pine is more dominant.

Sierra Juniper — Sierra juniper is found throughout the two parks at sites between 6,450 and 10,950 feet. Because this species has low resistance to fire-caused injury, old trees (individuals reaching 500 to 1,000 years in age are common) are typically located on steep rocky slopes or canyon walls where discontinuous fuels and physical barriers limit fire spread. A total of 20,984 acres of Sierra juniper has been mapped within the two parks (NPS 2007b). Jeffrey pine, red fir, foxtail pine, lodgepole pine, and western white pine are also common associates. Note: Because Sierra juniper was previously classified as western juniper, some figures and tables in the EIS refer to it as JUOC, the botanical abbreviation for western juniper.

ALPINE VEGETATION

At higher elevations, the climate becomes increasingly inhospitable for trees. Closed forests in the montane zone give way to sparse woodlands in the subalpine zone, and then to a treeless area called the alpine. The wilderness of Sequoia and Kings Canyon National Parks protects most of the subalpine and alpine environment of the southern Sierra Nevada of California. With nearly half the area of the parks (48%) above 10,000 feet, they are dominated by high-elevation habitats. Crowning the tops of mountain systems worldwide, the alpine ecosystem is considered quite rare from a global perspective (Heywood 1995), making the protected status of the Sierra Nevada alpine critical to the conservation of alpine ecosystems worldwide. In these environmentally extreme and biogeographically isolated highlands, life is tightly constrained by harsh growing conditions. Despite this, the alpine is rich in biodiversity. Although at first glance the high peaks and tablelands may appear nearly devoid of life, the alpine flora of the Sierra Nevada includes approximately 600 species of vascular plants (Major and Taylor 1988), with at least 200 of those restricted to the alpine zone (Sharsmith 1940). Dominated by slow-growing perennial plants that are adapted to the extreme climatic conditions that characterize high elevations, alpine vegetation is thought to be particularly vulnerable to the shifts in temperature and snowpack dynamics predicted under anticipated climate change scenarios. In the context of the alternatives evaluated in this plan, the primary impacts of concern are trampling by cross-country hikers or stock, especially in those areas where new routes may become popularized and established.

Delineating a boundary between the alpine and subalpine poses an ecological and cartographic challenge. Although at the landscape scale it may appear that the transition between the subalpine and the alpine occurs at a distinct elevation, alpine species are found not only above the treeline, but also in openings in subalpine woodlands (Major and Taylor 1988). Subalpine and alpine communities thus intermix and create a mosaic of vegetation types over a range of elevations and environments.

To describe the distribution of the alpine in Sequoia and Kings Canyon National Parks, vegetation associations and mapping units from the parks' vegetation map were used (USGS-NPS 2007). Two categories of associations were recognized: those that are exclusively alpine and those that could be considered conditionally alpine (occurring both in the alpine and subalpine). The vegetation types and mapping units used to define the alpine of the two parks are listed in table 58.

Table 58: Vegetation Associations and Mapping Units Recognized in the Alpine of Sequoia and Kings Canyon National Parks

Exclusively Alpine Mapping Units	Conditionally Alpine Vegetation Types and Mapping Units (if occurring above 10,000 feet)
Alpine Talus Slope	Boulder Field
Alpine Scree Slope	Dome
Alpine Snow Patch Communities	Intermittently to Seasonally Flooded Meadow
Alpine Fell-field	Mesic Rock Outcrop
Alpine Permanent Snowfield/Glacier	Oceanspray Shrubland Alliance
	Semi-permanently to Permanently Flooded Meadow
	Shorthair Sedge Herbaceous Alliance
	Sierra Willow/Swamp Onion Seasonally Flooded Shrubland Alliance
	Sparsely Vegetated Riverine Flat
	Sparsely Vegetated Rocky Streambed
	Sparsely Vegetated to Non-vegetated Exposed Rock
	Sparsely Vegetated Undifferentiated
	Upland Herbaceous
	Water
	Willow spp. Riparian Shrubland Mapping Unit
	Willow spp. Talus Shrubland Mapping Unit
	Willow spp./Meadow Shrubland Mapping Unit

Source: USGS-NPS 2007

Using the classification rules described above, 275,915 acres of these parks are mapped as alpine habitat. Of this total, approximately 45% (124,147 acres) is mapped as exclusively alpine, while the remaining 55% is derived from "conditionally alpine" mapping units (treeless types occurring above 10,000 feet). Taken together, the alpine habitats defined here account for approximately 32% of the area encompassed by the two parks (Haultain 2013).

PLANTS OF CONSERVATION CONCERN (PARK SENSITIVE PLANT SPECIES)

Sequoia and Kings Canyon National Parks support a rich and diverse vascular flora composed of more than 1,560 taxa. Of these, only one plant species from the parks is listed under the California Endangered Species Act, and one is under review for federal endangered listing. However, an absence of threatened and endangered species recognized by Endangered Species Acts is not equivalent to an absence of species at risk. The parks are home to an additional 77 vascular plant and non-vascular species and subspecies of conservation concern that have been ranked as rare by the California Native Plant Society (CNPS) and the California State Natural Diversity Database (CNDDB) (Huber et al. 2013). These plants have no federal or state status but may be recognized as rare in California, have extremely limited distributions in the park, represent relict populations from past climatic or topographic conditions, or occur at the extreme

extent of their range. They are distributed throughout wilderness and inhabit a wide range of environments along the elevation gradient that characterizes the parks. Of these 77 plants of concern (also referred to as park sensitive), 29 have been retained for analysis within this plan; they are listed in appendix O.

A relatively small proportion of the planning area has been systematically surveyed for park sensitive plants. What is known about their distribution and abundance within the parks is based on a number of NPS investigations conducted between 1980 and 2013, holdings at regional herbaria, and observation data housed in the CNDDB. These data sources are described in detail by Huber et al. (2013), which together with the most recent CNPS Rare Plant Inventory (CNPS 2014) and CNDDB Special Vascular Plants, Bryophytes, and Lichens List (January 2014) was used in the development of appendix O and subsequent analysis of environmental effects. Many of the known populations tend to be near trail corridors, in meadows visited as part of the park monitoring program, or within specific inventory plots, which reflects where most of the search effort has been focused. This implies that additional undiscovered populations may exist in wilderness, especially in less accessible areas.

Relative to the vascular flora, much less is known about the presence, distribution, and abundance of bryophytes in the parks. Four datasets served as the primary source of information about bryophytes in the two parks as reported in Huber et al. 2013: the *NPS Inventory and Monitoring Wetland Ecological Integrity Surveys*; James Shevock's personal dataset (which includes records of specimens collected by him and others); the CNDDB; and the parks' herbarium holdings.

The 29 plants retained for analysis in chapter 4 are those that exist in habitats that are more likely to be impacted by recreational or administrative activities, and include those that are found in meadows used by stock, uplands open to cross-country travel by stock, and destinations popular with rock climbers and cross-country hikers.

NONNATIVE PLANT SPECIES

Nonnative plant species are species that have been introduced in areas outside the range of where they originated or where they naturally exist (Tu et al. 2013). Invasive species are nonnative plant species that can establish in natural habitats, where they can outcompete or displace native plants, provide unsuitable forage or nesting sites for native wildlife species, alter gene pools through hybridization, or alter vital ecosystem processes such as fire, hydrology and nutrient cycling (Chornesky & Randall 2003). The threat of nonnative and invasive species in the parks has been known for some time, and current management activities and programs have been implemented to address the monitoring and control of nonnative and invasive species at the parks (Tu et al. 2013).

Surveys have detected 219 nonnative plant taxa present within the parks (Tu et al. 2013). These taxa were introduced by humans, either deliberately (cultivated) or accidentally. Of these, 78 are currently considered invasive (Gerlach et al. 2003; Tu et al. 2013). Of the invasive species, 54 were assessed as causing or having the potential to cause serious negative impacts on native vegetation, were restricted to a small number of sites, and require management to eliminate or isolate the population (these comprise Management Category 1). Twenty of the species were assessed as having a lesser effect on native vegetation and were also restricted to a small number of sites (Management Category 2). Many Category 2 species could be feasibly managed along with Category 1 species without expending significant additional effort. Lastly, four species were assessed as causing serious negative impacts on native vegetation, were widely distributed throughout the parks, had increasing ranges, and would be difficult or impossible to eliminate (Management Category 3).

The invasive plant species of highest concern in wilderness include those that spread rapidly, form persistent seed banks, are difficult to detect and identify, and/or cause severe ecological impacts (that is, they displace native species and habitats, reduce local diversity, form monotypic stands, or alter ecosystem processes such as hydrologic regimes, biogeochemical cycling, fire regimes, and other disturbance regimes). The species of highest concern in these parks' wilderness include smooth brome (*Bromus inermis*), cheatgrass (*Bromus tectorum*), velvet grass (*Holcus lanatus*), reed canary grass (*Phalaris arundinacea*), oxeye daisy (*Leucanthemum vulgare*), yellow star thistle (*Centaurea solstitialis*), and Himalayan blackberry (*Rubus armeniacus*). Other species of concern such as bull thistle (*Cirsium vulgare*), orchard grass (*Dactylis glomerata*), and prickly lettuce (*Lactuca serriola*) may not cause ecological impacts that are as severe as the species of highest concern, but can also spread rapidly and contribute to reduced diversity of native species locally.

Distribution and abundance of nonnative plants are influenced by many factors, including elevation, disturbance, sources of introduction and spread, stock use, and the ability of the NPS to prevent, detect and manage nonnative species. Following are discussions on elevation, disturbance, and sources of introduction and spread.

Elevation — In the Sierra Nevada, the strongest variable associated with the distribution and abundance of nonnative plants is elevation. Gerlach et al. (2003) found that nonnative species richness in Sequoia and Kings Canyon National Parks is strongly negatively correlated with elevation, even when site type (e.g., campground, pack station, trail) is considered. Keeley et al. (2003) similarly concluded that nonnative species richness and cover declined with increasing elevation, and added that a history of cattle and sheep grazing, as well as fire severity and time since fire, are important determinants of nonnative plant presence. D'Antonio et al. (2004) found that nonnative plant species present in the Sierra Nevada tend to occupy lower elevation (below 5,900 feet) meadows and foothill woodland/grasslands, while fewer nonnative species occupy intact conifer forest areas and higher elevation meadows (above 5,900 feet). The understory of the lower elevation oak woodlands in the western portions of the parks is dominated by nonnative plant species (Parsons and Stohlgren 1989).

There are multiple factors influencing this relationship between elevation and nonnative plant species richness and cover. Current, low levels of invasion observed globally at high altitudes might be explained by increasing climatic severity (negative effect on invasion) and decreasing human disturbance and propagule pressure with increasing altitude (Pauchard et al. 2008). Montane plant communities have greater tree canopy cover and thus decreased light levels at the soil surface. With increasing elevation, plant communities have reduced growing seasons, decreased soil aridity, different disturbance regimes, decreased potential propagule sources, and decreased frequency and severity of past and present human disturbance (Keeley et al. 2003). Sixteen nonnative plant species have been detected above 7,000 feet elevation. The most invasive of these are velvetgrass (*Holcus lanatus*), foxglove (*Digitalis purpurea*), Himalayan blackberry, woolly mullein (*Verbascum thapsus*), reed canary grass, bull thistle (*Cirsium vulgare*), cheatgrass, and Kentucky bluegrass (*Poa pratensis*) (Tu et al. 2013).

Disturbance — In the parks and the Sierra Nevada, nonnative plants are more abundant in disturbed areas. The USGS conducted a survey to fully inventory invasive plants in both human and naturally disturbed habitats, such as river corridors, campgrounds, developed areas, roadsides, trailsides, pack stations, pastures, and montane meadows. This survey, conducted 1996 to 1998 (Gerlach et al. 2003), produced a nonnative plant list of 209 nonnative plant taxa (Tu et al. 2013). Maps show a pattern of nonnative plant distribution along roads, trails, and valley bottoms (Tu et al. 2013). Riparian habitats are particularly at risk for the introduction of nonnative species because of the regular disturbance in these habitats, the ease of propagule transport along streams and rivers, and the abundant moisture present (Moore and Gerlach 2001, 1).

In particular, park staff observe that probability of invasion is highest in areas where recent or continued disturbance and propagule introduction overlaps with high resource availability, such as trail crossings of meadows, streams, or seeps; sites with recent fires; locations with past and current stock activity; and areas of high visitor use.

Sources of Introduction and Spread — Introduction of species into the parks' wilderness depends in part on whether surrounding areas have been invaded, and on the vectors available to transport the plant or its propagules into wilderness. Natural transport vectors, such as wind, animals, and water, can move propagules. Plants or propagules may also be transported by human activities that import materials into the parks. These materials may include equipment, soil, sand, gravel, hay, straw, cultivated plants, car tires, clothing, and shoes. Nonnative plant establishment is most successful in current and past natural and human-caused disturbances such as roads, trails, developed areas, recently burned areas, helicopter landing sites, camps, and riparian sites. Most of the mapped invasive plant populations in the parks' wilderness are found along trails, which are recognized as important vectors for the dispersal of invasive plants into the cores of protected areas (Mutch et al. 2008b).

Potential vectors in the wilderness include hikers, their equipment, helicopters, and stock. While seed adherence to hiker boots, clothing, and equipment can transport nonnative plant propagules into wilderness, stock used on recreational trails represent a potentially important dispersal vector for nonnative plants into western wildlands (Wells and Lauenroth 2007, Hammit and Cole 1987). Stock can pass large numbers of seeds through their digestive tracts. Seeds can remain viable in the gut for several days. St. John-Sweeting and Morris (1991) found that peak seed transmission occurred three to four days after consumption, with some species being transmitted up to ten days later. Vander Noot (1967) found that 84 % of ingesta were transmitted after two days and 99.8 % transmitted after four days. Janzen (1981) found that a tropical seed species remained viable in horse digestive tracts for up to two months. Therefore, nonnative plant seeds that were ingested in pastures or holding areas well outside the parks have the potential to be transported long distances into the parks' wilderness. Many of the detections of nonnative plants in the parks' wilderness are pasture grasses, including orchard grass (*Dactylis glomerata*), velvetgrass, barley (*Hordeum* spp.), reed canary grass, cultivated timothy (*Phleum pretense*), and Kentucky bluegrass.

CLIMATE CHANGE AND VEGETATION

With the warmer temperatures, decreasing snow pack, and increasing water deficit predicted for the Sierra Nevada, changes are expected in the locations of ideal habitat for many plant species (Huber et al. 2013). As a consequence, the distribution and abundance of many plants may shift significantly along the climate gradient, which is largely aligned with elevation but also includes other important physical factors. The sensitivity of an individual species to climate change can be determined by a number of factors, including dispersal ability; temperature, moisture and substrate requirements; dependence on snowpack extent and duration; genetic diversity; and reliance on special interactions between particular species of herbivores and pollinators (Anacker et al. 2013). Because information about these species-specific factors is largely lacking for most wildland plants (and particularly so for rare species), it is difficult to predict how they will respond to changing conditions (Lomba et al. 2010). The capacity of both vascular and nonvascular plants to respond to a warming environment will also be affected by changing disturbance regimes, such as the frequency and intensity of fire, extreme weather events including drought and increased storm activity, and other global change factors. In the following section, the potential impact of predicted changes in climate are briefly discussed for wetlands, meadows, high-elevation long-lived conifers, alpine communities, plant species of conservation concern, and nonnative plants.

Wetlands and Meadows — Wetlands, which are defined by their underlying hydrologic regime, are thought to be directly vulnerable to forecasted changes in the type, amount and seasonal availability of

precipitation. In the montane, subalpine and alpine zones, wetlands and meadows receive much of their water from snowmelt, from both surface flow and through groundwater recharge. The increases in temperature which are expected to continue to cause a greater proportion of total precipitation to fall as winter rain, as opposed to snow, and to drive earlier snowmelt, are likely to have consequences for the hydrology and functioning of these systems. Although the high elevation meadows of the southern Sierra may prove to be somewhat buffered from these effects, as they are currently well above the average snowline, those closer to snowline are not (Viers et al. 2013). Meadow vegetation may also be vulnerable to increases in high velocity run-off events (floods), which have the potential to destabilize streambanks and lead to increased erosion and stream incision; incised channels can lower water tables and alter the hydrologic conditions that allow wetland and meadow vegetation to occur.

Changes in climate also have the potential to impact processes such as productivity and carbon cycling. How different meadow types will respond to these changes is likely to vary. In a seven-year study of annual net primary productivity in dry, moist and wet meadows in Yosemite National Park, Moore et al. (2013) described the patterns and variability in aboveground live vascular plant biomass in relation to climate. Their results suggest that, under projected warmer and drier conditions, annual above-ground net primary productivity may increase in moist meadows but remain unchanged in dry meadows. Recent research in two meadows of the central Sierra suggests that multiple years of stress (such as extreme drought, or frost events exacerbated by a lack of protective snowpack) may have the potential to lead to dramatic shifts in vegetation and have significant consequences for carbon cycling (Arnold et al. 2014).

High Elevation Long-lived Trees — Contemporary high elevation long-lived tree species in the Sierra Nevada have experienced variation in late Holocene climate over the last several millennia, which has resulted in a dynamic treeline ecotone, changing at decadal to century time scales. With future climate changes high elevation forests will be critical barometers for detecting and characterizing effects and responses of vegetation. However, the climatic effects will be complex (Bunn 2004; Ettinger et al. 2011) with upper and lower areas of high elevation forests likely affected differentially as trees respond to varying environmental factors, such as warming temperatures, CO_2 fertilization, changes in the summer moisture deficit, the timing, frequency, and extent of wildfires, and biotic interactions. Forest treeline that is currently temperature limited may expand into alpine sites while CO_2 fertilization may increase tree growth rates (Salzer et al. 2009) but could also result in decreased longevity of individuals (Bugmann and Bigler 2011). At lower elevations competitive interactions with lower elevation species, also expanding their elevational range, could increase. This may result in the expansion of more fire prone forests (red fir), which would be detrimental to relatively fire intolerant high elevation species. Increasing temperatures may also permit outbreaks of species such as bark beetles, which have already caused dramatic changes in some high elevation forests in the Rocky Mountains (Bentz et. al. 2010). Because of this complexity there is uncertainty in predicting long-term vegetation changes in these long-lived species. Most changes in high elevation forests will occur over long time scales, from many decades to centuries. However, exceptions might be the rapid changes that accompany events such as wildfire or bark-beetle disturbances outside the natural range of variability, which could trigger vegetation type conversions at local to watershed scales.

Alpine Vegetation — Dominated by slow-growing perennial plants that are adapted to the extreme climatic conditions that characterize high elevations, alpine vegetation is thought to be particularly vulnerable to the shifts in temperature, growing season, and snowpack dynamics predicted under anticipated climate change scenarios. Although considerable uncertainty exists regarding how vegetation will respond to these changes, simulation models evaluated under nine different climate scenarios by Lenihan et al. (2008) agreed in predicting significant loss—on average, a 66% reduction in areal extent--of alpine and subalpine habitat in California. However, recent field research results suggest that the extensive microclimate heterogeneity found in the alpine environment may provide diverse thermal niches, or refugia, for alpine plants to colonize and re-establish in (Graham et al. 2012; Birks 2013).

Small-scale habitat diversity may thus confer more resilience to the alpine flora as a whole than is currently predicted by coarse-scale dynamic vegetation models.

Plants of Conservation Concern — It is also expected that many of the traits that confer rarity in plants—limited geographic range, small population size, limited dispersal ability, and habitat specificity--may increase the vulnerability of the park's sensitive plants to such changes (Anacker et al. 2013). As with animals, some plant species with restricted distributions may become further limited in both distribution and abundance, while others could expand or shift their ranges. As noted above, the lack of species-specific information about plants with limited or restricted distributions hampers the ability to predict how individual species will respond to a changing climate. Vascular and non-vascular plant (including plants of conservation concern) responses to climate change will depend not only on their physiological tolerances but also on their phenology, establishment properties, biotic interactions, and capacity to evolve and migrate.

Nonnative Plant Species — With the warmer temperatures, decreasing snow pack, and increasing water deficit predicted for the Sierra Nevada by climate change models, some nonnative plant species may find suitable habitat at increasingly higher elevations. Previously, propagules may have been introduced to disturbed soils at mid- to high-elevations, but the climate envelope was unsuitable and the species did not establish. In the future, the same propagule pressure and disturbance level at a given elevation may result in more frequent and successful nonnative plant establishment because the area is now within the climate envelope for additional species. Higher-elevation areas that have, until now, been relatively resistant to nonnative plant invasions may become more susceptible (Pauchard et al. 2009) and novel species that have not previously found suitable habitat in the parks may successfully establish.

Although the distribution and abundance of individual plant species, the composition of plant communities, and nonnative plant establishment patterns may shift significantly in response to changes in climate, at this time the effects of climate change are not expected to interact significantly with the potential impacts from human activity in wilderness. Therefore, climate change impacts on vegetation are not further analyzed within each alternative in chapter 4.

WILDLIFE

INTRODUCTION TO WILDLIFE

There are essentially two general forms of wildlife impacts caused by human activities in the parks' wilderness: impacts on wildlife behavior and impacts on wildlife habitat. The disturbances in wilderness are generally not measurable and are localized, affecting individuals, but not affecting the species or habitat overall. The alternatives in the plan, however, may have an effect on several species. Wildlife with the potential to be affected by the alternatives, which will be further evaluated in chapter 4, include black bears, birds, and invertebrates. Special-status species will be considered separately.

BLACK BEAR

The black bear (*Ursus americanus*) is an important and commonly observed wildlife species in the parks. Black bears are widely distributed, occupying a diverse variety of habitats from the oak woodlands of the foothills up to the subalpine zone. No population estimates are available but several hundred bears are likely present and the population is considered stable. Black bears are a focal attraction for visitors, and the opportunity to see a bear contributes significantly to the public's enjoyment of the parks. However, interactions between people and bears increase the probability that bears will become habituated and/or food-conditioned—behaviors that must be managed because they often result in negative impacts on both bears and people (McCullough 1982; Herrero 1985). Because the NPS is mandated to both conserve

wildlife and provide for the public's enjoyment of that wildlife by the NPS Organic Act, managing human/bear interactions to minimize habituation and food-conditioning, yet still provide viewing opportunities, is a challenging endeavor. In this context, these two mandates of the NPS Organic Act create a management dilemma.

Bears that associate people with food (i.e., they are food-conditioned) often become aggressive towards people and must be lethally removed out of concern for public safety. The national park environment is ideal for the development of these behaviors because with a high amount of public visitation, bears frequently encounter people without experiencing negative consequences; as a result they often tolerate people in close proximity or become comfortable foraging on natural foods within developed areas (i.e., they are habituated). Once habituation occurs, access to human food can result through intentional (e.g., hand-feeding) or though unintentional means (e.g., improperly secured food-storage containers), and bears "graduate" from being habituated to being food-conditioned. Extinguishing food-conditioned behavior is particularly difficult because the behavior is transmitted across bear generations. For example, Mazur and Seher (2008) found that roughly 80% of bears that foraged for human foods with their mothers as cubs continued this behavior as independent adults. Although aversive conditioning techniques, such as chasing, projectiles, and pepper spray have had some success in lessening food-conditioned behavior, lethal control is still necessary in many cases (Mazur 2010). Black bears are adept at problem solving, and as a result food-storage techniques have had to increase in sophistication as bears have learned to defeat them (Mazur 2008). In wilderness, this progression has gone from sleeping next to one's food, to hanging food over a branch with a rope tied to a tree, to suspending food over a branch without using side ropes (i.e., counterbalancing, which can be effective but is extremely difficult to perform correctly), to the use of food-storage boxes and portable bear-resistant containers (Mazur 2008). A discussion of food-storage techniques and the associated impacts with these techniques can be found in "Chapter 4: Environmental Consequences."

Black bear in LeConte area

Between 1959 and 2009, 14,450 black bear incidents were reported in the parks, averaging 283 incidents per year. Over the same time period, property damage caused by bears (e.g., breaking into vehicles or buildings to obtain human food items) exceeded $2.3 million, averaging $46,103 per year when adjusted for inflation. The vast majority of these incidents occurred in non-wilderness. Wilderness bear incidents have declined substantially in recent years, yet conflicts still occur annually. While there has been a promising downward trend in bear incidents parks-wide for the past decade, the historical record indicates that periodic eruptions of conflict occur, likely related to failures of mast crops (the fruit of forest trees, e.g., acorns). Over the long term, there is no downward trend overall.

Modern bear management began in 1972, with the development and implementation of a *Sequoia and Kings Canyon National Parks Bear Management Plan* that shifted management focus away from bear control (i.e., relocating problem bears and destroying dangerous ones) to a proactive approach that emphasized control of human food, visitor and employee education, enforcement of food-storage regulations, use of efficient bear handling procedures, and reporting of bear incidents and management

actions (Zardus and Parsons 1980). Several revisions of the 1972 plan have been made, most recently in 1992. The 1992 revision is the plan the parks operate under today.

BIRDS

The Sierra Nevada is home to a rich assemblage of bird species. Austin et al. (2013) list 203 bird species that are confirmed to maintain a presence in the parks, while Schwartz lists 212 bird species (Schwartz et al. 2013). Twenty-seven species have either a state or federal listing status or both (appendix L). The diversity of habitats within the parks and the lack of extensive development provide an important refuge for many bird species, and birds are found from the foothill zone up to the top of Mount Whitney. Bird diversity is closely correlated with the major river canyons of the parks. Overall, the low-lying southwestern region has the highest diversity, and this peak diversity is associated with montane hardwoods, montane riparian habitats and water.

Some of the common bird species in the parks include the dark-eyed junco (*Junco hyemalis*), mountain chickadee (*Poecile gambeli*), yellow-rumped warbler (*Setophaga coronata*), Steller's jay (*Cyanocitta stelleri*), red-breasted nuthatch (*Sitta canadensis*), American robin (*Turdis migratorius*), California towhee (*Pipilo crissalis*), western tanager (*Piranga ludoviciana*), American kestrel (*Falco sparverius*), and Anna's hummingbird (*Calypte anna*) (Holmgren et al. 2012, NPS 2013b).

A Clark's nutcracker (*Nucifraga columbiana*), whose call is familiar in the highcountry

A variety of visitor and administrative activities potentially impact bird species in the parks. These include (1) stock grazing, which may alter bird habitat positively or negatively (depending on the species considered) or facilitate invasion of brown-headed cowbirds (*Molothrus ater*) that parasitize the nests of dozens of host species (see Steel et al. 2012 for a list of known host species); and (2) hiking and camping, rock climbing, or intrusive birding, which may cause disturbance to nesting birds, impacting reproductive success. Because birds are a highly diverse group with varying habitats needs and life histories, not all species would be impacted in the same manner or at the same intensity.

The nonnative brown-headed cowbird has the potential to affect native bird species. The brown-headed cowbird has expanded its range in California since the 1930s as a result of human activities, particularly those associated with cattle and stock operations (NPS 2013c). The preferred foraging habitat of this species includes heavily grazed meadows and open areas (Graber 1996). Brown-headed cowbirds are nest

parasites, and have been known to parasitize the nests of dozens of Sierra Nevada bird species. This species does not produce a nest of its own. Females lay eggs in the nests of host species and do not participate in the rearing of their own offspring, which allows females to lay up to 40 eggs in a season in multiple different nests (Siegle and Ahlers 2004). The host birds act as unknowing foster parents, sometimes at the expense of their own offspring. The cowbird eggs hatch more quickly than other bird eggs, allowing the cowbirds to get more food from the foster parents. Cowbird eggs also have thick shells, and may crush other eggs in the nest when they are rolled around or when they are laid (Siegle and Ahlers 2004). Because cowbirds are obligate nest parasites, there is concern about their impacts on a variety of open-cup-nesting native bird species, most notably flycatchers, vireos, and warblers; cowbirds have been hypothesized to be a contributing factor to the range-wide decline of many songbird populations (NPS 2013c). Most brown-headed cowbirds observed within the parks have been in relatively open forests and forest boundaries at lower-elevation sites and near roads, although they have also been observed throughout much of the parks (NPS 2013c). Observations of brown-headed cowbirds peaked in the 1980s, with few observations in recent years.

INVERTEBRATES

Invertebrate species have not been inventoried in the parks, and thus the number of species is not known. Of all animal species present in the parks, it is likely that ≥97% are invertebrates (Buchsbaum et al. 1987). Invertebrates can be found throughout all elevations and waterbodies within Sequoia and Kings Canyon National Parks (NPS 2013c). Some of the more familiar taxa are arthropods (e.g., insects, spiders, centipedes, etc.), mollusks (e.g., snails), and annelids (e.g., earthworms). The most abundant groups in aquatic habitats in the montane areas are primitive minnow mayflies, spring stoneflies, black flies, midges, and fingernail clams. In terrestrial subalpine meadows, the most abundant invertebrates are mites, ants, leafhoppers, lesser dung flies, sheetweb and dwarf spiders, slender springtails, short-horned grasshoppers, bugs, beetles, butterflies and moths, flies, and spiders. The most abundant terrestrial montane meadow families are the lesser dung fly, leafhoppers, pomace flies, delphacid planthoppers, mites, rove beetles, and braconid wasps. The parks are also publicized for their abundance of cave-dwelling species (e.g., Anderson 2010). There are no species that are federal or state listed, although information to make status assessments, particularly of the cave fauna, is quite limited. The invertebrates that could be affected by the alternatives in this plan include those occupying meadows, riparian areas, and areas around trail corridors and popular visitor-use and camp areas.

Erman (1996) speculated that aquatic invertebrate species richness and diversity has declined over the past 200 years in the Sierra Nevada due to a variety of land-use changes, including conversion of running water to standing water, sedimentation from mining, logging, grazing, roads and construction, loss of riparian cover from grazing, removal of coarse woody debris, stream diversion into ditches and pipes, heavy metal contamination, ground water pumping, exotic fish/fish introductions, and use of rotenone and other pesticides on a large scale. In contrast, writing in the same volume as Erman (1996) – the Sierra Nevada Ecosystem Project reports to Congress – Kimsey (1996) provided no speculation about historical human impacts on terrestrial insects in the Sierra Nevada, restricting the analysis to a description of the taxa present with a focus on areas of endemicity.

While the parks have not experienced most of these major disturbances, invertebrates may be impacted, both positively and negatively, by a variety of ongoing human-induced manipulations of habitat in wilderness, the most important of which are the presence of nonnative trout, trampling (by both people and stock), and grazing by stock. Trampling and stock grazing impacts on invertebrates will be evaluated in "Chapter 4: Environmental Consequences," but nonnative trout will not be evaluated because there are no alternatives that would modify trout conditions. There are also a variety of minor disturbances, such as removal and consumption of downed wood for campfires, increased nutrient availability from discarded food scraps at campsites, and exotic vegetation removal that may impact invertebrates, but there has been

no research to address these subjects and it is likely that effects are localized and of negligible impact and will not be evaluated in chapter 4.

CLIMATE CHANGE AND WILDLIFE (INCLUDING SPECIAL-STATUS WILDLIFE)

Many aspects of wildlife ecology may be influenced by a changing climate, such as shifts in species distribution (often along elevational gradients), the timing of life-history events (such as breeding and migration), and demographic rates (such as survival and fecundity). Montane species or others with restricted distributions may experience reduced abundance or even extirpation while other species, including nonnative ones, may increase in abundance and distribution. Climate change may result in decoupling of co-evolved interactions, such as plant-pollinator relationships or predator-prey interactions, direct loss of habitat (e.g., through increased fire frequency or drying/warming of lakes/ponds), and increased spread of disease and parasites (Mawdsley et al. 2009). The effects of climate change on wildlife may be pronounced but are not expected to interact significantly with the potential impacts from human activity in wilderness.

SPECIAL-STATUS SPECIES

Special-status species are plants and animals that are legally protected under state regulations and the federal Endangered Species Act (ESA) of 1973 or other regulations. In this section, the presence of federally and state-listed threatened and endangered species and potential habitat to support these species, as well as candidate species and any designated critical habitat is presented. Presence data were compiled through agency consultation, the collection of existing electronic data, the review of natural resource reports, and the results of field surveys conducted in the parks' wilderness.

- *Endangered species* — If the USFWS determines that a species is in danger of extinction throughout all or a significant portion of its range, it is listed as endangered. Listing as endangered gives the species protection under section 9 of the federal ESA, which prohibits the unauthorized take of a federally listed endangered wildlife species and malicious damage to or destruction of federally listed plant species.
- *Threatened species* – If the USFWS determines that a species is likely to become endangered in the foreseeable future, the species is classified as threatened. Species listed as threatened do not automatically have protection under the federal ESA, but the USFWS has applied most of the same protection described above to threatened species (authorized by section 4(d) of the federal ESA).
- *Candidate species* – Plants and animals for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

The California ESA is similar to the federal ESA both in process and substance, and it is intended to provide additional protection to threatened and endangered species in California. The California ESA does not supersede the federal ESA, but operates in conjunction with it. Species listed as threatened or endangered by the ESA and the California ESA are referred to as federally listed and state listed, respectively. The California Department of Fish and Wildlife (CDFW) maintains a list of plant and wildlife species of special concern because of population declines and restricted distributions, and/or because they are associated with habitats that are declining in California. Through the CDFW, the California Natural Heritage Program uses a ranking methodology for plant and wildlife species that was originally developed by The Nature Conservancy. Heritage ranking includes a Global rank (G rank),

describing the rank for a given taxon (species) over its entire distribution and a State rank (S rank), describing the rank for the taxon over its state distribution. In addition to the CDFW, the CNPS has developed lists of plants of special concern in California. However, these species are still given equal consideration in this WSP/FEIS compared to the federally and state-listed species that are included in this section.

For federal and state-listed wildlife and plant species, mapped observations were used to determine if special-status species exist within the parks' wilderness. These data were assembled from previous reports or electronic data layers. If specific data were not available, electronic vegetation and habitat data were used to determine the potential for special-status species to occur. While many popular areas in the parks' wilderness are linear features (trails), it is understood that impacts from actions of visitors and stock are not limited specifically to the trails, but could occur beyond these linear features. Although habitats in the parks support many species with special status, only those species potentially affected by this WSP/FEIS are discussed in this section. Special-status species that are considered vagrants (i.e., individuals of species that have been documented in the parks on occasion) are not discussed further because these species are not likely to be affected by the WSP/FEIS due to the short-term nature of their presence at the parks. Federal- and state-listed plants and animals that are considered special-status and exist in the parks' wilderness are presented in appendix L. A total of five threatened and endangered species and associated critical habitat (when applicable) are being considered in this WSP/FEIS. Below are detailed life histories for each of the species evaluated in this WSP/FEIS.

FEDERALLY AND STATE-LISTED AQUATIC AND TERRESTRIAL WILDLIFE SPECIES

Yosemite toad (*Anaxyrus canorus*) — The Yosemite toad is listed as a federally threatened species (USFWS 2014). Under the ESA, designated critical habitat for the Yosemite toad was recently proposed in April of 2013 (USFWS 2013). Critical Habitat Unit 15 (Upper Goddard Canyon) consists of approximately 36,830 acres of federal land, a portion of which is located in the northwest portion of Kings Canyon National Park (see figure 25 on page 335), between the South Fork of the San Joaquin River and the Middle Fork of the Kings River (USFWS 2013).

The Yosemite toad has been found in a variety of high montane, subalpine and alpine lentic habitats. However, it is most commonly found in shallow, warm water areas, including small permanent and ephemeral ponds, normally located in meadows (Mullally 1953; Karlstrom 1962; Kagarise Sherman 1980; Knapp 2003). Toads require a combination of habitat types to support their life history stages including breeding, rearing, foraging, dispersal, and overwintering habitat. Yosemite toads are generally inactive from early October until mid-May to early June, typically hibernating under snow in rodent burrows or crevices under rocks or bushes (Karlstrom 1962; Sherman and Morton 1984). Juveniles appear to remain in their natal meadow for the first year (C. Brown, pers. comm., 2012) and juveniles and adults are often found in moist meadow habitats where they forage. Willow thickets and springs and seeps in adjoining uplands and forests are also important features of dispersal and overwintering habitat (Kagarise Sherman 1980; Martin 2008). Natural meadow depressions, cavities, and holes, such as those created by deer hooves or rodents, or crevices near boulders or logs and vegetation such as willow thickets, provide temporary cover and refuge for juvenile and adult toads. Breeding and rearing takes place in shallow ponds, slow-moving streams, marshes, and along shallow protected shores of lakes (Karlstrom 1962; Kagarise Sherman 1980). Water depth and water temperature appear to be important limiting factors in the survival of eggs and larvae (Kagarise Sherman and Morton 1993). Suitable breeding habitats are often warmer than other aquatic components in the landscape.

Yosemite toads were once a common species in the Sierra Nevada. Estimates suggest that the toad has disappeared from between 47% and 69% of the sites that it previously occupied (Jennings and Hayes 1994; Jennings 1996; Drost and Fellers 1994, 1996). Remaining populations appear more scattered across

the landscape and consist of a small number of breeding adults (Kagarise Sherman and Morton 1993). A two-year survey for the Yosemite toad and its habitat was conducted in 2010 and 2011 by the USGS to determine the current status and distribution of this species and the quality of its habitat within the parks. Although the results are currently being published, these recent surveys of suitable Yosemite toad habitat observed the species in approximately 30 meadows (USGS n.d., unpublished data). One or more Yosemite toad individuals were observed in these meadows in a total of 171 instances during the two years of study. The USGS results from 2010 to 2011 combined with additional Yosemite toad observations in the parks since 1993 (NPS n.d. a, unpublished data) show that Yosemite toads have been documented in approximately 42 meadows. The majority of the mapped occurrences are located in the northwestern portion of Kings Canyon National Park, with the most concentrated observations in the upper South Fork San Joaquin. Many of the sites historically occupied by Yosemite toads were still occupied during the 2010 and 2011 surveys — although these occupied sites exhibited very low abundance — or were isolated from other populations (USGS n.d., unpublished data). The only robust population of Yosemite toads in the parks appears to be in the headwaters and bench meadows of the South San Joaquin River. The USGS survey data will be used to conduct a broad-scale modeling effort to identify meadow attributes (e.g., size, elevation, etc.) that can be used to classify specific meadows as suitable for Yosemite toads, even if toads were not present during the project surveys (NPS 2013c). These data are currently being published and peer reviewed.

Multiple factors, both individually and likely through a variety of complex interactions, may have contributed to the Yosemite toad's decline (USFWS 2013). Factors analyzed by the USFWS for their potential impact on this species and its habitat include, in no order of importance: 1) meadow habitat loss and degradation (due to livestock grazing and use, roads and timber harvest, fire management regime, recreation [packstock grazing and use; human and vehicular traffic], dams and diversions, and climate effects); 2) overutilization for commercial, recreational, scientific, or educational purposes; 3) disease or predation; 4) inadequacy of existing regulatory mechanisms; and 5) other factors affecting its continued existence (contaminants, UV-B radiation, climate change, sources of direct and indirect mortality, small population size, and cumulative impacts of extant threats).

The USFWS concluded that the Yosemite toad is likely to become endangered within the foreseeable future based on several primary threats. These include: 1) habitat loss associated with degradation of meadow hydrology consequent to the cumulative effects of historic land-management activities, notably livestock grazing, and also the anticipated hydrologic effects upon habitat from climate change; 2) chytrid fungus, which likely contributed to its decline and may remain an important factor limiting recruitment in remnant populations; and 3) the direct effects of climate change impacting small remnant populations, likely compounded with the cumulative effect of other threat factors (such as disease).

Additional threats considered of currently moderate magnitude to the toad include meadow habitat loss and degradation due to fire management regime, and mortality due to stock use, especially where it coincides with breeding meadows. Threats considered of currently low magnitude include meadow habitat loss and degradation due to roads and timber harvest, dams and water diversions, and recreational land uses; predation and indirect effects from fish; contaminants; UV-B radiation; and mortality due to recreational activity, wildfires, and roads. Factors not considered a threat to the Yosemite toad include overutilization for commercial, recreational, scientific, or educational purposes, and inadequacy of existing regulatory mechanisms.

In the parks, packstock grazing occurs in primary toad habitat (meadows), while recreation may overlap all segments of toad habitat (NPS 2013c). Introduced fish may be having continuing impacts on toad populations, as well. Fish are often not a concern since the toads breed primarily in ephemeral areas where fish are not present (Drost and Fellers 1994). However, during drought years, Yosemite toads have been documented shifting breeding sites from ephemeral ponds to streams (USFWS 2013). This ensures

an adequate water supply but increases exposure to introduced trout. Introduced fish may also impact toads by increasing their exposure to diseases. Both viral (Mao et al. 1999) and fungal (Blaustein et al. 1994) pathogens have been known to be shared by fish and amphibians (NPS 2013d).

Of greater disease concern, however, is chytrid fungus, which has recently been shown to be present in many Yosemite toad populations in the Sierra Nevada, including those in Sequoia and Kings Canyon National Parks (Dodge and Vredenburg 2012). The prevalence and spread of this pathogen appears to have coincided with the recorded declines of Yosemite toads in the late 1970s. Chytridiomycosis was first detected in Yosemite toad populations in 1961, became highly prevalent in the late 1970s, and peaked in the 1990s when 85% of museum specimens showed infection (Dodge and Vredenburg 2012). Recent samples collected from extant populations between 2006 and 2011 showed chytridiomycosis ranging from 17% to 26% prevalence. Although infection levels currently appear lower than peak measurements in the 1990s, chytrid fungus remains present in Yosemite toad populations and may be reducing survival during metamorphosis and recruitment through to breeding populations, as has been documented for mountain yellow-legged frogs (Vredenburg et al. 2010). In addition, chytrid infection may interact with changing climate to further suppress recruitment. Overall, it appears the threat to Yosemite toads from chytrid fungus was historically substantial, is likely ongoing, and is thus continuing to pose a moderate risk to the species (USFWS 2013).

Because of its historic abundance, the toad was likely an important link in energy and nutrient cycling within meadow ecosystems. Therefore, past and predicted future losses of the toad could impact food webs and nutrient cycling with potentially significant and important consequences for Sierra Nevada high-elevation wet-meadow ecosystems (NPS 2013d).

Mountain Yellow-legged Frogs – Northern distinct population segment (DPS) of mountain yellow-legged frog (*Rana muscosa*) and Sierra Nevada yellow-legged frog (*Rana sierrae*) — Mountain yellow-legged frogs are a native amphibian species complex within the parks that includes two species (Vredenburg et al. 2007): the Sierra Nevada yellow-legged frog and the northern DPS of the mountain yellow-legged frog. Both species are federally listed as endangered (USFWS 2014), while the Sierra Nevada yellow-legged frog is state listed as threatened and the northern DPS of the mountain yellow-legged frog is state listed as endangered (CFGC 2012). Both species are of management concern to the NPS. The USFWS, the NPS, the USFS and the CDFW are currently collaborating on the development of the *Mountain Yellow-legged Frog Complex Conservation Strategy* (NPS 2013d).

At Sequoia and Kings Canyon National Parks, both species of mountain yellow-legged frogs generally live along the eastern boundary of both parks, although some populations occur to the west, such as on the Monarch Divide. Under the ESA, critical habitat for the Sierra Nevada yellow-legged frog and the northern DPS of the mountain yellow-legged frog was proposed in April of 2013 (USFWS 2013), including six subunits in the parks (figure 25 on page 335).

Mountain yellow-legged frog

The natural habitats of mountain yellow-legged frogs include mountain lakes, ponds, marshes and streams at elevations that range from 4,500 to 12,000 feet (Stebbins and McGinnis 2012). Due to the fact that they overwinter in waterbodies, and their tadpoles take multiple years to develop, waterbodies that do not freeze solid in the winter or dry out in the summer are required (Lannoo 2005). Open lake and stream edges with a gentle slope seem to be preferred. Mountain yellow-legged frogs are most active during the day. Both species of mountain yellow-legged frogs only exist in high-elevation waterbodies of the Sierra Nevada and southern California and were thought to be one of the most abundant vertebrates in these systems (Grinnell and Storer 1924), providing critical ecological function as predator, prey and agents of energy and nutrient cycling between aquatic and terrestrial ecosystems (Finlay and Vredenburg 2007). Within the montane zone, mountain yellow-legged frogs were reported as inhabiting wet meadows, but streams probably provided the necessary areas for over-wintering and connectivity to other meadows (Pope and Matthews 2001). In the parks, mountain yellow-legged frogs disappeared from many montane areas by the late 1900s (Jennings and Hayes 1994) due to the implementation of a fish stocking program.

The first recorded stocking of nonnative trout into the parks' fishless high-elevation waterbodies occurred in 1870 and unrecorded stockings may have occurred as early as the 1850s (Christenson 1977). Fish stocking continued under the management of various sporting groups, U.S. Army staff, NPS staff, and CDFW (Knapp 1996; Christenson 1977) until the 1970s when the parks began phasing out nonnative fish stocking (Zardus et al. 1977). In 1988, the NPS terminated all fish stocking in Sequoia and Kings Canyon National Parks lakes. Although stocking no longer occurs in the parks, nonnative fish had established self-sustaining populations in approximately 575 waterbodies (Knapp 2003) and in hundreds of miles of stream. The presence of these fish in naturally fishless mountain ecosystems has resulted in negative ecological effects on these systems (Anderson 1971, Bahls 1992, Knapp 1996).

By the early 1900s, mountain yellow-legged frogs generally became rare to extinct in lakes containing nonnative fish, while remaining common to abundant in most fishless lakes (Grinnell and Storer 1924). Studies in the past decade, however, determined that mountain yellow-legged frog populations have disappeared from approximately 92% of historic localities in the Sierra Nevada including the parks (Vredenburg et al. 2007). This decline has largely been attributed to the widespread introduction of nonnative fish (Bradford et al. 1994; Knapp and Matthews 2000) and the recent emergence of disease (Rachowicz et al. 2006).

Chytrid fungus is a recently discovered fungal pathogen (Weldon et al. 2004) that causes a highly infectious disease (chytridiomycosis) in many amphibian species. Studies indicate it recently spread into the Sierra Nevada (Rachowicz et al. 2006; Morgan et al. 2007; Vredenburg et al. 2010) and has infected nearly all remaining mountain yellow-legged frog populations in the parks. Most mountain yellow-legged frog populations severely declined within a few years after becoming infected and many populations have gone extinct. Chytrid fungus has thus been a major factor in accelerating the decline, which was initially caused by the presence of nonnative fish throughout the Sierra Nevada (NPS 2013d). Chytrid fungus is not well understood and is currently being investigated in several studies. A few mountain yellow-legged frog populations are showing evidence of persistence, surviving and reproducing while continuing to be infected (Vredenburg et al. 2010; NPS unpublished data). All persisting mountain yellow-legged frog populations are in fishless areas and had high abundance prior to infection. Eradication of nonnative fish near existing mountain yellow-legged frog populations would allow these populations of frogs to expand (Knapp et al. 2007), and the resulting recovery should increase their chances of long-term persistence (NPS 2013d). Air pollution has also been implicated in the mountain yellow-legged frog decline by depositing contaminants into aquatic habitat, which may make mountain yellow-legged frogs more susceptible to disease (Davidson et al. 2002; Davidson and Knapp 2007; Fellers et al. 2007). In addition, global climate change has been implicated in drying up critical breeding habitat in one mountain yellow-legged frog population (Lacan et al. 2008) and may have more impact in the future.

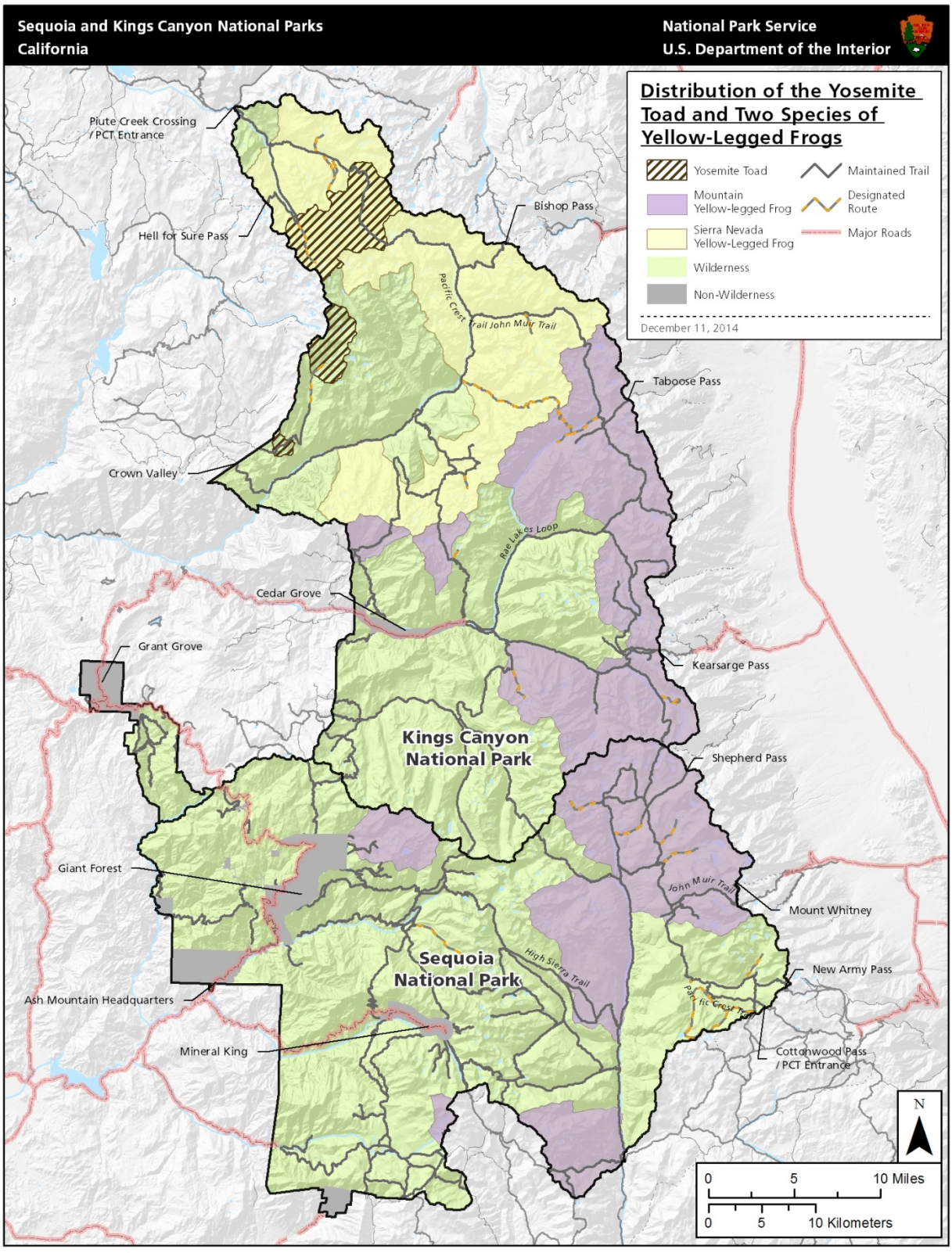


Figure 25: Distribution of the Yosemite Toad and Two Species of Yellow-legged Frogs in Sequoia and Kings Canyon National Parks

The ecological effects of continuing losses of formerly abundant mountain yellow-legged frogs from most of their ranges have been substantial, and current studies indicate that both species are continuing to decline and are on trajectories toward extinction (Vredenburg et al. 2010; Knapp et al. 2011). Because important interactions occur between mountain yellow-legged frogs, other aquatic and terrestrial species, and key ecosystem processes, the presence of mountain yellow-legged frogs in an ecosystem today indicates a system that has retained much of its native species diversity and ecological function, and thus likely has stronger potential for resistance and resiliency to ecosystem stressors and uncertain future conditions (Knapp et al. 2005).

Mountain yellow-legged frogs and proposed mountain yellow-legged frog critical habitat overlap with relatively popular areas of wilderness located near the PCT/JMT, Bishop Pass, Rae Lakes Loop, Mount Whitney area, the HST, and the Lakes Trail. Several lakes where mountain yellow-legged frogs live are directly adjacent to the PCT/JMT and Bishop Pass, and there are a few mountain yellow-legged frog lakes in the Mount Whitney area. One lake occupied by mountain yellow-legged frogs occurs near the HST. There are many more lakes along these trails that historically contained mountain yellow-legged frogs, and visitors can access occupied mountain yellow-legged frog habitat by hiking off trail.

Sierra Nevada bighorn sheep (*Ovis canadensis sierrae*) — These animals have been listed as federally endangered since 2000 (USFWS 2007). At the time of listing, only 122 animals were known to exist (USFWS 2007), making them one of the rarest large mammals in North America. Since then, management actions have focused on minimizing the two primary concerns identified in the recovery plan for the species (USFWS 2007): (1) negative effects of mountain lion predation and (2) the threat of respiratory disease that could result from contact with domestic sheep grazed on public lands. In 2012, the population was estimated at more than 500 individuals (CDFW 2013). With continued support for management, the CDFW projects that recovery goals could be reached by 2022 (Few et al. 2013).

Sierra Nevada bighorn sheep near Forester Pass

Bighorn sheep in the Sierra Nevada use a wide range of elevations, from alpine peaks in excess of 13,120 feet to the base of the eastern escarpment as low as 4,760 feet (Wehausen 1980). Critical habitat for the bighorn sheep was designated in September 2008 (USFWS 2008b); the 93,174 acres of critical habitat within these parks accounts for 22% of the total. In the recovery plan, potential bighorn sheep habitat is divided into 16 herd units, 10 of which are located wholly or partially within the parks (table 59). Of these 16 herd units, 12 have been identified as essential to recovery of the species because of habitat characteristics that make them the most likely areas where recovery will occur (i.e., they are designated critical habitat); eight of the 12 essential herd units are located wholly or partially within the parks, primarily located along the eastern boundary of both parks within wilderness (figure 26 on page 338). This WSP will address visitor and administrative activities throughout the eight areas of bighorn critical habitat located in the parks.

Table 59: Sierra Nevada Bighorn Sheep Herd Units Located Wholly or Partially in Sequoia and Kings Canyon National Parks

Herd Unit Name	Herd Unit Essential	Currently Occupied by Bighorn Sheep
Wheeler Ridge	Yes	Yes
Coyote Ridge	No	No
Taboose Creek	Yes	No
Sawmill Canyon	Yes	Yes
Mount Baxter	Yes	Yes
Mount Gardiner/Bubbs Creek	No	Yes
Mount Williamson	Yes	Yes
Mount Langley	Yes	Yes
Big Arroyo (as of March, 2014)	Yes	Yes
Laurel Creek	Yes	No

The PCT/JMT, Rae Lakes Loop, HST, and Rattlesnake Trail are relatively popular trails that travel through essential herd units. The PCT runs through the eastern side of the parks from north to south and travels through three essential bighorn sheep herd units (Taboose Creek, Sawmill Canyon, and Mount Baxter) and touches the edge of a portion of the Mount Williamson unit. The PCT is also located near the Wheeler Ridge and Mount Langley essential bighorn sheep herd units but is separated by fairly extreme topography. The Rae Lakes Loop travels through the Mount Baxter essential bighorn sheep herd units and travels along the boundary of the Sawmill Canyon unit. Mount Whitney lies between the Mount Williamson and Mount Langley essential bighorn sheep herd units. The HST travels through the Big Arroyo bighorn sheep critical habitat where 10 ewes and 4 rams were reintroduced in March 2014 in an attempt to reestablish sheep populations in this area. The Rattlesnake Trail can be accessed from the Mineral King area and this trail passes through the Laurel Creek essential bighorn sheep herd unit; the Laurel Creek unit does not currently contain any bighorn sheep, but eventual occupancy (most likely through reintroductions) is a requirement of the recovery plan. Finally, Mount Langley is located within the center of the Mount Langley essential bighorn sheep herd unit. This area is a popular off-trail destination.

Bighorn sheep are generally considered to be sensitive to human activity (Krausman et al. 1999) but there are many conflicting reports (Schoenecker and Krausman 2002) and the threshold at which such disturbances become adverse to bighorn sheep population welfare is not clear (Krausman et al. 1999). In a meta-analysis of 59 studies on the subject of ungulate flight responses to human disturbance, Stankowich (2008) noted that factors such as the type of recreation, presence of hunting, history of exposure, availability of alternative habitats, population size, presence of other predators, and physical terrain all interact in different ways in different locations. The report concluded that "it is important to recognize that populations may differ in the way they respond to human disturbance." Correspondingly, long-term bighorn sheep responses to human disturbance have varied from complete range abandonment (e.g., Etchberger et al. 1989; Schoenecker and Krausman 2002) to habituation with little negative impact (e.g., Hicks and Elder 1979; Stanger et al. 1986; Jansen et al. 2007). Papouchis et al. (2001) found evidence of both avoidance and habituation within the same population in Canyonlands National Park, Utah.

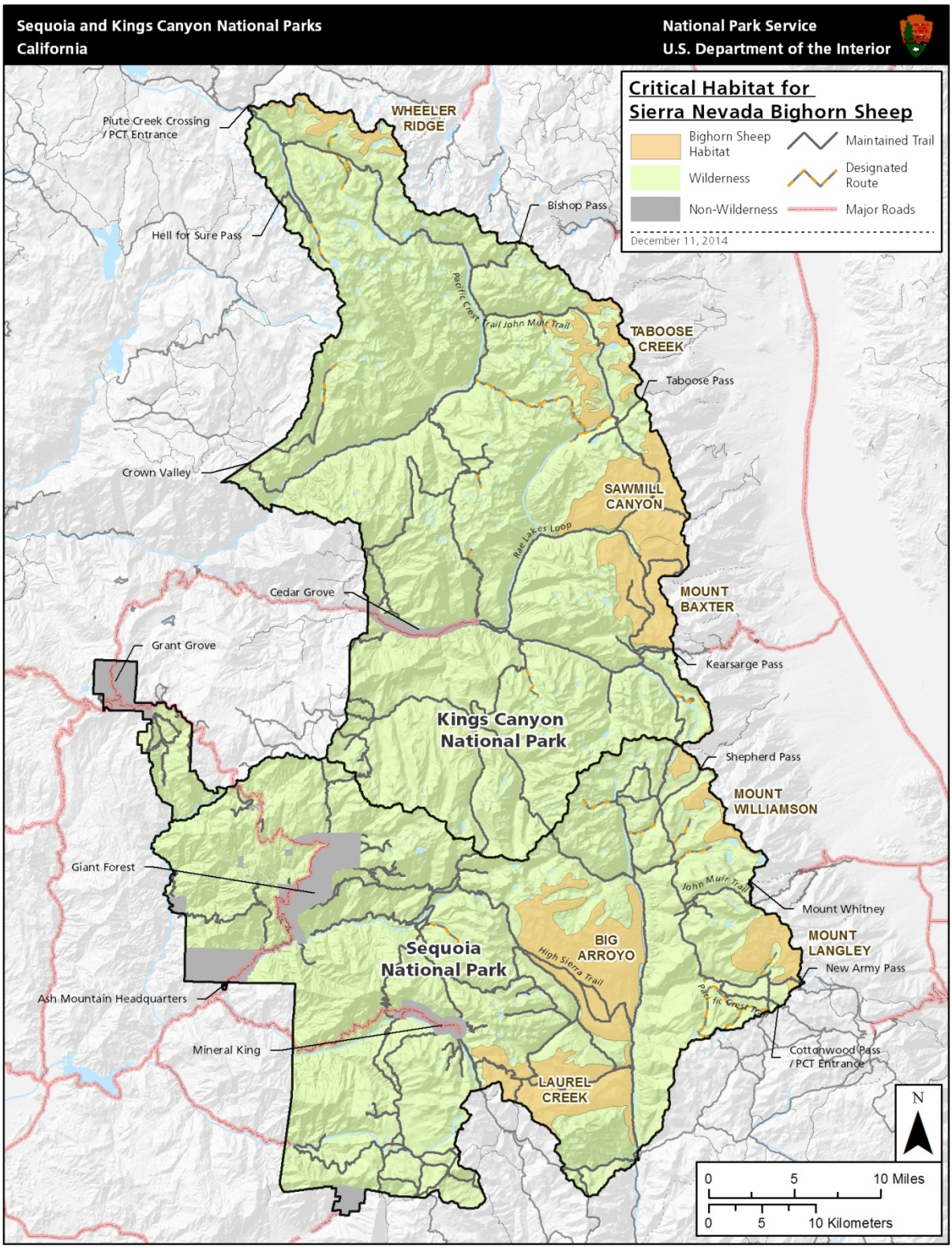


Figure 26: Critical Habitat for Sierra Nevada Bighorn Sheep in Sequoia and Kings Canyon National Parks

FEDERALLY AND STATE-LISTED PLANT SPECIES

Whitebark pine (*Pinus albicaulis*) — Whitebark pine is a candidate species for listing as federally endangered. This slow-growing, long-lived coniferous tree is a keystone species, one whose presence is critical to maintaining the structure of an entire community. It inhabits cold, windy, high-elevation sites in western North America (USFWS 2011). In the two parks, whitebark pine grows on gentle to very steep subalpine slopes of varying aspect between elevations of approximately 8,200 feet and 12,600 feet. It is the dominant high-elevation conifer in Kings Canyon National Park, and reaches the southern limit of its Sierra distribution near Mount Whitney in Sequoia National Park (see figure 27 on the following page). From a global perspective, the primary threat to whitebark pine is from the nonnative disease white pine blister rust and its interaction with the effects of predation by the native mountain pine beetle (*Dendroctonus ponderosae*), fire suppression, and climate change. In the Rocky Mountains whitebark pine populations are experiencing a long-term pattern of decline and the USFWS anticipates that the species could be in danger of extinction within three generations (USFWS 2011). Although incidence of white pine blister rust is currently low in the Sierra Nevada populations, the disease is now nearly ubiquitous throughout the northern range of the tree. Recent surveys found very low levels of infection in whitebark pine in the parks, but studies have documented continued expansion of the rust among populations of the two lower-elevation white pines, sugar pine (*Pinus lambertiana*) and western white pine (*Pinus monticola*) (Duriscoe and Duriscoe 2002, J. Nesmith, pers. comm., 2013).

The USFWS has concluded that white pine blister rust will likely continue to intensify and kill whitebark pine throughout its entire range. A secondary factor in whitebark pine mortality is predation by the native mountain pine beetle; conditions will likely remain favorable for epidemic levels of mountain pine beetle to continue (in the Rocky Mountains) into the foreseeable future. It is also anticipated that under predicted warming scenarios, climate change will result in direct habitat loss for whitebark pine, which is limited to cold, high-elevation environments. Although important in the decline of Rocky Mountain populations, fire suppression is not considered a major factor in whitebark pine population dynamics in the Sierra Nevada (Nesmith 2013, pers. comm.).

Recreational effects on subalpine conifers in the parks' wilderness include localized habitat degradation in heavily used areas, primarily in the form of soil compaction in campsites, and consumption of dead and downed wood for campfires. Since 1978, park managers have established campfire limits based on best-available estimates of the treeline and ground-fuel availability. Limits started at 10,000 feet in Kings Canyon National Park and 11,200 feet in Sequoia National Park in 1978 and have been modified as more sophisticated analyses of the vegetation at the parks have become available. Current campfire limits are defined per watershed: 10,000 feet in the Kings River drainage, 9,000 feet in the Kaweah River drainage, and 10,400 feet in the Kern River drainage.

In the past, whitebark pines were occasionally cut in the course of trail maintenance/construction and fire operations; since attaining status as a candidate for protection under the ESA, cutting or removal of whitebark pine by park crews has largely ceased.

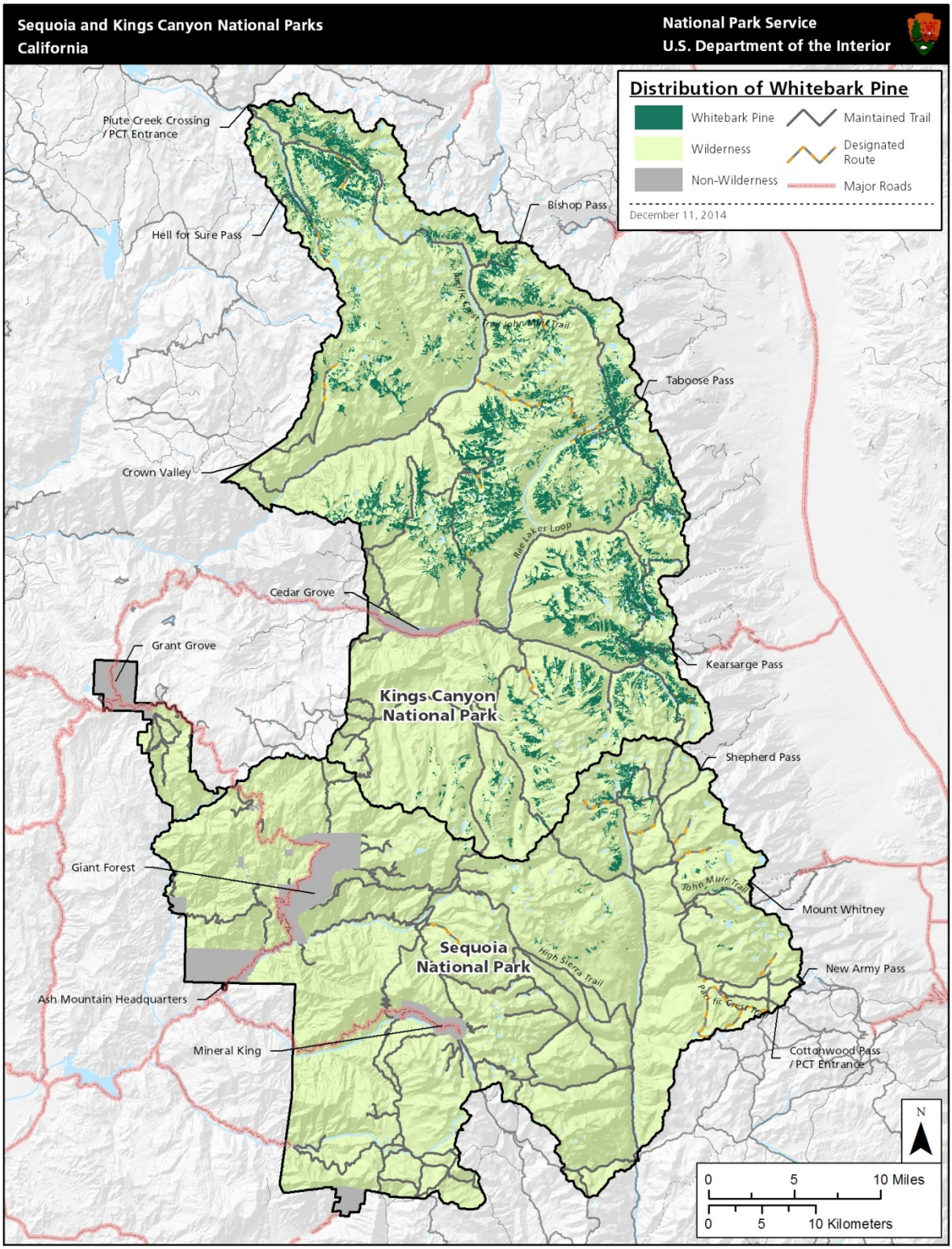


Figure 27: Distribution of Whitebark Pine in Sequoia and Kings Canyon National Parks

CULTURAL RESOURCES

This section is limited to cultural resources located in wilderness. It is organized with a general discussion of the prehistory and history of areas now designated as wilderness, followed by descriptions of specific cultural resources located in wilderness. For the purposes of this plan, cultural-resource topics focus on archeological resources, historic structures and districts, ethnographic resources, and cultural landscapes.

The National Historic Preservation Act (NHPA) recognizes five property types: districts, sites, buildings, structures, and objects. To focus attention on differing management requirements within these property types, NPS *Management Policies 2006* categorizes cultural resources as archeological resources, historic structures, cultural landscapes, ethnographic resources, and museum objects. Cultural resources may be linked to historic events or noteworthy people; they may be embodiments of technical accomplishment, design, or workmanship; they may be sources of information important in historical or archeological research; or they may be important in the cultural system of an ethnic group (NPS 1998c).

The rich human history of Sequoia and Kings Canyon National Parks is reflected in the abundance of cultural resources throughout the parks. Every cultural resource in the parks represents a time in the history or prehistory of the Sierra Nevada. These resources include evidence of sheep and cattle herding and ranching, recreation, evidence of scientific research, and extractive activities including mining and logging; as well as habitation structures, cultural landscapes, ethnographic resources, and archeological sites. Under certain circumstances and to the extent permitted by law, sensitive or confidential information about the specific location, character, nature, ownership, or acquisition of cultural resources on park lands is withheld from public disclosure. This is to reduce the likelihood of looting and to address the concerns and wishes of American Indians.

HISTORICAL OVERVIEW OF THE PARKS

American Indians — It is unclear when present-day Sequoia and Kings Canyon National Parks were first inhabited. The likelihood of Paleo-Indian presence is supported by the presence of projectile-point evidence dating from 12,000 B.C. to 9,000 B.C. Human occupation in the parks from around 1,000 B.C.is better documented, indicating more intensive use that continued into the historic period.

The Tübatulabal occupied a territory that included the Kern River drainage. The population was isolated and apparently rather small, with an estimated peak population of 1,000 members. There were less than 150 Tübatulabal by the 1920s. Due to their small population and relative isolation, Tübatulabal influence on the Kern River area was likely not profound, but it is not very well documented. The Western Mono population, estimated at up to 2,000 individuals by the time of contact with Europeans (mid-19th century), was both larger and more resilient than the Tübatulabal. By 1935, an estimated 1,000 Western Mono were living in the vicinity of Sequoia National Park (Steward 1935). The Western Mono occupied large camps at lower elevations and ventured to smaller seasonal camps in the middle and higher elevation zones in the summer. They modified some of the environments in which they lived through the use of fire. The Kaweah River drainage, therefore, was more intensively modified than the Kern River drainage (Vankat 1977).

The Eastern Mono are part of an extensive group of tribes known collectively as the Northern Paiute. Each tribe controlled its own territory and varied slightly in dialect from the others. The Eastern Mono lived in villages in the Owens Valley and Inyo Mountains in the winter. During spring and summer, kin groups traveled into the Sierra Nevada in search of game and wild foods. They also crossed over the Sierra Crest to trade with the Western Mono and other western Sierra tribal groups. Trade items included obsidian, which was used by the western tribes for tool making and weaponry. Intermarriage was not uncommon between the Western and Eastern Monos. The Eastern Mono congregated for communal

hunts, harvests, and ceremonies in the fall before returning to their winter villages. Population estimates for the Eastern Mono range from 1,800 to 4,000 for the pre-contact period. There were approximately 1,500 Eastern Mono in 1920 (Kroeber 1919, Cook 1976).

Archeological evidence includes projectile points and tools of different cultural complexes and periods, pictographs and petroglyphs, small encampments and larger village sites, trade rendezvous places, granite bedrock mortars used to prepare acorns and other seeds, rock shelters associated with habitation sites, and so-called "workshops" where projectile points were manufactured from materials such as obsidian.

European/Euro-American — European and Euro-American use of the area that became Sequoia and Kings Canyon National Parks was rare prior to the 1860s. Trapping was the first activity that brought non-Indians into the Sierra Nevada. Trappers, who usually left little lasting evidence of their presence, crossed into the Sierra and into the mountains' western foothills in the late 1820s and early 1830s. Trapping was still practiced into the 20th century. In particular, a trapper named Shorty Lovelace operated throughout what is now Kings Canyon National Park from 1910 until 1940. He left behind a series of small trapper cabins in wilderness (Tweed 1977).

Use of the future parklands expanded in the 1860s and 1870s. Cattle ranchers occupied most of the grazing land on the lower western slopes of the mountains by the 1860s. Hale Tharp, a rancher, is credited as the first Euro-American to enter the Giant Forest sequoia grove in 1858. In subsequent years he explored the high country from Kings Canyon to Mineral King.

Sheepherders, unable to access forage on the lower slopes, made the first commercial use of the Kings, Kaweah, and Kern watersheds and wilderness during the 1860s and 1870s. Basque shepherds became a summer fixture in the high country. Harry Quinn, an immigrant from Ireland, developed the most extensive sheep operation in the parks. Based out of a headquarters ranch in the foothills, he gained control of some of the most important grazing land in Kern Canyon. Eventually his mountain holdings included a mountain "horse camp" as a secondary base (Tweed 2010).

Prospectors and loggers also participated in the exploration and utilization of future parklands. Logging began in the 1860s. In 1885, colonists associated with the utopian Kaweah Colony filed timber claims to lands in the Giant Forest vicinity and built the Colony Mill Road to provide logging access. After years of futile efforts to find valuable minerals, silver was discovered in 1873, which touched off a rush to the Mineral King Valley. Prospectors eagerly entered the southern Sierra and by 1874 they had filed more than 200 claims in the Mineral King area (Dilsaver and Tweed 1990).

The California Geological Survey turned its attention to the high country of the southern Sierra Nevada in 1864. Members of the survey included some of the most dynamic scientists of their day: Josiah D. Whitney, William H. Brewer, and Clarence King. Brewer and King, along with a survey party, spent the summer exploring the region that became Sequoia and Kings Canyon National Parks. They passed near Grant Grove on their way to the high country, before going on to name several features, including Mount Whitney, Mount Silliman, Mount Tyndall, Mount Williamson, Table Mountain, and Milestone Mountain (Brewer 1966). King unsuccessfully attempted to climb Mount Whitney from the west in 1864. He finally reached the summit from the east in 1873. Another intrepid explorer, John Muir, made four trips to the canyons of the Kings and Kaweah rivers in the 1870s. On one of these journeys, he traced the belt of giant sequoias south from the Mariposa Grove in Yosemite, crossing the North and Marble forks of the Kaweah River and climbing into a "noble forest," which he named "The Giant Forest."

Meanwhile, efforts to save the magnificent sequoias had begun. Congress established Sequoia National Park on September 25, 1890, the second national park designated in the United States. Less than a week

later, they tripled the park in size and created General Grant National Park, now the Grant Grove area of Kings Canyon National Park.

Administration of these new national parks was assigned to the military; a national park service did not yet exist to do the job. On June 7, 1891, Captain J. H. Dorst of Troop K, Fourth United States Cavalry, established a camp outside the parks at Mineral King and became their first acting superintendent. He and 58 men spent the summer patrolling and maintaining the new national parks. Their greatest challenge in the first summer was in preventing continued logging and grazing in the parks. They constructed trails and patrol cabins to support their mission. One of these cabins was built at Harry Quinn's mountain "horse camp." These activities dominated military management of the parks for the next two decades. African American soldiers known as Buffalo Soldiers patrolled Sequoia National Park in 1899, 1903, and 1904. Captain (later Colonel) Charles Young, one of the first African American graduates of West Point, commanded the troops in the park in 1903 and was thus the first black national park superintendent (Dilsaver and Tweed 1990). His troops accomplished a significant amount of work in both the frontcountry and what is now wilderness.

Efforts to improve access to the national parks and to develop their recreational potential began in the early 1900s while the parks were under U.S. Army administration. Several road projects were undertaken at Sequoia and General Grant national parks. In 1902, a contract was awarded to John Broder and Ralph Hopping, two local ranchers, to operate the first commercial transportation and camping facilities in Sequoia National Park. In 1903, the Colony Mill Road was improved and extended to Round Meadow and Moro Rock in Giant Forest (Dilsaver and Tweed 1990).

The Army managed the parks until 1914. Subsequently, Walter Fry was appointed the first civilian superintendent of the two national parks. Originally hired as a road foreman in 1901, he had become a park ranger in 1905 and chief ranger in 1910. Fry was still superintendent when the NPS was established in 1916.

Franklin Delano Roosevelt's New Deal facilitated road work and many other projects, including the Civilian Conservation Corps (CCC), which was established in April 1933. Five CCC camps were established in Sequoia National Park that summer; two more were added later. Enrollees constructed campgrounds, trails, ranger stations, and other administrative facilities; landscaped roadsides; cut firewood; and controlled forest fires. Enrollees built structures in wilderness, including the Hockett Meadow Ranger Station and the Bearpaw Meadow High Sierra Camp (Dilsaver and Tweed 1990). After the United States entered World War II the CCC Program was disbanded, but the Civilian Public Service, comprised of men with conscientious-objector status, continued to use the camps and perform work for several more years.

Congress established Kings Canyon National Park on March 4, 1940. The new 710-square-mile park encompassed scenic mountains and rugged canyon wilderness on the west slope of the Sierra Nevada and absorbed the former General Grant National Park. Several months later the Redwood Mountain area north of Sequoia National Park was added to Kings Canyon. In 1943, administration of the two parks was unified as a wartime economy measure, an arrangement that continues to the present day.

Almost two decades of austerity during the Great Depression and World War II gave way to a burst of park use. Park and concession facilities, roads, and other infrastructure, already in need of maintenance, were unable to accommodate the dramatic expansion of post-war visitation. National Park Service leadership was not oblivious to these trends. Director Conrad Wirth, a career NPS planner, revealed a plan known as "Mission 66" in the winter of 1956. The Mission 66 Program emphasized a decade-long expansion of park staff, increased development of interpretive services, construction of modern facilities, and the improvement of roads, trails and campgrounds. Mission 66 projects were also implemented in

wilderness, including a new ranger station at Bearpaw Meadow High Sierra Camp (Dilsaver and Tweed 1990).

The 1960s also ushered in a new stewardship philosophy that emphasized preservation of natural habitat and wildlands. The Wilderness Act of 1964 became one emblem of this stewardship that stressed preservation and ecosystem-based management. The law included a mechanism for designating areas as wilderness. Wilderness areas were soon proposed within the parks. Eventually, in 1984 and 2009, about 93% of the parks were designated as wilderness. Another 3.4% are currently managed as wilderness according to policy.

Archeological Resources — These resources include both the remains of past human activity and records documenting the scientific analysis of these remains (NPS 1998c). The remains are often buried but may extend above ground.

In this document the term "prehistoric" refers to archeological resources associated with American Indians, particularly before contact with Europeans/Euro-Americans. It also refers to cultural resources that predate the beginning of written records, and includes isolated artifacts, petroglyphs, and pictographs. The term "historic" is used in referring to archeological resources that postdate Euro-American contact with American Indians. Historic archeological resources may include trails, building remnants, and a variety of other features.

As of November, 2013, there are 598 known archeological sites in the parks. About 9% of the parks' acreage (approximately 77,930 acres out of 865,964) has been surveyed for cultural resources. Most survey work has been in the parks' frontcountry, which is more accessible and where developments or projects are most often proposed (e.g., roads, campgrounds, overnight accommodations, and prescribed fires). Comparatively fewer wilderness surveys have been carried out (excluding historic-structure evaluations, trail surveys, and topic-specific research) largely due to the fact that fewer projects are undertaken that might affect potential sites. Both prehistoric and historic archeological sites are found in the parks. Two sites located in wilderness have been evaluated for National Register of Historic Places (National Register) eligibility. One was determined eligible and the other was deemed ineligible.

Although relatively unsurveyed, the parks' wilderness contains a variety of site types. For example, 88 archeological sites with obsidian fragments have been recorded in wilderness areas along the eastern boundary of the parks (Burge 2010). Sites in east-west passes, such as Taboose Pass in Kings Canyon National Park, suggest trade routes because obsidian from distant sources has been recorded at the sites. Many trade sites also reflect the presence of women with children, because grinding stones have been found as evidence of food preparation. Archeologists have also recorded stone structures thought to have served as hunting blinds or shelters (Burge 2010). At least one site suggests evidence of use over many years because its artifacts range from 1200 B.C. to A.D. 1850 – from prehistoric stone tools to 19th-century trade beads (Burge 2010). There is also archeological evidence that sheep and cattle herding as well as extractive activities (including mining and logging) occurred in many locations throughout the parks, in both frontcountry and wilderness (NPS 2007a). Other types of historic sites from a variety of eras include aircraft wreckage, abandoned trails and roads, cabins (some still in use), rock walls, fences, dendroglyphs (tree carvings), survey markers, and many other features (NPS 2007a).

HISTORIC STRUCTURES AND DISTRICTS

Historic Properties Listed on the National Register of Historic Places — A historic structure is "a constructed work … consciously created to serve some human activity" (NPS 1998c). Historic structures are usually immovable, although some have been relocated and others are mobile by design. Historic structures in Sequoia and Kings Canyon National Parks include buildings, cabins, historic districts,

shelters, CCC structures, campgrounds, roads, fences, and other structures of historic, utilitarian, aesthetic, or scientific importance.

According to federal law and NPS management policies, all historic structures in which the NPS has a legal interest are to be managed as cultural resources. Regardless of type, level of significance, or current function, every structure is to receive full consideration for its historical values whenever a decision is made that might affect its integrity. Historic structures that are central to the legislated purposes of parks, especially those that are to be interpreted or used in education, may be subjects of additional, specialized efforts appropriate to their functions and significance.

The National Register was authorized in 1966, coinciding with the passage of the NHPA. It is a program for identifying, evaluating, and protecting historic and archeological resources on private and public lands. While having a site listed on the National Register is considered a great honor and can assist parks in acquiring funds for documentation and preservation efforts, all historic structures and sites (i.e., those greater than 50 years of age) on federal lands must be treated as though they are eligible for listing on the National Register unless they are found not eligible through consultation with the California state historic preservation office (CA SHPO).

Historical sites having integrity of various attributes (including location, design, setting, materials, workmanship, feeling, and association) may be found eligible for listing on the National Register under one or more criteria, which include:

a) Association with events that have made a significant contribution to the broad patterns of our history;

b) Association with lives of persons significant in our past;

c) Those embodying the distinctive characteristics of a type, period, or method of construction, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

d) Having yielded, or may be likely to yield, information important in prehistory or history (36 CFR 60.4; NPS 1997).

The following historic structures and districts in the parks are located in wilderness or in a DPWA and have either been determined eligible for listing or are currently listed on the National Register:

- Barton-Lackey Cabin – Listed on the National Register March 30, 1978
  - This is a small (17’ x 21’) cabin built around 1910. It is associated with the development of cattle ranching in the region.
- Colony Mill Road – Determined Eligible for Listing on the National Register April 25, 1978
  - Approximately 10 miles long, the road was built in the 1880s and improved in 1903. It has not been maintained for vehicles since 1969. The unsurfaced road is 10–12 feet wide. There are some remnants of stone retaining walls along the route.
- Hockett Meadow Ranger Station – Listed on the National Register April 27, 1978
  - The CCC constructed the ranger station and barn in 1934. The 23’ x 33’ cabin and 17’ x 26’ barn are both constructed of logs.

- Pear Lake Ski Hut (also known as Pear Lake Ranger Station) – Listed on the National Register May 5, 1978
    - The 17' x 30' masonry building was erected by the CCC between 1939 and 1941. It originally served as a winter ski-touring hut, but took on a second role as a summer ranger station in the 1970s.
- Quinn Ranger Station (also called Quinn Patrol Cabin) – Listed on the National Register April 13, 1977
    - The U.S. Army erected the ranger station in 1907 at the site of Harry Quinn's horse camp. The building is constructed of logs and measures 13' x 19'.
- Redwood Meadow Ranger Station (also called Redwood Meadow Patrol Cabin) – Listed on the National Register April 13, 1978
    - The CCC built the ranger station and associated barn in 1938. The 23' x 33' cabin and 17' x 26' barn are both constructed of logs.
- Shorty Lovelace Historic District – Listed on the National Register January 31, 1978
    - The district includes Cloud Canyon, Vidette Meadow, Gardiner Creek, Woods Creek, and Granite Pass Cabins, which were all built by trapper Shorty Lovelace between 1910 and 1940. Located at disconnected sites in Kings Canyon National Park, they are all small (5' x 7') one-room log cabins with shake roofs.
- Smithsonian Institution Shelter (also known as Mount Whitney Summit Shelter, Mount Whitney Shelter) – Listed on the National Register March 8, 1977
    - This 31' x 11' stone structure was built on top of Mount Whitney in 1909 to provide shelter for scientists performing atmospheric research on the mountain. The shelter was used for its intended purpose for only 11 years. It is currently used to store search and rescue supplies and equipment.

Properties on the National Park Service List of Classified Structures — The List of Classified Structures is defined by the NPS as an evaluated inventory of all historic and prehistoric structures that have historical, architectural, and/or engineering significance within units of the national park system in which the NPS has, or plans to acquire, any legally enforceable interest. The list is evaluated or "classified" by the National Register criteria. Structures are constructed works that serve some form of human activity and are generally immovable. They include buildings and monuments, dams, millraces and canals, nautical vessels, bridges, tunnels and roads, railroad locomotives, rolling stock and track, stockades and fences, defensive works, temple mounds and kivas, ruins of all structural types that still have integrity as structures, and outdoor sculpture.

Currently there are 218 structures on the List of Classified Structures – a number of them in wilderness – in Sequoia and Kings Canyon National Parks (note: not all structures have been evaluated, so the number of classified structures in the wilderness could increase). The NPS is required to make a reasonable effort to preserve and maintain these structures. Although little may be known about some of the listed structures, and the subject-matter expertise and associated funding to classify and preserve some of them may be limited, that does not preclude their historical and cultural significance or the parks' obligation to ensure their protection.

Historic Properties Potentially Eligible for Listing on the National Register of Historic Places — Simpson Meadow Ranger Station has not been officially evaluated for listing on the National Register.

This WSP/FEIS has evaluated impacts on the ranger station, which is now used for storage, as if it is eligible for listing on the National Register.

The Muir Hut was constructed by the USFS in 1930, with funds donated to the Sierra Club. This stone shelter is located along the JMT at Muir Pass. The NPS is preparing a national register nomination for the hut, with the goal of submitting it to the CA SHPO in 2015. The building is currently managed as if it is eligible for listing on the National Register.

The historic Muir Hut

Additionally, other draft national register nominations and/or Determinations of Eligibility have been prepared for numerous cultural resources within the parks. These nominations, including those in wilderness, require further work before they can move forward to receive CA SHPO concurrence for National Register eligibility.

The WSP does not anticipate having any effect on Barton Lackey Cabin, Quinn Ranger Station, Hockett Meadow Ranger Station, Shorty Lovelace Historic District, Muir Hut, or the Smithsonian Shelter, under any of the proposed alternatives. These specific resources are therefore not addressed further in the WSP/FEIS.

CULTURAL LANDSCAPES

Cultural landscapes are complex resources ranging from large rural tracts covering several thousand acres to formal gardens of less than an acre. Natural features such as landforms, soils, and vegetation are not only part of the cultural landscape; they provide the framework within which it evolves. In the broadest sense, a cultural landscape is a reflection of human adaptation and use of natural resources and is often

expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined both by physical materials, such as roads, buildings, walls, and vegetation, and by use that reflects cultural values and traditions. Identifying significant characteristics and features in a landscape and understanding them in relation to each other and to significant historic events, trends, and persons allows us to experience and study the landscape as a cultural resource. In many cases, these features are dynamic and change over time. In many cases, too, historical significance may be ascribed to more than one period in a landscape's physical and cultural evolution.

Cultural landscape management involves identifying the type and degree of change that can occur while maintaining the historic character of the landscape. The identification and management of an appropriate level of change in a cultural landscape is closely related to its significance. In a landscape significant for its association with a specific style, individual, trend, or event, change may diminish its integrity and needs to be carefully monitored and controlled. In a landscape significant for the pattern of use that has evolved, physical change may be essential to the continuation of the use. In the latter case, the focus should be on perpetuating the use while maintaining the general character and feeling of the historic period(s), rather than on preserving a specific appearance (NPS 1998c).

Four types of cultural landscapes, not mutually exclusive, are recognized (definitions are taken from NPS 1998c):

- **Historic designed landscapes** are deliberate artistic creations reflecting recognized styles, such as the twelve-acre Meridian Hill Park in Washington, D.C., with its French and Italian Renaissance garden features. Designed landscapes also include those associated with important persons, trends, or events in the history of landscape architecture, such as Frederick Law Olmsted National Historic Site and the Blue Ridge Parkway.
- **Historic vernacular landscapes** illustrate peoples' values and attitudes toward the land and reflect patterns of settlement, use, and development over time. Vernacular landscapes are found in large rural areas and small suburban and urban districts. Agricultural areas, fishing villages, mining districts, and homesteads are examples. The 17,400-acre rural landscape of Ebey's Landing National Historical Reserve represents a continuum of land use spanning more than a century. It has been continually reshaped by its inhabitants, yet the historic mix of farm, forest, village, and shoreline remains.
- **Historic sites** are significant for their associations with important events, activities, and persons. Battlefields and presidential homes are prominent examples. At these areas, existing features and conditions are defined and interpreted primarily in terms of what happened there at particular times in the past.
- **Ethnographic landscapes** are associated with contemporary groups and typically are used or valued in traditional ways. In the expansive Alaska parks, Native Alaskans hunt, fish, trap, and gather, and imbue features with spiritual meanings.

The four cultural landscape categories are not mutually exclusive. A landscape may be associated with a significant event, include designed or vernacular characteristics, and be significant to a specific cultural group.

All or part of seven proposed cultural landscapes located in wilderness have currently been identified in the parks; one has been evaluated for listing on the National Register. Currently identified cultural landscapes in wilderness include the following:

- Kern Canyon Ranger Station / Lewis Camp Area
    - Lewis Camp is located at the southern edge of Sequoia National Park along the Kern River. It was established in the 1870s as a supply camp for commercial fisherman who operated in Kern Canyon. There was a store and tent cabins for travelers. A sawmill and suspension bridge were added in the early decades of the 20th century. The NPS erected a ranger station nearby in 1927. The camp was abandoned in 1951 and the buildings eventually fell into disrepair or were razed over subsequent years. However, the ranger station was rehabilitated in 1952. The potential cultural landscape includes the archeological remnants, landscape structures (irrigation ditches) and historic objects associated with Lewis Camp and the extant Kern Canyon Ranger Station.
- Bearpaw Meadow High Sierra Camp
    - Located 11 miles east of Giant Forest, the camp is accessed by the HST. It consists of six tents on platforms for guests, a dining hall and kitchen platform and tent, a manager's tent, an employee-restroom tent, a shower, a wood-fueled water heater, guest toilet, and other small features. The guest tents, dining hall, and kitchen were constructed in 1934. All except one guest cabin remain in their original locations. The other structures were probably built in the 1990s and are not eligible.
    - Two ranger stations were built just north of the camp. The first, a rustic log cabin, was built by the CCC in 1934 and is now used for storage. The second ranger station, an A-frame building, was constructed in 1964 as part of the Mission 66 initiative and is still used by the NPS.
    - The ranger stations, a trail segment (see HST below), five guest tents, dining hall, and kitchen may be contributing elements to the cultural landscape. The Determination of Eligibility is under review by the CA SHPO.
- Barton Lackey Complex
    - This potential cultural landscape in the Roaring River area of Kings Canyon National Park is associated with the Barton Lackey Cabin (which is listed on the National Register). It includes the cabin and historic archeological resources associated with the cattle camp that was located at the site between 1910 and 1940.
- Colony Mill Road
    - Listed on the National Register April 25, 1978, the remnant road (now used as a trail) is approximately 10 miles long. This potential landscape district was first built in the 1880s and improved in 1903. There are some remnants of stone retaining walls along the route.
- John Muir Trail
    - This trail, which runs from Yosemite Valley to Mount Whitney, was conceived in 1915 as a tribute to its namesake. Trail planning and construction took nearly three decades. The NPS constructed the 22 miles of trail in Sequoia National Park between 1926 and 1931, and a few alterations to its alignment were made in the early 1930s. In 1938, the USFS completed the 75-mile section through the region that became Kings Canyon National Park. The current alignment of the JMT has been in place since 1938.

- High Sierra Trail
  - The HST, constructed in 1934, begins at Crescent Meadow and travels east about 49 miles to the JMT. Bearpaw Meadow High Sierra Camp lies about 11 miles up the trail from the Giant Forest.
- Early Trail System Assessment
  - This proposed assessment will verify locations, inventory, and subsequently develop consensus determinations of eligibility for all other trails in Sequoia and Kings Canyon National Parks.

Hiker on the historic Colony Mill Road

The evaluation of cultural landscapes for listing in the National Register has not been completed; therefore, all of the cultural landscapes listed above are treated as if they are eligible.

ETHNOGRAPHIC RESOURCES

Ethnographic resources are expressions of human culture and the basis of continuity of cultural systems (NPS 1998c). Ethnographic resources can include sites, structures, objects, traditional landscapes, or a natural-resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a traditionally associated group.

Ethnographic information collected in the 20th century varies in its depth and utility relative to the primary American Indian groups who traditionally occupied or used park areas. Currently a comprehensive ethnographic overview and assessment is lacking at Sequoia and Kings Canyon National

Parks. However, via the NPS Cultural Resources Preservation Program, a Multipark Ethnographic Overview for Sequoia and Kings Canyon National Parks, Yosemite National Park, and Devils Postpile National Monument is funded in FY2014. It will provide needed research, emphasizing accessible archival and documentary data as well as consultation with American Indian elders, tribal historians, and leaders.

A new synthesis of available information will improve the ability to interpret, for park visitors, the historic and contemporary activities and concerns of the area's American Indian groups. Additionally, it will enhance formal consultation with American Indian Tribes and organizations and will enable parks management to preserve and protect traditional cultural properties and practices that are important to current tribes.

SOCIOECONOMICS

GENERAL SETTING

Sequoia and Kings Canyon National Parks comprise the eastern portions of Fresno and Tulare counties, California. Inyo County borders the parks to the east. Federal lands administered by the USFS surround the vast majority of the parks. Private lands involved primarily in agriculture, along with public lands managed by the Bureau of Land Management, border Sequoia National Park to the southwest.

Fresno, Tulare, and Inyo counties are large, ranging from 4,839 square miles to 10,227 square miles of land and water, ranking them among the largest counties in California (table 60). Together the two parks encompass 1,353 square miles, accounting for 12.5% of the combined area of Fresno and Tulare counties. Federally managed lands in the three counties total nearly 13,400 square miles including the parks, which is 63.4% of the total land.

Table 60: Summary Area and Federal Land Management Characteristics

Federal Land Management Characteristics	Fresno County	Inyo County	Tulare County	California (State)
Total Area (square miles)	6,017	10,227	4,839	163,695
Rank among the 58 California counties (1 being largest)	6th	2nd	7th	NA
Federal Lands (% of total area)	40%	84%	50%	42%

Sources: California Department of Finance 2009 and BLM 2013.
NA – Not Applicable

Fresno and Tulare counties are primarily agricultural land plus undeveloped forest and parklands, but more than 80% of the residents in each county live in urban centers. Each county has a major central city: Fresno with more than 508,000 residents and Visalia with more than 128,000 residents in 2013. Inyo County is predominately rural, with a rich ranching and mining history, but less than 2.0% of the land in the county is privately owned. Bishop is the largest community in Inyo County. Population densities in 2010 for the three counties ranged from 1.8 persons per square mile in Inyo County to 156.2 persons per square mile in Fresno; all considerably lower than the statewide average of 239.1 persons per square mile.

Fresno, Tulare and Inyo counties had a combined population of 1.43 million at the beginning of 2013 – a net increase of 240,000 residents, or 20%, compared to 2000 (table 61). This change in resident population is not reflective of annual visitation to the parks during the same period.

Table 61: Population Change, 2000 to 2013

County	2000	2010	2013	Change 2000 – 2013
Fresno County	799,407	930,450	952,166	19.1%
Tulare County	368,021	442,179	455,599	23.8%
Inyo County	18,071	18,546	18,573	2.8%
Three-county total	1,185,499	1,391,175	1,426,338	20.3%

Sources: U.S. Census Bureau 2000, 2010 and California Department of Finance 2013a.

The cities of Fresno and Visalia are the largest gateway communities to the parks, each offering a wide array of recreation, entertainment, lodging, and other businesses catering to park visitors and other tourists and travelers. Business establishments in many other smaller communities west of the parks, including Porterville, Springville, and Three Rivers, and individual establishments along the primary access routes, also cater to park visitors.

Visitors at the Kings Canyon Overlook on the Generals Highway

Smaller gateway communities east of the parks include Bishop, Big Pine, Lone Pine, and Independence, all in California. There is no highway access from these communities into the parks, but there are nearby trailheads used by wilderness visitors. For the most part these communities offer essential needs of wilderness visitors — overnight lodging before or after their visits, meals, water and other beverages, snacks, groceries and other supplies, and motor-vehicle fuel. Bishop is the base of operations for several of the authorized pack stations providing service into the parks. A number of other communities also serve as gateways for wilderness visitors who hike into the parks via trails from adjacent national forests. Given the overall number of wilderness visitors, the overall economic contributions and economic dependency of the local community economies attributable to those visitors is important, but likely limited in the context of the overall regional economy.

The vast majority of visitor use in the parks occurs in the developed frontcountry, which includes the Cedar Grove, Grant Grove, Lodgepole, and Foothills visitor centers and associated campgrounds, Giant Forest Museum, concession-operated lodging, trails, and other visitor services. More than 1.5 million visitors annually enter the parks from the west, primarily in private vehicles via State Highway 180 from Fresno and State Highway 198 from Visalia. No motorized access to the parks exists from the north, south, or east (Inyo County). Some visitors to wilderness access the parks from Inyo County, entering by foot or horseback after passing through Inyo and Sequoia national forests and the Golden Trout and John

Muir wilderness areas. The combined influences of the travel and access patterns, and levels of use in the frontcountry, skew the parks' commercial and economic influence on the local environment heavily toward Fresno and Tulare counties. However, wilderness visitors support the local hospitality industries, retail sector, and outfitter and guide services in many of the smaller gateway communities to the parks, including those near the national forest trailheads.

Projected Population Growth to 2040 — Information compiled as part of the NPS Visitor Services Project reveals that the majority of visitors to the parks – approximately 65% in 2002 – are California residents. Residency information specific to wilderness use is not compiled by the parks; however, according to recent visitor surveys, California residents comprise at least a comparable share of the total wilderness use (Martin and Blackwell 2013; Watson 2013).

Long-term population projections from the California Department of Finance anticipate population growth of nearly 750,000 additional residents (a 54% increase in population) projected for the three-county region between 2010 and 2040 (table 62). Statewide growth of 10.3 million residents is anticipated for the 30-year period.

Table 62: Projected Population Growth, 2010 to 2040

County	2010	2020	2030	2040	Projected Change 2010–2040	
					Abs.	%
Fresno County	932,277	1,071,728	1,241,773	1,397,138	464,861	50%
Inyo County	18,528	19,350	20,428	22,009	3,481	19%
Tulare County	443,066	526,718	630,303	722,838	279,772	63%
Three-county total	1,393,871	1,617,796	1,892,504	2,141,985	748,114	54%

Source: California Department of Finance 2013b

Population growth of the magnitude projected is not viewed as a precursor to comparable increases in wilderness use, in part due to the effects of trailhead permits and quotas in regulating actual visitor use. Rather, the projected population growth is viewed as indicative of continued long-term demand for the wilderness experience provided by the parks' wilderness and other nearby wilderness.

ECONOMIC CONDITIONS

Total employment in the three counties in 2011 mirrored their respective populations, ranging from more than 428,000 jobs in Fresno County to 10,426 jobs in Inyo County. Farm employment, expressed as a share of the total employment, is considerably higher in Fresno and Tulare counties than across the state, particularly in Tulare County (7.8% of the total). In Inyo County, government and government enterprises account for a disproportionately high share of total employment; 30.2% compared to the statewide average of 13.1% (table 63).

Table 63: Employment by Place of Work (Number of Jobs), 2011

Place of Work	Fresno County	Inyo County	Tulare County	California (State)
Total employment	428,951	10,426	187,073	19,969,266
By major category (% of Total)				
Farm employment	5%	1%	8%	1%
Private nonfarm employment	80%	69%	75%	86%
Government and government enterprises	16% *	30%	17%	13%

*The total for Fresno County exceeds 100% due to rounding.
Source: U.S. Department of Commerce, Bureau of Economic Analysis 2012

Business establishments catering to market demands from travelers, visitors to the parks and other tourists and outdoor enthusiasts, and demand from residents are important elements of the local economies (table 64). Fresno and Tulare counties each have more than 1,400 accommodation and food service establishments, including those located in the parks and nearly one-third of all establishments in Inyo County are in the arts, entertainment and recreation, and accommodation and food services sectors. The guides, stables, pack stations and outfitters operating in the parks under commercial-use authorizations (CUAs) are included in the "recreation" sector. Bearpaw Meadow High Sierra Camp and Pear Lake Ski Hut, both of which operate seasonally to provide limited-scale overnight lodging opportunities in wilderness, fit the definitions for the accommodations and food-services sector, but may not be included as they are each operated by a larger operating entity, the Delaware North Companies Parks and Resort, Inc. and the Sequoia Natural History Association, respectively.

Table 64: Selected Tourism-related Establishments and Employment in the Three-county Area, 2011 County Business Patterns

Tourism-related Establishment	Fresno County		Inyo County		Tulare County	
	No. of Estab.	Total Paid Employees	No. of Estab.	Total Paid Employees	No. of Estab.	Total Paid Employees
All industries	15,700	227,628	531	5,149	6,109	83,911
Selected tourism related sectors:						
Arts, entertainment & recreation	162	4,968	22	275	58	563
Accommodation & food services	1,431	24,027	88	1,418	1,413	8,048
Selected tourism total	1,593	28,995	110	1,693	1,471	8,611
Selected tourism share of total	10.1%	12.7%	20.7%	32.9%	24.1%	10.3%

Note: "Estab." is the abbreviation for Establishments.
Source: U.S. Department of Commerce, Census Bureau 2013.

Average annual unemployment for 2012 was above 15% in Fresno and Tulare counties and 9% in Inyo County. Collectively, those rates translated into more than 101,000 individuals seeking work. Statewide unemployment for 2012 was 10.5%. The regional economy experiences substantial seasonal expansion and contraction that is reflected in unemployment over the course of the year. Seasonal fluctuation in agricultural labor needs is a major contributor to the fluctuation. Visitation patterns at the parks also contribute to seasonal declines in unemployment as the NPS, in-park concessioners, and lodging, dining, entertainment and retail establishments outside the parks hire seasonal staff. Seasonal employment related to wilderness use includes alpine backpacking guides and the wranglers/packers of the outfitters and pack stations.

Residents of the three counties in the study area earned a total personal income of $43.75 billion in 2011; 2.7% of the statewide total. On a per capita basis, personal incomes ranged from $29,460 in Tulare County to $37,905 in Inyo County — all below the statewide average of $43,647. Again, the seasonal effects of the region's agriculture and tourism industries are contributing factors to the differences. More than 25% of residents in Fresno and Tulare are in poverty. In Inyo County, an estimated 13% of residents were in poverty in 2011, less than half the rates in Fresno and Tulare counties.

ECONOMIC CONTRIBUTIONS OF SEQUOIA AND KINGS CANYON NATIONAL PARKS

The parks are an important, albeit not a dominant element of the overall regional economy. Spending by visitors to the parks and NPS personnel, as well as capital outlays, research, environmental restoration, and operating and maintenance expenditures by the NPS and other entities, support local businesses and generate tax revenues that help support the state and local government.

Over the 20-year period from 1993 to 2012, recreation visits to the two parks fluctuated from about 1,340,800 in 1996 to more than 1,706,000 in 1994 (figure 28). In 2012, the parks received nearly 1,700,000 recreation visits, more than 10% more than the 20-year average of 1,536,600 visits.

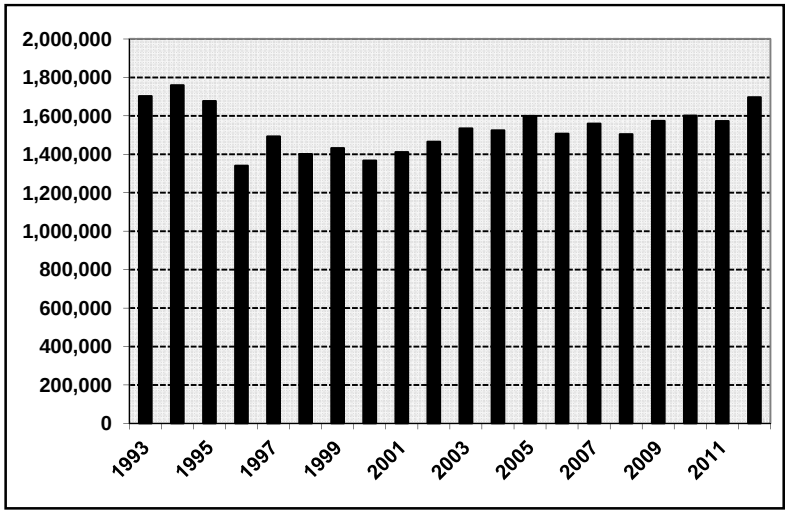


Figure 28: Annual Recreation Visits to Sequoia and Kings Canyon National Parks, 1993 to 2012

Overnight visitors to the parks, including guests at concession-operated lodging in the parks, tent and RV campers using campgrounds, and wilderness campers, historically accounted for more than 400,000 annual visits. Wilderness hikers and backpackers, including pack station clients and visitors who stay at the Bearpaw Meadow High Sierra Camp and Pear Lake Ski Hut, account for approximately 10% of all overnight visitors and 2.5% of the annual total visits.

An analysis of the economic contributions of units of the national park system, based on visitor origin, length of stay, type of overnight accommodations, and typical spending of park visitors, estimated that a total annual spending of $122.14 million occurred in the parks or within 80 miles of the parks, primarily in Fresno and Tulare counties, in conjunction with recreation visits to the parks in 2012 (Cook 2013). The total includes entry and wilderness-permit fees collected by the parks; outlays for accommodations, fuel, food and beverage purchases; boat, canoe, and other equipment rentals; and other miscellaneous expenditures (table 65).

The bulk of the total spending (62%) was by nonlocal visitors staying overnight in area motels and hotels and camping. Total expenditures reported by overnight visitors not staying at the lodges located in the parks, including those staying in developed campgrounds, backcountry and wilderness visitors, presumably including expenditures at the Bearpaw Meadow High Sierra Camp (summer) and Pear Lake Ski Hut (winter), and those staying with friends or relatives and not reporting lodging expenditures, totaled $16.24 million, or 13% of the total. Of that amount, $7.2 million was spent inside the park.

Table 65: Total Visitor Spending by Visitor Segment, 2012

Expenditures	Spending by Visitor Segment (Millions)							All Visitors
	Local	Day Trip	Motel Inside	Motel Outside	Camping Inside	Camping Outside	Other Overnight	
Inside the parks	$1.118	$4.063	$10.138	$8.563	$3.996	$2.814	$3.213	$33.904
Outside the parks	1.319	1.779	2.361	66.720	2.340	7.025	6.692	88.236
Total inside & outside	$2.437	$5.842	$12.499	$75.284	$6.335	$9.839	$9.905	$122.14
% of the total	2%	5%	10%	62%	5%	8%	8%	100%

Source: Cook 2013.

A breakdown of the direct spending, jobs and labor income effects, presented in table 66 below, shows that spending for lodging and camping is the single largest category of spending. The spending estimates capture any pre- or post-visit lodging expenditures by wilderness backpackers and pack station clients, as well as expenditures by overnight visitors to the Bearpaw Meadow High Sierra Camp and Pear Lake Ski Hut. Visitor outlays for wilderness permits, which allow camping in wilderness, are accounted for in the admissions and fees expenditure category.

Table 66: Selected Tourism-related Sales, Jobs and Labor Income Effects Attributed to Sequoia and Kings Canyon National Parks Visitor Spending, 2012

Sector/Expenditure Category	Sales (Thousands)	Jobs	Labor Income (Thousands)
Direct effects			
Motels and camping fees	$47,393	487	11,134
Restaurants and bars	$17,917	318	5,730
Groceries and takeout food	$8,807	148	2,733
Gas, oil, and local transportation	$13,736	250	7,322
Admissions and fees	$3,521	21	1,645
Souvenirs and other expenses	$8,302	107	3,433
Total direct effects	$ 99,676	1,331	$ 31,997
Secondary effects	$ 63,706	486	$ 19,211
Total Economic Effects	**$163,382**	**1,817**	**$51,208**

Source: Cook 2013.

Spending by the parks visitors also includes purchases made at the visitor center bookstores operated by the Sequoia Natural History Association. The Sequoia Natural History Association is a nonprofit cooperating association that supports education, interpretation, and research in the two parks.

The net direct effect of the $122.1 million in spending is estimated at $99.7 million in new direct sales, after adjusting for spending by local residents and day-trip visitors to the parks and the wholesale costs of

goods imported into the area for retail sales that do not represent new economic stimulus. Those sales support the equivalent of 1,331 jobs and nearly $32.0 million in labor income in the regional economy. Subsequent iterations of local spending (i.e., the secondary effects) support an additional 486 jobs and $19.2 million in labor income).

The total spending and jobs specifically attributable to wilderness visits by hikers, backpackers, and clients of the saddle horse, spot and dunnage services and the pack stations was not addressed in the aforementioned analysis. An insight into the major portion of that spending is provided by the reports filed by CUA permit holders summarizing their activities in the parks and gross income derived from those activities. The number of CUAs issued by the parks has varied from 32 to 35 over the four year period from 2009 to 2012, with 13 pack and saddle horse/mule services and 19 backpack/hiking guide service CUA permit holders providing services in wilderness in the parks in 2012 (table 67 and appendix B). The total number of clients served ranged from 970 to 1,582 during the same period, with an increase of 43% reported between 2011 and 2012, representing approximately 7% of all wilderness users. These numbers can vary greatly each year due to the amount of snowpack and the opening and closing dates of meadows for stock grazing. Additionally, some of the year-to-year variation may reflect changes in reporting procedures over time and between different permit holders. Many of the CUA permit holders do not record the number of day-use clients or report a "client" for trips for administrative or resupply purposes. Because of the way that the data from the annual CUA reports is captured, the number of commercial clients served from these reports may vary from other reporting sources (i.e., wilderness permits and stock-use reports).

Table 67: Number of Commercial Use Authorizations Issued for Activities in Wilderness and Number of Clients Served, 2009 to 2012

Types of CUAs	2009	2010	2011	2012
Number of CUAs				
Pack and Saddle (Stock)	15	14	13	13
Backpack/Hiking Guides	16	21	19	19
Total	31	35	32	32
Reported Clients Served[1]				
Pack and Saddle (Stock)	469	669	617	819
Backpack/Hiking Guides	501	663	490	763
Total	970	1,332	1,107	1,582

[1] These totals undercount the actual number of clients because some permit holders do not report day users.

The summary activity reports also provide information regarding the duration of activity by wilderness visitors taking day or overnight trips with one of the wilderness guides or outfitters. Based on data for more than 930 total trips over the four-year period, approximately 45% were day trips or administrative and resupply trips. On the other end of the range, 5% were 10 days or longer, many of which were summer backpacking/hiking adventure camps sponsored by Outward Bound and other organizations. The distribution of trips by duration is shown in figure 29 on the following page.

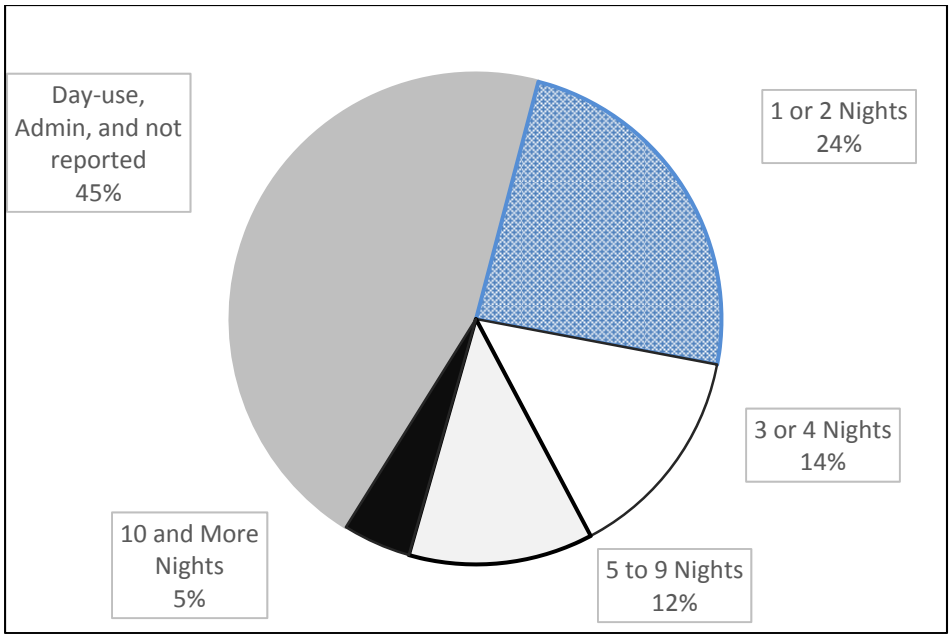


Figure 29: Duration of Activity in Wilderness Reported by Commercial Use Authorization Permit Holders in Sequoia and Kings Canyon National Parks, 2009 to 2012

The gross income reported by these CUA permit holders for their wilderness-related activities (both inside and outside the parks) ranged from a low of $882,451 in 2010 to a high of $1.26 million in 2012, averaging just greater than $982,000 per year over the four-year period. Income derived from backpack and hiking guide services has accounted for most of the variability in overall income, including an increase of $389,000 from 2011 to 2012 (figure 30).

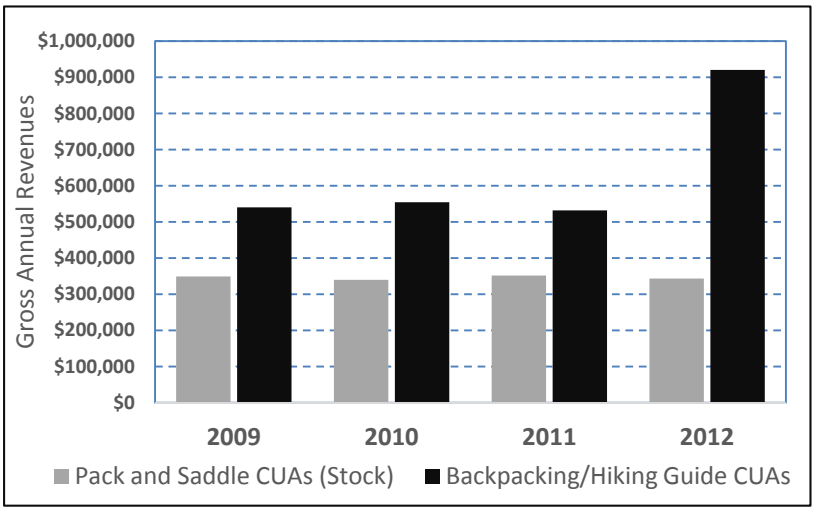


Figure 30: Annual Gross Revenue Reported by Commercial Use Authorization Permit Holders in Sequoia and Kings Canyon National Parks, 2009 to 2012

The revenues from clients, including the NPS, and the additional spending made outside the parks by wilderness visitors are critical to supporting the continued economic viability of the individual guides and outfitters, however, they represent but a small segment of the overall regional economy.

In summary, the visitor spending supported an estimated 1,817 jobs, with an estimated annual income of $51.2 million in the regional economy, with the majority of the benefits accruing in Fresno and Tulare counties. These totals include the local employees, managers and operators of the CUAs that are authorized to operate in wilderness in the parks. Although the jobs supported by the parks visitor spending represent only about 0.3% of the total regional employment, the visitor spending and jobs supported are important to many businesses in the gateway communities and the full and part-time concession employees in the parks.

Park Operations and Maintenance — The annual budget for NPS operations at the parks also contributes to the regional economy, as spending for utilities, supplies, and services, and spending by NPS employees support additional business sales, jobs, income, and generates tax revenues to help support state and local governments. These effects are in addition to those associated with visitor spending.

The annual base operating budget at the parks for fiscal year (FY) 2012 was $16.5 million. The base budget was supplemented in several ways: by donations; funding for equipment purchases; funding for specific construction, environmental monitoring, restoration projects, management planning (including this plan), and implementation projects; fees from concessions; and a portion of the entry and camping fees. The FY 2012 budget supported approximately 550 permanent and seasonal NPS employees and the NPS payroll and park operations spending supported the equivalent of more than 65 additional jobs in the region (Stynes 2011). The majority of the economic benefits accrue to Fresno and Tulare counties due to the location of NPS administration, maintenance, and visitor centers / contact stations.

Partner organizations provide additional benefits to the regional economy in the form of purchases of goods and services to support their research, educational, community outreach, and other missions conducted in support of the parks, as well as the spending by members and guests at events and activities hosted by the organizations. In addition, a cadre of more than 800 volunteers provides support for the parks operations, maintenance, and visitor services.

Payments in Lieu of Taxes — All three counties receive federal payments in lieu of taxes due to the combination of NPS, USFS and other federal lands located within their boundaries. Administered by the Department of the Interior, the payments in lieu of taxes program distributes payments to county governments to help offset the diminished property tax receipts resulting from federal ownership. For FY 2012, payments in lieu of taxes to the three counties were $2.285 million to Fresno County, $1.71 million to Inyo County, and $2.91 million to Tulare County (BLM 2013).

VISITOR USE AND EXPERIENCE

INTRODUCTION TO VISITOR USE AND EXPERIENCE

This section describes overall wilderness use levels and visitor characteristics, and provides information on the types and amounts of recreational activities occurring in wilderness.

In 2010, Sequoia and Kings Canyon National Parks had more than 1.6 million visitors. The frontcountry of the parks comprises only 2.5% of their total area but receives around 98% of the visitor use (i.e., number of visitors). Areas designated or managed as wilderness make up nearly 97% of the parks' area but receive only about 2% of the visitors (NPS 2007a). Wilderness visitors tend to stay an average of 75 hours or longer in the parks, while frontcountry visitors average less than 8 hours (NPS 2011a).

Approximately 25,000 to 35,000 people enter the Sequoia and Kings Canyon National Parks' wilderness each year (NPS 2011a). Visitor-use data from 1990 to 2010 indicates that visitation is lower in terms of total numbers of permits, people, and visitor-use nights relative to 1970 to 1990 (NPS 2011a.). However, there are still areas of concentrated use, such as the JMT, the Mount Whitney area, and in popular day-use areas, where high encounter frequencies in wilderness may occur.

Visitors to the parks' wilderness are subject to permit regulations, trail quotas and party size limits, campfire limits, requirements to stay in designated campsites in certain areas, and other regulations depending on their trip's origin and destination. They are also encouraged to be familiar with and employ Leave No Trace© practices to minimize their impact on resources.

This section describes wilderness visitor characteristics, methods of travel, camping and campsite conditions, and visitor experience in Sequoia and Kings Canyon National Parks.

WILDERNESS VISITOR CHARACTERISTICS

The NPS has conducted surveys and studies in the past to more accurately understand visitor characteristics and how visitors respond to management actions. A study conducted in Sequoia and Kings Canyon National Parks during the early 1990s (Watson et al. 1993) documented the differences and similarities between wilderness hikers and stock users and the role these characteristics play in conflicts between the users. Another survey was conducted in 2011 among overnight wilderness visitors to provide a more current understanding of visits and visitors to wilderness and how visitors respond to various elements of the parks' wilderness (Martin and Blackwell 2013). These two studies provide a variety of visitor-related information, including demographics and use characteristics, which allow the NPS to understand the characteristics of today's wilderness visitor. Table 68 compares the parks' wilderness visitors in 1990 and 2011.

Table 68: General Trends in Wilderness Visitor Characteristics

Wilderness Visitor Characteristics		1990	2011
Average Age	• ≤ 29 years old • 30–59 years old • ≥ 60 years old	N/A	11% 36% 16%
Education Level	• High school or less • Some college • College graduate • Graduate study	10% 18% 23% 49%	2% 9% 33% 54%
Gender	• Male • Female	N/A	83% 17%
Race and Ethnicity	• White • Hispanic/Latino • Asian • Other	N/A	91% 2% 5% 1%
Experience	• First visit • 1–2 previous visits • 3–8 previous visits • >8 previous visits	27% 27% 29% 17%	11% 21% 30% 38%

Source: Martin and Blackwell 2013 in NPS 2013e

Young and old enjoy wilderness, each according to his or her abilities and interests

Visitor-use Patterns and Trends — The average age of visitors to the parks' wilderness in 2011 was 47. The average level of education of wilderness visitors is apparently increasing. The 1990 survey recorded that 72% of wilderness campers had at least a four-year college degree, while an additional 18% had "some college" education (total of 90% with college attendance). The 2011 survey showed that 87% of wilderness campers had at least a four-year college degree, while an additional 9% had "some college" education (total of 96% with college attendance) (Martin and Blackwell 2013).

The respondents were predominantly male (83%) and described their race as white (91%) (see table 68) (Martin and Blackwell 2013).

The parks' wilderness visitors in general are very experienced wilderness users. In 2011, 38% had been to the parks' wilderness more than eight times (with 16% having made more than 20 trips) and 30% had made between three and eight trips. Approximately 21% have been there between one and two times, and only 11% were making their first visit. Previous experience in wilderness seems to be increasing among visitors to the parks' wilderness, as the 1990 survey showed a more evenly distributed variation in the level of previous experience in the parks' wilderness. The 1990 survey also recorded that 65% of respondents had visited more than five other wildernesses (Watson et al. 1993), while the 2011 survey recorded that 76% of respondents had been to six or more other wildernesses (Watson 2013). The 2011 survey also noted that more than one-fourth of visitors report their first trip to the parks' wilderness more than 33 years ago; and almost half first visited this wilderness more than 20 years ago (Watson 2013).

TRIP CHARACTERISTICS

Visitors may travel through the parks' wilderness on foot or with the assistance of stock, which includes horses, mules, burros, and llamas. Visitor use of stock is discussed further under the "Visitor Experience" section.

Seasonality — Because of the extended winter season of the alpine environment, much of the parks' wilderness use is concentrated in the months when wilderness is more easily accessed. The most popular time to visit is late spring through early fall (June through September; table 69). Peak visitation occurs during the 80-day period from approximately June 20 through September 10 (the third weekend in June through Labor Day). There are some notable spikes outside this period occurring during Memorial Day

weekend (depending on snow conditions), early June, and later September weekends, adding an additional 15 days to the peak visitation period (NPS-USFS 2013).

During the summer months, the parks' frontcountry roads and trailheads are ordinarily accessible and the weather is more stable and favorable for wilderness excursions. With these favorable conditions, visitors of a variety of skill levels can experience wilderness. Also during the summer months, wilderness visitors engage in the widest variety of activities and the parks' wilderness areas are at maximum staffing. Commercial-service use, including stock use, is highest during this time period.

People also visit wilderness in winter and spring months, engaging in activities such as snowshoeing and cross-country skiing. Visitors during this period are typically more experienced and prepared to withstand potentially difficult conditions and less predictable weather. Some winter visitors take advantage of commercial services, most of which provide wilderness ski tours or snowshoe hikes. Winter use, from early November through mid-May, likely accounts for less than 4% of annual wilderness visitation (NPS 2012a).

Table 69: Overnight Wilderness Visitor Use by Month (Number of People)

Month	2007	2008	2009	2010	2011	2012	2013	% Annual Use
Jan	87	121	85	118	108	116	92	0.4
Feb	108	74	102	117	98	155	199	0.5
Mar	139	223	224	171	111	203	211	0.8
Apr	199	216	302	146	183	214	307	0.9
May	1108	918	1176	815	681	1088	1559	4.4
Jun	2557	2081	2477	1496	1344	3771	3926	10.6
Jul	5922	6504	7035	6489	5449	9483	8352	29.7
Aug	6455	7095	7933	7985	7877	10122	7370	33.1
Sep	3057	2494	3730	3970	4293	5259	3197	15.7
Oct	753	674	816	779	862	676	167	2.9
Nov	243	169	153	151	90	122	224	0.7
Dec	72	43	35	48	80	41	55	0.2

Geographic Distribution of Use — In the 2011 visitor survey, a high percentage (76%) of respondents reported that they visited wilderness destinations considered popular by the park, although many visited areas of less-concentrated use as well. The popular areas noted in the survey include JMT, HST, Rae Lakes Loop, Whitney area (Crabtree to Mount Whitney), Dusy Basin, Kearsarge Lakes, Rock Creek, and Pear Lake areas. Popular areas for stock include Roaring River, the Kern Canyon, Hockett Plateau, and Rock Creek (both upper and lower) (Martin and Blackwell 2013). Bearpaw Meadow, Sawtooth Pass, Woods Creek Trail, Bubbs Creek Trail, and Charlotte Lake also receive moderate to high levels of use.

The most popular wilderness destination in the parks is Mount Whitney, which receives approximately 16,000 to 20,000 visitors annually. Other popular entry points and destinations for day users include Tokopah Falls, Lakes Trail/Watchtower and Heather Lake, and Mist Falls and Paradise Valley. Wolverton/Alta Peak and Panther Gap, Sawtooth/Monarch Lake and Sawtooth Peak, Franklin/ Farewell Gap and Franklin Lakes, and Bishop Pass/Dusy Basin are also popular, receiving relatively high levels of use (NPS 2013f).

The wilderness in Sequoia and Kings Canyon National Parks offers opportunities for both on- and off-trail travel. Almost all visitors (97%) indicate they spent time hiking on trails. Approximately 42% of visitors also traveled off-trail. Those traveling off-trail spent an average of 1.6 nights in these areas. While there is no baseline information on the amount of off-trail travel in the parks, managers in many locations perceive that off-trail travel may increase with the rising use of hand-held technological devices. This trend could serve to spread out visitor impacts on wilderness over time, and even cause some increased impacts in trail-less areas as visitors share information about them with each other. These trends challenge managers to monitor the growing use of off-trail areas and the potential for increased impacts on those areas. Off-trail areas offer visitors the challenge of navigation and may offer more opportunities for solitude in wilderness (Martin and Blackwell 2013).

Meadows and their surroundings are often perceived as a focal point of the wilderness experience as they frequently serve as principal destinations for wilderness travelers. For those who ride and/or pack into wilderness, these areas also may provide forage for their stock. While the popularity of meadows remained fairly constant from 1992 to 2012 (varying only with the snowpack), several trends have become apparent. Stock groups repeatedly use the same meadows and campsites. As a result, some meadows open to grazing receive little or no use while others receive use sufficient to necessitate management controls.

Party Size — The typical party visiting the parks' wilderness averaged just fewer than three people per party between 2002 and 2012 (NPS 2012a). Respondents to the 2011 survey were part of parties ranging from one (24% of respondents), two (38% of respondents), three to four (24% of respondents), and more than four people (14% of respondents).

During each year between 2002 and 2012, parties traveling with stock usually had an average of slightly more than four people per party. This average ranged from a low of 1.9 people per party in 2009 to a high of five people per party in 2006. The average number of stock per person over the 11-year period was 1.9 (NPS 2012a).

Trip Length — The majority of visitors (54%) to the parks' wilderness during the summer of 2011 spent two to four nights. Five-to-seven-night trips were also common (26% of visitors). Only 9% spent eight to ten nights, while just 2% stayed in wilderness for 11 nights or longer. This represents a slight increase in trips of four nights or more since 1990, and a slight decrease in trips less than three nights. The average trip length for 2011 was slightly more than four nights (Watson 2013).

Approximately 18% of wilderness overnight visitors stay fewer nights than anticipated. Actual trip lengths were, on average, about one night shorter, or about 20% shorter, than the expected or intended trip length recorded on wilderness permits. Recent research has shown a similar trend in Yosemite National Park, where the average trip was about 15% shorter than planned (Watson 2013).

Overnight Use and Day-use

Overnight Use — Visitors who wish to stay overnight in wilderness must obtain a permit from the NPS or USFS. An average of 7,582 wilderness permits was issued each year between 2002 and 2012 by the USFS and the NPS combined for trips into the parks. An average of 141 stock-use permits (private and commercial) was issued each year between 2002 and 2012 (NPS 2012a).

The average number of overnight wilderness visitors to the parks for the past 3 years (2010–2012) is approximately 23,000, accounting for an average of approximately 111,000 visitor-use days (VUD) per year. These figures are compiled from permits issued by Sequoia and Kings Canyon National Parks and Inyo, Sequoia, and Sierra national forests. The average does not include PCT users coming from south of

Sequoia National Forest or coming from north of Inyo and Sierra national forests or JMT users coming from Yosemite National Park or other points north of Sierra National Forest (NPS 2012a).

It is estimated that these additional 3,500 users account for 28,000 visitor-use days (based on projected numbers of users and days of use; the estimate of visitor-use days in these parks per trip per person for the PCT and JMT users is eight). For the purposes of the WSP, only the VUDs calculated from wilderness permits are used. The estimates from PCT/JMT long-distance use have not been included, though they have been considered in visitor capacity decision making.

Wilderness stock-use permits average about 2% of total permits issued each year by the NPS and USFS. Overnight stock-use levels vary with the persistence of the snowpack each year, but were fairly consistent in the 1980s and 1990s. In 1996, following the establishment of the 1986 SUMMP, stock use was about one third of the level of the early 1950s and about one-sixth of the peak levels reported in the 1930s (NPS 1998a).

Day-use — Several destinations are very popular among day users, including Mount Whitney, Mist Falls, and the Watchtower. Day trips provide an important introduction to wilderness and may be the only wilderness experience available to many people. Though day-use visitors spend much less time in the parks' wilderness than overnight users, they may still have impacts on natural and cultural resources and other visitors' experiences due to the brief, spatially compressed nature of their visit (NPS 2013f).

VISITOR EXPERIENCE

Activities — The parks' wilderness includes high-elevation lakes, streams, meadows, and peaks, which are destinations for wilderness visitors. These areas offer opportunities to experience a variety of recreational activities away from the busy pace and noise of modern daily life. Visitors use wilderness in many different ways and for many different reasons. Surveys of overnight wilderness visitors showed that popular activities included hiking on trails (97%), hiking in trail-less areas (42%), fishing (24%), non-technical mountain climbing (without gear) (22%), speed hiking (6%), technical mountain climbing (with gear) (3%), and trail running (2%) (Martin and Blackwell 2013). Other recreational opportunities in wilderness include boating, photography, nature study, horseback riding/pack trips, swimming/wading, and cross-country skiing and snowshoeing during the winter.

Stock use is a popular activity in Sequoia and Kings Canyon National Parks. Recreational stock use in the parks predates their establishment and peaked in the 1930s. Stock-use levels have varied since then, peaking again in the 1950s and then decreasing in the 1960s and 1970s as backpacking became more popular (NPS 1998a). In 1996, about 54% of stock use was commercial use, 14% was private use, and the remaining 32% was for administrative purposes. In 2012, total stock use was comprised of 41% commercial use (one concession, 15 CUA holders), 9% private use, and 51% administrative use (NPS 2012a).

There are four different methods in which wilderness visitors use stock. People can travel with stock for their entire trip, spot trips occur in which visitors ride in and are dropped off, after which the stock leave, dunnage trips occur in which visitors hike in and stock carry supplies and then leave, or stock can make mid-trip resupply trips to overnight visitors. Horses and mules account for 97% of total stock use and burros and llamas account for about 3%.

Commercial day-use involving stock for spot and dunnage trips to support overnight wilderness visitors (i.e., excluding day rides) totaled 896 stock days in 2012, higher than the 2007 to 2012 average of 793 stock use days. It is not known how many private stock day-rides occur, but the number is believed to be very low considering the low number of points of entry.

Camping — Camping is rarely restricted in the parks' wilderness. Wilderness visitors are generally free to choose their camp areas, except in three popular destinations where use of designated campsites is required (Emerald and Pear lakes, Bearpaw Meadow, and Paradise Valley), as well as areas near frontcountry trailheads that are closed to camping to prevent overuse. First location at which camping is allowed and other camping limits are presented in the "Alternative 1: No-action / Status Quo" section of chapter 2.

Several activities related to camping were included in the Martin and Blackwell survey (2013) to provide managers with information on campfire use and food storage. The results are summarized below.

Campfires — In 2011, visitors surveyed reported that 40% of groups had at least one campfire; nearly all of those visitors with at least one fire reported having both evening campfires (99%) and non-cooking campfires (97%). Of the groups having campfires, 86% of the groups had two or fewer during their trip. The groups having campfires had an average of one campfire for every four nights of camping (Martin and Blackwell 2013).

The survey also showed that visitors built campfires in trail-less areas much less frequently than those who traveled on-trail. Only 15% of off-trail travelers built fires, resulting in an average of about one campfire every 14 nights spent in wilderness. In contrast, 45% of those traveling on trails built campfires, amounting to an average of one fire every four nights (Martin and Blackwell 2013).

Fuel types for stoves used by surveyed visitors included propane (58%), liquid (30%), wood (9%), and solid/pellet fuel (4%). Approximately 5% reported no stove/cooking use. The total percentage exceeds 100% because some visitors used multiple fuel types (Martin and Blackwell 2013).

Most visitors responding in 1998 (89%) said that campfires should be allowed, but many felt campfire use should be limited by conditions such as elevation (29% set the limit at 9,000 feet) and fuel type. Prohibiting the use of wood, charcoal, and other campfire fuels from outside the parks was favored by 55% (NPS 1998a).

Food Storage — A variety of food-storage options are available to overnight wilderness visitors in these parks. Portable food containers are the most prevalent; 90% of visitors surveyed in 2011 reported using them. There are also 86 food-storage boxes installed by the parks at selected locations, which were used by 29% of visitors surveyed in 2011. Food may also be hung from trees or boulders (which is not permitted), or hung via the counterbalance method in which two bags are hung opposite each other over a branch or rock. Approximately 12% of visitors surveyed reported counterbalancing food in a tree. Less than 5% of visitors hid or buried their food, left it sitting out, or stored it in a tent (all of which are not permitted) or kept it in a bear-resistant drum carried by stock (which is permitted), or employed other methods (Martin and Blackwell 2013).

For those parties carrying portable containers, approximately 40% carried one, 34% carried two, 12% carried three, 8% carried four, and 6% reported carrying more than five (up to 30). This averages about two containers per person. Visitors carried an average of about six person-nights of food per container. However, while 85% of visitors carrying four person-nights of food or less in each container were able to fit all food, trash, and other scented items in their containers during every night of their trip, that percentage dropped to 64% for those carrying more than four person-nights of food per container (Martin and Blackwell 2013). There is clearly a direct relationship between food-storage outcomes and the amount of food, measured in person-nights that visitors try to fit into a container. While experienced backpackers can often fit six, eight or ten person-nights of food into a container, four person-nights of food per container is recommended for those that are not very experienced (Martin and Blackwell 2013).

These data also show that wilderness visitors often have trouble fitting all their food into their food containers unless they carefully plan out how many containers they need prior to leaving the trailhead. Of the survey respondents who were unsure if all their food would fit into their containers, or who had not considered it, 69% subsequently reported that they were not able to fit everything into their container(s) on every night of their trip (Martin and Blackwell 2013).

Factors Affecting Visitor Experience — The number of encounters with other visitors and the type of groups encountered can affect some visitors' experience in wilderness. The frequency of encounters with others is described under "Wilderness Character – Opportunities for Solitude or Primitive and Unconfined Recreation" of this chapter. The visitor reactions to the various types of groups encountered are described below, as are the visitor perceptions of facilities and the condition of the wilderness.

Encounters with Other Types of Parties — The 2011 survey asked overnight wilderness visitors whether encounters with others interfered with their enjoyment of wilderness. Of those who said yes, 10% reported that hikers with backpacks or daypacks had interfered with their experience and 8.5% reported that groups with stock had interfered with their experience. Behaviors that visitors reported as interfering with their enjoyment of wilderness included inconsiderate or inexperienced people, the presence of stock or manure, people who were not following regulations, overcrowding, the presence of rangers, park staff, or trail crews, and noise from planes, jets, or helicopters (Martin and Blackwell 2013).

Large parties of more than 10 people on trails were noticed by 37% of visitors, all of whom felt that the presence of large groups detracted from their enjoyment of wilderness. Approximately 49% felt that the number of large groups should be less, 50% felt it should be the same, and 1% felt it should increase. Groups camping nearby were noticed by 70% of visitors in the 2011 survey. The presence of these groups detracted from 37% of visitors' trips, added to 7% of visitors' trips, and had no effect on 56% of visitors. Approximately 37% of visitors suggested the amount of groups camping nearby should decrease while 63% felt it could stay the same (Martin and Blackwell 2013).

Groups traveling with stock were noticed by 56% of visitors in the 2011 survey. The presence of groups with stock detracted from the quality of 45% of visitors' trips, added to 6% of visitors' trips, and had no effect on 49% of trips. Approximately 49% felt that the number of groups with stock should be lower, 50% felt it should stay the same, and 1% indicated that it should increase (Martin and Blackwell 2013). Data from the 1990 survey is used in table 70 to compare the changes in the average number of encounters by group type in 1990 and 2011. Overall the numbers have slightly decreased.

Table 70: A Comparison of Average Group Encounters in 1990 and 2011

Group Type	Average Number Encountered per Day	
	1990	2011
Large groups (>10) seen per day	0.2	0.2
Groups camped within sight or sound of visitors	1.2	0.9
Groups with horses or mules per day	0.3	0.2

Source: Martin and Blackwell 2013 in NPS 2013e

Facilities — Toilets and sanitation in wilderness were not considered a problem by 67% of survey respondents. Approximately 19% thought they were a small problem, 8% considered them a moderate problem, and 5% thought they were a big problem.

The presence of ranger stations and camp crews can also affect visitor experience. Approximately 37% of visitors noticed ranger stations in wilderness, though only 2% said the stations detracted from their

experience. Ranger stations added to the enjoyment of 32% of visitors and had no effect on 66% of visitors. Most visitors (94%) thought the number of wilderness ranger stations should remain at current levels. Camp crews were noticed by 23% of visitors. Again, few (5.2%) felt camp crews detracted from their experience, while most visitors were indifferent to the presence of camp crews (77%) and felt the number of camp crews in wilderness should stay the same (93%) (Martin and Blackwell 2013).

The survey respondents were also asked if they noticed different types of facilities and equipment in wilderness, whether seeing these facilities detracted from the quality of their visit, and whether they would suggest that the parks offer the same number or fewer of these facilities. Of the ten different types of facilities, the two that detracted from the quality of the most visitors' trips were stock gates and drift fences (24.6%) and helicopters (26.5%). Visitors found the eight other items to be minimally distracting and most recommended a similar amount. Table 71 provides a summary of these responses (Martin and Blackwell 2013).

Table 71: Summary of Facilities Encountered

Facility	Notice? (Yes %)	Detract? (Yes %)	Recommend Fewer	Recommend Same
Directional signs	95.6	2.2	2%	96%
Regulatory signs	86.7	7.9	10%	89%
Informational signs	81.3	3.0	5%	94%
Bridges	73.4	1.2	2%	96%
Food-storage boxes	71.2	7.3	8%	90%
Wilderness ranger stations	62.6	1.9	5%	94%
Stock gates/drift fences	50.9	24.6	35%	65%
Science equipment or Installations	25.0	5.0	6%	94%
National Park Service crew camps	22.7	5.2	7%	92%
Helicopter overflights or landings	21.5	26.5	35%	65%

Source: Martin and Blackwell 2013 in NPS 2013e

Condition of Wilderness — Respondents to the 2011 survey were asked to give their perception of the severity of various impacts and problems within wilderness by ranking them on a scale of 1 (not a problem) to 4 (a big problem). Most impacts and problems were rated less than a 2 (no problem to small problem). The seven items that were considered the biggest problems (1.5 or above) were horse manure on trails (1.96), too many people in certain places (1.74), too many stock animals on trails (1.6), stock damage to vegetation (1.55), too many hikers on trails (1.52), litter (1.51), and improper human-waste disposal (1.50). Again, none of these problems received a mean rating of greater than 2, equaling a "small problem." Table 72 presents the survey results for impacts/ problems that received an average score of greater than 1.5.

Table 72: Summary of Perceived Severity of Impacts or Problems

Impact or Problem	Percentage of Visitors				Mean[1]
	1=Not a Problem	2=Small Problem	3=Moderate Problem	4=Big Problem	
Horse manure on the trail	41.8%	31.7%	14.7%	11.8%	1.96
Too many people in certain places in the area	53.6%	25.0%	15.2%	6.1%	1.74
Too many stock animals on the trail	66.4%	15.8%	9.5%	8.3%	1.6
Stock damage to vegetation (e.g., trampled meadows, damaged trees)	66.7%	17.8%	9.2%	6.3%	1.55
Too many hikers on the trail	64.0%	23.3%	9.9%	2.9%	1.52
Litter	63.3%	26.0%	7.5%	3.3%	1.51
Improper human waste disposal	67.8%	19.1%	8.2%	4.9%	1.5

[1]Measured on a scale of 1 to 4, where 1=Not a Problem; 2=Small Problem; 3=Moderate Problem; 4=Big Problem.
Source: Martin and Blackwell 2013 in NPS 2013e

Impacts or problems perceived as less problematic than those in table 72 included horse manure in the campsite (1.47), groups with too many horses (1.45), not enough campsite privacy (1.44), too many people in the area as a whole (1.42), rutted trails (1.37), human damage to vegetation (e.g., hatchet/axe damage to trees; 1.36), too many large groups (1.35), overall trail conditions (1.33), too may rules and regulations (1.31), too many fire rings (1.28), helicopter noise (1.24), and lakes and streams appear polluted (1.18).

Visitor Opinion Regarding Management: The 2011 survey included questions on what visitors thought about the rules and regulations governing visitors to Sequoia and Kings Canyon National Parks' wilderness. Survey respondents were asked if there should be limits on the size of groups visiting this wilderness and, if so, to provide their preferred maximum group size for various types of user groups. Almost 80% of respondents said there should be limits. Table 73 provides the preferred average group size.

Table 73: Average Preferred Group Size

Type of Group	Average Preferred Group Size
Number of people in hiking-only groups (no stock) on trails	9.6
Number of people in hiking-only groups traveling cross-country in trail-less areas	7.7
Number of people in groups with stock on trails	6.8
Number of people in groups with stock traveling cross-country in trail-less areas	4.1
Number of stock in groups on trails	5.4
Number of stock in groups in trail-less areas	3.1

Source: Martin and Blackwell 2013 in NPS 2013e.

The survey concluded that preferred maximum on-trail group size was similar between survey respondents who had visited both popular and less-visited areas, and that the preferred off-trail maximum group size was similar between respondents who had traveled on-trail and off-trail. Likewise, the preferred maximum group size for people and stock was similar between those who had visited "high stock-use" areas and those who had not (Martin and Blackwell 2013).

COMMERCIAL SERVICES

The parks permit some commercial services to support activities in wilderness. Currently authorized services include guided hikes and backpacking, climbing, mountaineering, ski mountaineering, cross-country skiing and snowshoeing, and stock trips. Visitors take advantage of guide services to facilitate their wilderness experience for a variety of reasons. Some of these reasons include the extent of preparation and equipment needed by visitors traveling from afar, physical limitations due to age or other conditions, safety concerns, or the desire to experience wilderness with skilled and knowledgeable guides. These commercial services support about 7,500 to 8,000 visitor service days per year (appendix B).

Sequoia and Kings Canyon National Parks issue about 32 CUAs annually for hiking-guide entities (about 19 permits per year) and stock-guide entities (about 13 permits per year), and one concession contract that facilitates stock services in wilderness (Cedar Grove Pack Station). Non-stock guides support about 4,500 visitor service days per year, and stock-guide services support about 3,000 visitor service days per year.

Two destinations, Bearpaw Meadow High Sierra Camp and Pear Lake Ski Hut, are commercially operated overnight facilities. The Bearpaw High Sierra Camp, operated during the summer months, is a commercial lodging enterprise, operated through a contracted concessioner, which provides tent-cabin lodging and meals at a cost to the user. Reservations for Bearpaw are required and it is typically at or near capacity during peak season. From 2006 to 2012, the Bearpaw facility had an annual average of 1,500 visitor service days. The Pear Lake Ski Hut is operated in the winter months and serves as a destination for cross-country and backcountry skiers and snowshoers. The Pear Lake Ski Hut is currently operated through an agreement between the NPS and a cooperating association (currently the Sequoia Natural History Association). From the winter of 2008/2009 through 2012/2013, the Pear Lake Ski Hut provided an annual average of 1,200 visitor service days (appendix B).

PARK OPERATIONS

The superintendent, five division chiefs, and additional support staff comprise the parks management team. In FY 2012, the full-time employees numbered approximately 240, down from FY 2010, which had around 262 (NPS 2013g). During the summer, 300 to 325 seasonal employees are typically hired, and approximately 830 volunteers contribute more than 42,000 hours of work (NPS 2013g). Additionally, there are about 26 cooperating association employees, 45 interagency staff and researchers, and 250 concession employees (NPS 2007a).

This section describes the divisions, operations, programs, and administrative activities and facilities related to wilderness management.

WILDERNESS OFFICE – MANAGEMENT AND COORDINATION

The parks' wilderness office is the principal public-contact point for wilderness information and permits. Associated with this office are the management of a fee collection program for permit reservation; coordination of quota and permit activity among all park units and with surrounding interagency operations; and wilderness education through information dissemination (via hard copy and web). The office provides and updates wilderness information as needed to provide visitors with current information related to the protection of park resources, resource education, and safety. Publications are reviewed annually and revised if necessary. The office staff provides multiple support activities for the public, including trip planning, and dispersal of park information. The staff keeps reports on wilderness trail conditions and publishes meadow opening dates. The coordinator participates in internal and external meetings and coordination with other management divisions of the parks; commercial users, stakeholder organizations and interest groups; and neighboring state and federal land management agencies.

Management staff of the R-2508 Military Aviation Complex is consulted regarding their low-level military overflights above the park. The wilderness office staff provides training for trailhead rangers, which includes permit issuance, Leave No Trace© techniques, and wilderness safety.

The wilderness coordinator serves as primary staff advisor to the superintendent, chief ranger, and district rangers on all matters relating to managing visitor activities in wilderness and is responsible for short-term direction and long-term planning input for the wilderness management program. The wilderness coordinator develops, with the district rangers, strategies to implement operational aspects of existing plans. The program consists of three permanent employees (wilderness coordinator, wilderness assistant, visitor services assistant) and three seasonal employees (one office worker, and two trailhead rangers, one each working at the USFS offices in Lone Pine and Bishop) through an interagency agreement. Three other seasonal trailhead ranger positions (Road's End, Lodgepole, and Cedar Grove trailheads) are supported by project funds from the wilderness office but supervised by area subdistrict rangers.

WILDERNESS RANGER OPERATIONS

The wilderness in Sequoia and Kings Canyon National Parks is patrolled by rangers who are either stationed full time in wilderness or are stationed outside of wilderness and complete periodic patrols into wilderness. The majority of patrols are conducted from June through mid-October each year to coincide with peak visitation. The patrols are completed primarily by foot; however, there are generally one or two stock-mounted rangers each season. There are also infrequent patrols on skis in the winter months.

Trailhead ranger

Wilderness patrol rangers play a key role in the protection of natural and cultural resources, the preservation of wilderness character, and the safety of park visitors and staff. Wilderness rangers provide information on minimum impact techniques, local conditions, route selection, and regulations. They also provide emergency services, including search and rescue and both minor first aid and emergency medical response. Some of these rangers have law enforcement authority and are able to address illegal activity. The parks' rangers also patrol areas where sensitive resources may be at risk, and routinely monitor wilderness conditions.

Park rangers patrolling wilderness carry a modicum of equipment with them; to include camping equipment, emergency medical equipment, food, and communications equipment. Rangers communicate with other personnel at the parks using a variety of methods including two-way radios, satellite phones and satellite tracking and messaging devices.

Rangers who are assigned to wilderness full time reside at designated ranger stations during the patrol season. These rangers complete patrols of the geographic area around the stations, focusing on popular corridors and areas such as the JMT and the Mount Whitney area. These patrols range from single day patrols to ten day patrols. Supplies and equipment to sustain these rangers are delivered to the stations at the beginning of the season. The supplies are delivered by stock or by helicopter; the decision to

determine how the supplies are delivered is based on a MRA taking into account the current environmental conditions, including snow coverage and water levels.

Rangers based in the frontcountry and completing periodic patrols into wilderness carry most of their supplies and equipment with them. These rangers are generally patrolling popular areas closer to the frontcountry. As these rangers carry out their patrols they either set up temporary camps or stay at unstaffed ranger stations. There are three lightly developed ranger camps which are used to facilitate patrols; these have weather proof boxes which are lightly stocked with equipment each season. There is one in Paradise Valley, one at Junction Meadow, and one at Ranger Lakes.

The wilderness patrol function is heavily supported by ranger stations in the wilderness of Sequoia and Kings Canyon National Parks. Beyond serving as a home base for rangers, the stations provide a base for emergency operations and the sheltering of wilderness visitors who are sick or injured.

The first stations were constructed in the 1890s to facilitate patrols completed by the military. Since that time a total of 19 ranger stations have been constructed; currently about 10 to 12 stations are staffed each year, another three to five are staffed if budget constraints allow, the remainder are used intermittently by rangers as they patrol those areas. Each station is marked on U.S. Geological Survey (USGS) maps and by a "Ranger Station" sign at the nearby trail junctions. Guidebooks also note station locations.

The stations vary in size and design from single wall tents seasonally erected on wooden platforms to larger multi-room buildings. Most of the stations are about 12 x 15 feet in size and have only one room. Six stations are larger, with two rooms, and the Pear Lake Ranger Station is two stories with a basement storage area. Most of the ranger stations have very basic facilities: a woodstove for cooking and heating, a cot, a table, propane or solar-powered lights, storage cabinets, and an outhouse. Almost all of the stations have solar panels used to power 12-volt interior lights and recharge the batteries for portable equipment. Few have sinks, and only four stations have running water. All are at least a day's hike or horse ride from a trailhead or road.

Each ranger station has an identified patrol area associated with it, although the patrol areas are not strictly defined. The geographic boundaries of the patrol areas are generally defined by passes, drainages, basins and the park boundary. The rangers are given latitude to patrol outside the defined patrol areas, but are directed to focus on the popular corridors and higher use areas.

Consistently staffed ranger stations and general patrol areas (figure 4 on page 76):

- Charlotte Lake – Glen Pass to Forester Pass, Junction Meadow (Bubbs) and East Lake
- Crabtree – the Mount Whitney area
- LeConte Canyon – Muir Pass south to Mather Pass, upper Middle Fork of the Kings River
- Little Five Lakes (platform and yurt) – Great Western Divide to Kern River
- McClure Meadow – northern portion of Kings Canyon National Park to Muir Pass
- Pear Lake – Marble Fork of the Kaweah and the Tablelands
- Rae Lakes – Pinchot Pass to Glen Pass, Sixty Lake Basin, Baxter Basin
- Roaring River – Mitchell Peak to Avalanche Pass, Cloud Canyon, Deadman Canyon
- Rock Creek – Rock Creek drainage
- Tyndall Creek – Forester Pass to Wallace Creek, west to Kings/Kern Divide

Ranger stations staffed as funding permits and general patrol areas:

- Bearpaw Meadow – West of the Kings/Kern Divide and south to Cliff Creek
- Bench Lake – Mather Pass to Woods Creek Crossing
- Hockett Meadow – Hockett Plateau
- Kern Canyon – Kern Canyon to Junction Meadow and the Coyote Creek drainage
- Monarch – Granite Basin, Simpson Meadow, Monarch Divide

Patrol cabins that are rarely staffed:

- Quinn
- Redwood Meadow
- Simpson Meadow

INTERPRETATION, EDUCATION, AND PARTNERSHIPS

The Division of Interpretation, Education, and Partnerships plays a significant role in wilderness, especially in regard to visitor perception, stewardship, and safety in wilderness. The division accomplishes this via its own staff, as well as by directing the wilderness-related activities of the Sequoia Natural History Association, a non-profit partner.

Interpretive rangers provide wilderness information to hundreds of thousands of visitors. At some locations, they issue permits. Through visitor contacts, ranger-led programs, education, public outreach, and media contacts, they personally interact with wilderness travelers and others about the parks' wilderness. Interpreters regularly travel into wilderness to meet with school, volunteer, and work groups to assist them with understanding this resource.

Through Sequoia Natural History Association backpacking trips, day hikes, and youth-in-wilderness programs, the division and its partners enable direct experience of wilderness. The association also provides logistical support and gear to other youth-in-wilderness courses.

These activities, along with webpages, exhibits indoors and out, newspapers and other publications created by interpretive staff, facilitate connections between visitors and wilderness.

RESOURCE MANAGEMENT AND SCIENCE

Key activities of the Division of Resources Management and Science include survey, monitoring and research; planning; regulatory activities (with regional, state, and federal regulatory groups); partnerships; and education. Much of this work occurs in and is focused on wilderness. Field crews working in wilderness travel primarily by foot, with some support provided by stock when needed. Helicopter use for supporting resource management and science activities is authorized when such use meets the minimum requirements for the administration of the area based on a MRA. Field camps established at project sites are of limited extent and duration and strictly follow Leave No Trace© practices.

The division has five branches, each of which has programs managed by subject-matter experts focused on different aspects of resource stewardship. The division also participates in the Sierra Nevada Inventory and Monitoring Program, and supports the USGS Sequoia and Kings Canyon Field Station. All are described briefly below:

A member of a field crew assessing vegetation in a meadow

Branch of Science Coordination and Data Integration — This branch has three units that directly support wilderness stewardship: science coordination, GIS and data integration, and collections/ archives management. The science coordination program manages the research permit program and leads/supports landscape-scale science-management partnerships and the generation, synthesis, application, and communication of science for addressing management issues, including adapting to changing climatic conditions. Research permitted in wilderness includes studies, inventories, and monitoring conducted by NPS staff as well as scientists from other federal agencies, state and local governments, universities, and nonprofit organizations. From 2010 to 2013, 73% of the parks' permitted research included activities in wilderness covering a wide range of disciplines (figure 31 on the following page). Most frequent were vascular plants/plant communities, herpetology (amphibians/reptiles), geology, caves/karst, invertebrates, and fire (behavior, ecology, and effects). Each of the division's subject-matter experts reviews research proposals within their area of expertise, including analyzing the effects for work proposed in wilderness. Permitted research is detailed in appendix P. The Geographic Information Systems (GIS) and tabular-data section supports wilderness operations and management activities including: maintenance of the parks' Spatial Data Warehouse; development and management of spatial and tabular metadata and data-collection standards; monitoring and analyses of wilderness character conditions; generation of web-based and paper maps for wilderness users (including search and rescue); and training on GPS and GIS tools. The curatorial program is responsible for the collection of wilderness images, administrative history, and artifacts; the archives include nearly 700,000 items, including historical documents, maps, and photographs.

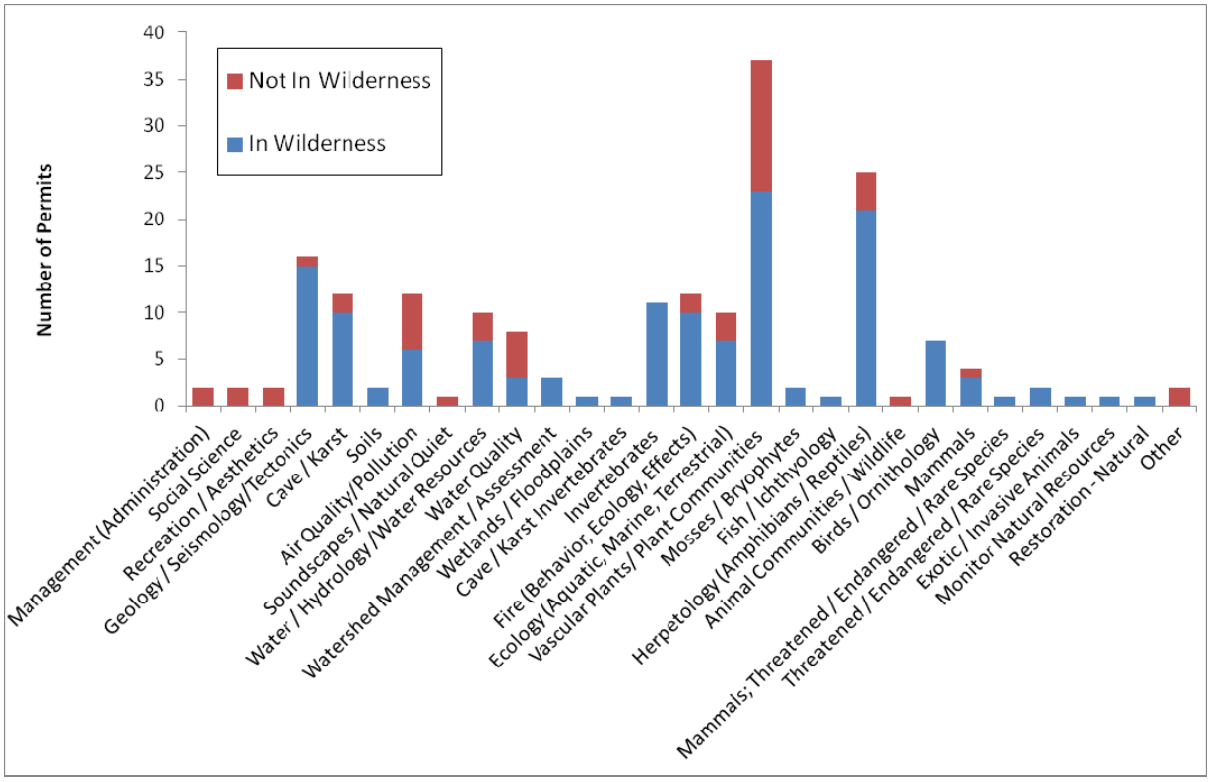


Figure 31: Permitted Research in 2011–2013 (until 8/30/2013)

Branch of Biodiversity and Ecological Resilience — The Branch of Biodiversity and Ecological Resilience includes three components that contribute to wilderness management: the Aquatic Ecosystems Program, the Plant Ecology Program, and the Wildlife Program. The Aquatic Ecosystems Program oversees the restoration of aquatic ecosystems in wilderness. These efforts seek to improve the habitat available to native fauna, with an emphasis on restoring mountain yellow-legged frog habitat. Up to three crews of two to four biologists are stationed in wilderness during the summer season. The program also supports aquatic research on the Yosemite toad, and on the effects of nonnative fish on invertebrates in Sierra Nevada lakes. It supports long-term water quality monitoring in the Marble Fork of the Kaweah River above Tokopah Falls, part of an interagency agreement between the parks and the USGS Hydrologic Benchmark Network Program.

A primary responsibility of the Plant Ecology Program is to monitor administrative, commercial, and private stock use and associated ecological impacts. Stock-use and meadow-monitoring data are central to the adaptive management of stock use and grazing in the parks; as such the program focuses on preventing resource impacts that may be associated with pack-animal use. Efforts include design and implementation of monitoring protocols to evaluate impacts and detect changes due to stock use, disseminating information to stock users and park managers, facilitating research into stock-related ecological effects, and development of standards for acceptable impacts, which can then be translated into effective management.

Annual monitoring by the program is accomplished in cooperation with the wilderness ranger staff; plant ecologists provide technical oversight and field consultation. It includes residual-biomass monitoring in approximately 35 meadows; monitoring of plant composition in five pairs of grazed/ungrazed meadows on a rotational basis (one pair is monitored each year); stock-use monitoring through a system of self-

reporting, staff observations, and the wilderness-permit database; surveys for nonnative plants; and site visits to assess condition at meadows of concern throughout the parks.

The Wildlife Program manages efforts to restore and perpetuate the natural distribution, ecology, and behavior of black bears and other wildlife; monitors and minimizes negative human / wildlife interactions; monitors and manages nonnative animals; records wildlife sightings from park employees and visitors; and participates in bighorn sheep research and recovery efforts. Operations are based in the frontcountry but respond to wilderness needs as requested. The wildlife biologist coordinates placement and maintenance of bear-resistant food-storage facilities in wilderness.

Branch of Vegetation Management — The Branch of Vegetation Management includes the Invasive Plant Management Program, the Forestry Program, the Disturbed Lands Restoration Program, and the Fire Ecology Program. The Invasive Plant Management Program coordinates early detection efforts and treatment of selected harmful nonnative plant species. To accomplish this, crews are periodically stationed in wilderness during summer months to implement control efforts, and specialists may address specific issues on a case-by-case basis. The Forestry Program deals primarily with tree-hazard and forest-pest management, plus forest-health monitoring. These take place largely outside of wilderness, but the parks' forester is active in wilderness management as needs arise.

The Disturbed Lands Restoration Program returns natural processes, topography, and vegetation to sites that have been degraded by human activities. Within the wilderness setting, these activities are often associated with trail projects and are conducted in concert with the Trails Management Program. The Fire Ecology Program evaluates resource effects related to fire by collecting and analyzing monitoring and research data, and provides feedback to park managers on the Fire Management Program. This program maintains a network of long-term monitoring plots to assess the effects of fire on vegetation, which field crews read during summer months.

Branch of Physical Sciences — The physical-science programs provide expertise in air resources, hydrology, geology, and cave and karst systems. The Air Resources Program documents the abundance of pollutants that are atmospherically transported into the parks, their health effects on employees and visitors, and their effects on natural resources. It cooperates with the national USEPA, California's Air Resources Board, and the regional San Joaquin Valley Unified Air Pollution Control District. The program also facilitates research into the effects of air pollutants on vegetation; research and monitoring of ozone, nitrogen, particulates, synthetic chemicals, and fine particulate matter; meteorology; wet- and dry-deposition chemistry (acidic, nitrogen, and contaminant deposition); visibility, including availability of dark skies; and soundscapes. The Hydrology and Cave Resources Program provides coordination and consultation on issues related to hydrology and cave environments and their management, as well as soils and geology.

Branch of Cultural Resources Management — The purpose of the program is to proactively protect and preserve the parks' prehistoric and historic cultural resources. Ongoing research informs appropriate management of cultural resources as mandated by key federal legislation. The program manager directs the archeology, ethnography, history, cultural landscapes and historic architecture programs. Staff advise on issues related to prehistoric/historic artifacts, management of historic buildings, and contacts with American Indian tribes and individuals. The program manager serves as senior principal advisor on cultural resources and ensures development of and sustained relationships with researchers, resource managers, and subject-matter experts in other agencies, universities, traditionally associated groups, and other entities in order to facilitate cooperative regional strategies on adjacent lands in order to achieve broad protection strategies and prevent human impacts.

SIERRA NEVADA NETWORK INVENTORY AND MONITORING PROGRAM

The Sierra Nevada Network Inventory & Monitoring Program is one of 32 NPS Inventory & Monitoring networks across the country established to facilitate collaboration, and economies of scale in natural-resource monitoring. The Sierra Nevada Network comprises four NPS units: Devils Postpile National Monument plus Kings Canyon, Sequoia, and Yosemite national parks. Network ecologists are developing and implementing six long-term monitoring protocols as part of the NPS Vital Signs Monitoring Program: birds, climate, high-elevation forests, lakes, rivers, and wetlands. Field monitoring is conducted by crews of two to four biologists who travel to wilderness sites primarily by foot, with some supplies and materials transported by stock and, in limited cases, by helicopter.

U.S. GEOLOGICAL SURVEY SEQUOIA AND KINGS CANYON FIELD STATION

This field station reports directly to the USGS Western Ecological Research Center in Sacramento, which serves the Pacific Southwest of the United States. The staff currently carries out research addressing global climate change, forest demography, ecological impacts and historical patterns of fire, and invasive plants. As part of the Forest Demography Program, ecologists at the field station maintain a network of long-term tree-monitoring plots within wilderness, which are visited annually by biologists traveling by foot; in limited cases, supplies and materials may be transported by stock.

FACILITIES MANAGEMENT DIVISION

The Division of Facilities Management takes responsibility for annual and periodic maintenance of most structures in wilderness. These include approximately 650 miles of wilderness trails plus trail bridges, historic and non-historic buildings, water and septic systems, several types of toilets, food-storage boxes, radio repeaters, drift fences, and gates.

A CCC crew member maintaining trails

By far the most effort is spent on trail maintenance. Each year eight to ten crews totaling from 60 to 90 workers travel the trails to remove fallen trees and rocks, clear drainages and remove encroaching vegetation, and repair and rebuild trail structures and portions of trails. They may reroute or restore sections of trail to natural conditions. Trail crews also make most of the repairs on drift fences, relocate privies as needed, and repair hinges or latches on food-storage boxes. Second in annual effort is maintenance of historic buildings using a single crew of one to four workers. This crew assesses building condition and completes major renovations such as reroofing, foundation and window repair, painting, staining, and replacement and chinking of logs. The utilities branch occasionally works on septic systems and the restrooms at Emerald and Pear lakes, and at the Bearpaw Meadow Ranger Station. The radio shop maintains, upgrades, and troubleshoots problems with radio repeaters. Special-project crews may be called on for one-time needs, such as the complete replacement of three deteriorated ranger stations during 2010 to 2013.

The typical work season for these activities runs May through October, with June to September seeing the most work. Maintenance crews travel mostly by foot or by horse. Most logistical support is provided via horses and pack mules; helicopters are used occasionally but are subject to approval through an MRA. Although the Facilities Management Division has primary responsibility for upkeep of wilderness facilities, other divisions do operational maintenance as necessary. Wilderness rangers in particular are instrumental in completing some work on ranger stations, signs, and drift fences, and are vital to the timely reporting of problems with facilities.

OTHER FACILITIES AND DEVELOPMENTS

Pastures — Fenced stock pastures are associated with wilderness ranger stations at Kern, Roaring River, Redwood Meadow, and Hockett Meadow. The Kern and Redwood Meadow pastures are used infrequently for administrative purposes, while the Roaring River and Hockett Meadow pastures are used more frequently.

Crew Camps — Crew camps can be established for the short- or long-term for administrative purposes (e.g., wilderness patrols, resource management/research activities, and trail maintenance/project activities). Currently, there are 15 established long-term trail crew camps within Kings Canyon National Park and 10 within Sequoia National Park. The camps are generally located near major junctions or hubs. Camps may be occupied for several days or for several seasons, depending on the project, and may contain food and/or tool storage boxes, a fire pit, and tool caches.

Redwood Canyon Cabin — Redwood Canyon Cabin has been in place for more than 30 years. The cabin pre-dates the wilderness designation of the Redwood Canyon area in 2009, though the area was managed as proposed wilderness since 1984. It is currently used by a nongovernmental organization to facilitate research in Lilburn Cave. The cabin and associated infrastructure is operated and maintained under a memorandum of understanding. The cabin is approximately 12 feet x 18 feet. It is a single story building with the attic/loft space dedicated to sleeping. The main floor houses storage containers, a fireplace, a wood-fired stove, and a kitchen/workbench. Personal protective equipment, ropes, sleeping bags/pads, and rescue gear is stored in the cabin. There is also storage for scientific equipment, caving equipment, and non-perishable food. External infrastructure includes picnic tables, a wood shed, food-storage boxes, water-storage tanks and associated water supply lines. A privy (pit toilet) is also located on the site.

CONCESSIONS AND COMMERCIAL USE

The Concessions Management Office at Sequoia and Kings Canyon National Parks manages the concessions and commercial uses within the parks. Currently, most frontcountry commercial visitor services are provided under concessions contract by Delaware North Companies Parks & Resorts (Delaware North). The frontcountry services include hospitality operations and facilities at Wuksachi, Lodgepole, and Wolverton in Sequoia National Park; and at Grant Grove and Cedar Grove in Kings Canyon National Park. The Bearpaw Meadow High Sierra Camp, located in a designated potential wilderness addition (DPWA), is also operated by Delaware North. Concessions contracts are generally awarded for a 10-year period, after which time a new prospectus is developed and distributed for bid.

Another concessioner operates horseback riding and stock services under a concessions contract at facilities located in Grant Grove and Cedar Grove. The concessioner provides commercial day rides from the pack station at Grant Grove (frontcountry only) and both frontcountry and wilderness day rides and pack services from the pack station at Cedar Grove.

CUAs, which are not considered concession contracts, may be issued pursuant to section 418 of the National Park Service Concessions Management Improvement Act of 1998 (16 USC 5966). A CUA is a permit that authorizes suitable commercial services to park area visitors when those services (1) are determined to be an appropriate use of the park; (2) will have minimal impact on park resources and values; and (3) are consistent with the purpose for which the unit was established, as well as all applicable management plans and park policies and regulations. Guidance for issuance of CUAs also comes from the Wilderness Act, which states, "Commercial services may be performed within the wilderness areas designated by this Act to the extent necessary for activities which are proper for realizing the recreational or other wilderness purposes of the areas" (§4(d)(5) of the Wilderness Act).

Approximately 32 CUAs are issued each year in the parks. Of those, more than half include services in wilderness. From 2003 to 2012, these services have included guide services for backpacking and hiking, mountaineering, snowshoeing, cross country skiing, photography, climbing, and pack and saddle stock services. Commercial use authorizations are issued on a yearly basis and include permit conditions that define and regulate use and specify reporting requirements.

ADMINISTRATIVE STOCK USE

NPS administrative stock use comprises 40% of total overnight stock use in the parks (Frenzel and Haultain 2013). The parks maintain a herd of approximately 90 horses and mules used for packing supplies in and out of wilderness and for ranger patrols. When not working in wilderness, these animals are held in the Ash Mountain administrative pasture in the foothills (nonwilderness) or on lands outside of the parks.

An administrative pasture near the Kern Ranger Station

ADMINISTRATIVE MECHANICAL TRANSPORT AND MOTORIZED EQUIPMENT USE

The parks, in administering wilderness, will on occasion use mechanical transport and motorized equipment, land aircraft (helicopters), and erect installations. The Wilderness Act allows for these actions provided they meet "minimum requirements for the administration of the area," as stated in Section 4(c) of the Wilderness Act, and as outlined and directed in NPS *Management Policies 2006* (6.3.5).

In wilderness trail and facility maintenance operations, transport of supplies, equipment, and personnel may occur through the use of stock or helicopters, as determined through a MRA. Trail operations also use motorized equipment, such as chainsaws, rock drills, and on occasion, generators and electric tools, to accomplish projects in wilderness if determined necessary through a MRA.

Helicopters may also be used to support ranger activities for hauling supplies to ranger stations, and providing emergency services, such as emergency medical response, fire management, and search and rescue. Scientific activities also may receive the support of helicopters to transport sensitive or bulky equipment and samples, or to allow scientists to safely reach remote areas. The parks also use helicopters to reach hard-to-access radio communication equipment to conduct maintenance and repair.

Helicopter use in the parks from the period of 2010 through 2013 averaged 307 "landings" per year (a landing is defined as when a person or object goes from the ground to the air, or from the air to the ground, whether or not the aircraft itself touches down). Of these; 68 per year were for emergency search and rescue and emergency medical response; 99 per year were for emergency fire-management response (of these, 46 per year were "bucket" drops of water onto fires); and 140 per year were for other administrative purposes, as described above.

All actions that require landing of aircraft, use of motorized equipment or mechanical transport, or the erection of installations, with the exception of emergencies, are analyzed through a MRA process prior to occurring. In order to comply with the mandate and intent of the Wilderness Act, the parks have established the use of "primitive" (e.g., foot or stock travel, hand tools, etc.) methods as the first preference in accomplishing projects and tasks in wilderness.

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Chapter 4

Environmental Consequences

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Oak Woodlands and chaparral in the foothills
Photo Courtesy of Tim Williams

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

This chapter describes the potential environmental consequences of implementing any of the alternatives being considered. It is organized by resource topic and provides a standardized comparison between alternatives based on impact topics discussed in chapters 1 and 3. Direct, indirect, and cumulative impacts are described, and significance of the impacts is assessed in terms of context, intensity, and duration (in accordance with Council on Environmental Quality (CEQ) regulations 40 CFR § 1502.16).

This analysis is based on the assumption that the mitigation measures identified in "Mitigation Common to All Alternatives" (in chapter 2) would be implemented for the action. Mitigations are actions taken to lessen the severity and probability of a potential impact. The analysis for each impact topic includes the methods used to assess the type of impact. As required by the CEQ regulations implementing NEPA, a summary of the environmental consequences for each alternative is provided in table 53 on page 285 at the end of chapter 2. Because this document addresses compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA), the analysis of cultural resources also contains an assessment of effect. Integration of the requirements of Section 106 of the NHPA into the NEPA process and documentation are accomplished by meeting the criteria set forth in 36 CFR § 800.8(c)(1)-(4). The information required by the criteria set forth in 36 CFR § 800.8(c)(1)(ii)-(v) is incorporated into the analysis in this chapter.

GENERAL METHODOLOGY FOR ANALYZING IMPACTS

GENERAL ANALYSIS METHODS

The NPS based these impact analyses and conclusions on a review of existing literature, studies, and research done by the parks, information provided by experts within the parks and other agencies and institutions, professional judgment, staff expertise and insights, and public input. These analyses relied most heavily on existing literature and studies conducted specifically to support this plan. The following is a description of the geographic area evaluated for the impacts, and the definition for the common terms used within this chapter to assess the impacts of each alternative on each impact topic.

GEOGRAPHIC AREA EVALUATED FOR IMPACTS

Sequoia and Kings Canyon National Parks are located in Central California between the Owens Valley and the San Joaquin Valley. The two parks occupy the western slope of the Sierra Nevada, the 400-mile-long mountain range that forms the eastern edge of the California biological and cultural province. Combined acreage for the two parks is 865,964 acres. The parks span a great range of elevation; Sequoia National Park rises from the low western foothills at 1,370 feet in elevation to the crest of the Sierra Nevada at 14,494 feet high Mount Whitney, the highest point in the lower 48 states.

The WSP/FEIS is evaluating the wilderness areas within the parks, including designated potential wilderness areas (DPWA) and proposed wilderness areas managed as wilderness. Together, these encompass nearly 97% of the parks' area. Where appropriate, adjacent frontcountry areas are also evaluated. Some actions are taken in the frontcountry for the management of wilderness, which could impact resources in wilderness areas.

ADDRESSING CLIMATE CHANGE IN THE ANALYSIS

The potential consequences of the biophysical changes associated with climate change on wilderness resources include drying of wetland and aquatic habitat; rising incidence of drought stress and insect and disease outbreaks in woodlands and forests; shifts in seasonality and ranges of plants and animals; new or intensified nonnative species invasions; changes in wildlife behaviors; die-off of species that cannot adapt to these changes; and population increases of species that adapt well to these changes. Cultural resources are also vulnerable to increased fire activity and erosion.

Climate change may amplify health and safety risks to the parks' visitors and staff, including fires, floods, extreme hot temperatures, and ozone levels. The park's visitation could change, including the magnitude, distribution, seasonality, and type of wilderness recreation. However, the impacts of climate change on the wilderness is not expected to differ among the alternatives, and the lack of qualitative information about climate change effects adds to the difficulty of predicting how these impacts would be realized in Sequoia and Kings Canyon National Parks. Therefore, the potential effects of this dynamic climate on wilderness resources were included in "Chapter 3: Affected Environment" and will not be analyzed in detail in "Chapter 4: Environmental Consequences" with respect to each alternative because of the uncertainty and variability of outcomes, and because these impacts are not expected to differ among the alternatives.

It is expected that additional data on climate change and climate change modeling will become available during the life of this Wilderness Stewardship Plan including specific effects of climate change and the rates of changes. The best available scientific climate change data and modeling will be incorporated into specific management planning, decisions, or actions that may be undertaken by any of the alternatives described in this plan.

DURATION AND TYPE OF IMPACTS

Impacts are discussed by type, as follows (the terms "impact" and "effect" are used interchangeably throughout this document):

Beneficial: An impact that would result in a positive change to the resource when compared to the existing conditions.

Adverse: An impact that causes an unfavorable result to the resource when compared to the existing conditions.

Direct: Impacts that would occur as a result of the proposed action at the same time and place of implementation (40 CFR § 1508.8).

Indirect: Impacts that would occur as a result of the proposed action but later in time or farther in distance from the action (40 CFR § 1508.8).

CUMULATIVE EFFECTS ANALYSIS METHOD

A cumulative effect is defined as "the impact on the environment that results from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR 1508.7). As stated in the CEQ handbook, *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ handbook 1997), cumulative effects need to be analyzed in terms of the specific resource, ecosystem, and human community being affected, and should focus on impacts that are truly meaningful.

Cumulative effects are considered for all alternatives. Cumulative effects were determined for each affected resource by combining the impacts of the alternative being analyzed and other past, present, and reasonably foreseeable actions that would also result in beneficial or adverse impacts. Because some of these actions are in the early planning stages, evaluation of the cumulative effect is based on a general description of the projects. These actions were identified through the internal and external project scoping processes.

Table 74: Past, Current, and Future Actions that Make Up the Cumulative Effects Scenario

Action or Project	Status	Brief Description	Impact Topics
Recreational and Administrative Grazing	Past and ongoing	Recreational and administrative stock grazing has occurred and continues to occur in the parks. From 1986-2011, grazing occurred an average of approximately 8,000 stock nights per year. The effects of past grazing activities has been incorporated into the description of current conditions in the wilderness character, soils, vegetation, wildlife, special-status species, and visitor use and experience sections of "Chapter 3: Affected Environment," and incorporated into the baseline conditions (alternative 1) for predicting the effects of proposed future grazing management for each alternative in "Chapter 4: Environmental Consequences." Therefore, no additional discussion of the effects of past grazing activities is provided under "Cumulative Effects."	- Wilderness Character - Soils - Vegetation - Wildlife - Special-Status Species - Visitor Use and Experience
Bear Management Plan	Past, ongoing, and future	Activities under the Bear Management Plan generally occur in the frontcountry but affect bears that use wilderness areas. Some of these activities (e.g., hazing, capturing and tagging, euthanasia) would adversely impact individual animals in the short-term but would not likely have population-level effects, while other bear-management activities (e.g., visitor education, food-storage regulation, law enforcement, etc.) would beneficially impact individuals as well as provide a population-level benefit, in both the short and long term.	- Wilderness Character - Wildlife: Bears
Research activities permitted through Sequoia and Kings Canyon National Parks	Past, ongoing, and future	Over the past three years, 73% of the parks' permitted research included activities in wilderness. Research may include, but is not limited to inventory, monitoring, and studies, surveys, and assessments on biodiversity, genetic differentiation and taxonomic, species distribution, glaciology, geology, mineralogy, geologic mapping, water quality and quantity, air quality, wetlands, habitat associations and modeling, population demographics, home-range and movement, mark/recapture, nonnative species impacts, ecosystem effects of airborne or aquatic contaminants, climate change, fire history and ecology, species and ecosystem restoration techniques, and ecology.	- Wilderness Character

Table 74: Past, Current, and Future Actions that Make Up the Cumulative Effects Scenario (continued)

Action or Project	Status	Brief Description	Impact Topics
Soils Mapping Project	Past, ongoing through 2016	This project is a collaboration between these parks, the NPS Geologic Resources Division and the State of California Natural Resource Conservation Service. Soils mapping will entail teams of four to five technicians examining surface soils across the parks' wilderness and remote-sensing data analysis; some ground disturbance will occur during soil assessment. Final project work will include a comprehensive soil map with extensive data analysis concerning physical soil characteristics (hydrology, chemistry, etc.), plant and ecological community associations, and much more.	- Wilderness Character - Soils
High-elevation Forest Monitoring Program	Past, ongoing, and future	The objectives of this long-term project are to quantify the present conditions of high-elevation forests in Sierra Nevada parks (Yosemite, Sequoia, and Kings Canyon national parks and Devils Postpile National Monument), and determine whether these conditions are changing over time in a manner that will warrant management action.	- Wilderness Character
Lake Sampling Project	Past, ongoing, and future	The Sierra Nevada Inventory and Monitoring Network, in conjunction with the Division of Resources Management and Science in these parks, have implemented a long-term park-wide program to monitor lake ecosystems (since 2007). This project assesses lake ecosystem status and trends. There are 49 lakes in wilderness selected for long-term monitoring.	- Wilderness Character
Wetland Monitoring	Ongoing and future	The Sierra Nevada Inventory and Monitoring Network is preparing to implement a long-term park-wide program to monitor wetland ecological integrity. This project is designed to provide basic information on the condition of targeted wetlands (wet meadows and fens), and to allow for the evaluation of long-term trends of key ecological variables in Sierra Nevada parks. Wetlands monitoring will begin in summer 2014 and will include hydrologic (groundwater wells), vegetation, and invertebrate monitoring at 30 sites in Sequoia and Kings Canyon.	- Wilderness character - Vegetation: Wetlands and meadows
Air Quality Monitoring	Past, ongoing, and future	Remote Automated Weather Stations provide critical weather data for developing fire behavior predictions in wilderness areas. Two RAWS are currently placed in the parks' wilderness each summer, and are the primary resources for monitoring air quality associated with fire.	- Wilderness character

Table 74: Past, Current, and Future Actions that Make Up the Cumulative Effects Scenario (continued)

Action or Project	Status	Brief Description	Impact Topics
Snow Surveys	Past, ongoing, and future	The California Division of Water Resources has over 30 sites in the parks' wilderness as part of their data-collection network. The California Division of Water Resources has collected snowpack and other climatic data and conducted ongoing studies (in cooperation with the NPS) for more than 50 years at a large majority of these sites.	- Wilderness character
Aquatics Restoration Plan Habitat/Ecosystem Restoration Projects	Past, ongoing, and future	The NPS in Yosemite, Sequoia and Kings Canyon national parks have on-going habitat-restoration programs that include eradication of nonnative fish in wilderness. Thus far Sequoia and Kings Canyon have restored or are restoring 26 lakes by eradicating nonnative trout (Vredenburg 2004; NPS 2012c). Yosemite has restored or is in the process of restoring 16 lakes. If the program is approved for expansion, these activities will continue to occur for the next 30 years within the parks' wilderness.	- Wilderness character - Water resources - Special-status species
Related studies on frogs	Past, ongoing, and future	Intensive field studies on mountain yellow-legged frogs, in the parks and on neighboring USFS lands, include but are not limited to efforts to better understand the effects of nonnative fish, chytrid fungus, pollution and climate change, and how to mitigate those effects. Much of this work is in wilderness. Actions performed include marking animals for tracking purposes, removing a small percentage of animals from a population for disease studies in the lab and the field, collecting tissue for genetic analyses, and treating animals with antifungal cleansers and probiotics. Reintroduction of frogs into unoccupied habitat is also ongoing.	- Wilderness character - Special-status species
Yosemite toad activities	Past, ongoing, and future	Several studies are taking place within the range of the Yosemite toad in wilderness. Projects in the parks involve: 1) documenting current distribution; 2) relating Yosemite toad population trends to ongoing visitor uses of toad meadow habitat; 3) relating habitat suitability/condition to toad distributions and historical visitor stock-use patterns; 4) providing detailed, credible information for analysis and management recommendations, and 5) developing best management practices for traditional wilderness visitor use activities to protect toad habitat and preserve visitor opportunities. These studies are observational and not likely to have an effect on the Yosemite toad, other than increasing knowledge about the species.	- Wilderness character - Special-status species

Table 74: Past, Current, and Future Actions that Make Up the Cumulative Effects Scenario (continued)

Action or Project	Status	Brief Description	Impact Topics
Bighorn Sheep Restoration Plan and U.S. Fish and Wildlife Service (USFWS) Bighorn Sheep Recovery Actions	Past, ongoing, and future	This project involves collaring, monitoring, and reintroducing bighorn sheep into wilderness in partnership with the California Department of Fish and Wildlife, both in NPS and adjacent U.S. Forest Service (USFS) (Inyo) wilderness areas.	- Wilderness character - Special-status species
Cave Management Plan	Past, ongoing, and future	Ongoing cave management is based on the 1998 Cave Management Plan, which provides for administering and protecting cave resources in the parks. An updated Cave and Karst Management Plan is in preparation and would create a planning framework providing essential information to managers, and define cave and karst management activities.	- Wilderness character
Halstead Meadow Restoration	Past, ongoing, and future	This ongoing project was initiated in 2007; its final phase will likely start in 2017. Halstead Meadow, a portion of which is in wilderness, is the most severely damaged meadow in Sequoia National Park. The project includes restoring the meadow landforms, hydrologic processes, wetlands vegetation, and functions.	- Wilderness character - Soils - Water resources - Vegetation: Wetlands and meadows - Wildlife
Past grazing by cattle and sheep and related restoration projects	Past and Future	Prior to designation, there was grazing by sheep and cattle in several areas of the wilderness, including the Roaring River area within Kings Canyon National Park, and Cahoon Meadow in Sequoia National Park. Most of the cattle grazing leases in Kings Canyon National Park were surrendered or expired in the 1950s. In 1948, the NPS started actively restoring the most damaged meadows, starting with Sugarloaf Meadow. Restoration continued through the 1970s. Cahoon Meadow, 17 acres, lies at 7,350 feet elevation at the headwaters of Cahoon Creek, a tributary of the East Fork of the Kaweah River in the John Krebs Wilderness. In private ownership until 1980, the meadow was historically dedicated to cattle grazing. During this time, the stream channel was severely impacted by cattle, marking the onset of serious erosion. Upon acquisition by the NPS, grazing was discontinued. For the past 30 years the channel has continued to show active head erosion, which produced a massive gully extending over 75% of the length of the meadow. The gully has lowered the water table and reduced the meadow's water-storage capacity. Planning is underway to restore the meadow.	- Wilderness character - Soils - Water resources - Vegetation: Wetlands and meadows - Wildlife
Invasive Species Management Plan/Activities	Past, ongoing, and future	This project includes control, survey, and monitoring of exotic vegetation, follow-up treatment, preventive measures, and data management using park-approved methods.	- Wilderness character - Vegetation - Visitor use

Table 74: Past, Current, and Future Actions that Make Up the Cumulative Effects Scenario (continued)

Action or Project	Status	Brief Description	Impact Topics
Ecological Restoration Program	Past, ongoing, and future	This program restores landscapes disturbed by human impacts or development to more natural conditions. Abandoned non-historic human development may be removed (asphalt, marijuana grow-site materials, etc.); disturbed landforms recontoured close to their pre-disturbance state to restore natural drainage patterns; and erosion-control measures installed. The projects in wilderness are marijuana grow-site, wilderness trail, and campsite restoration.	- Wilderness character - Soils - Water resources - Vegetation - Wildlife
Fire Management	Past, ongoing, and future	The Fire and Fuels Management Plan, completed in 2003, directs management of fires in these parks. The plan supports the use of prescribed fires, allowing fires to burn, suppression where necessary, and follow-up restoration actions. The goals of fire use are to restore and maintain ecosystems, reduce hazard fuels, protect natural and cultural resources, and protect wildland / urban-interface communities.	- Wilderness character - Soils - Vegetation - Wildlife: bears - Cultural resources - Visitor use
Concessions Prospectus	Future	The Sequoia National Park concessions prospectus will be renewed in 2015-2016. Whether the Bearpaw Meadow High Sierra Camp will be authorized to operate in the future is directly linked to this WSP.	- Wilderness character - Visitor use - Park operations
Parkwide Communication Network	Past, ongoing, and future	The parks' radio system consists of 17 repeaters, 15 base stations, and 10 towers. Two of the equipment sites are in developed areas reachable by road. Radio-repeater maintenance includes troubleshooting and basic repair work. System maintenance includes routine replacement of antennas, transmission lines, solar panels, batteries, lightning protection, and underground cables. On-ground maintenance and repair work includes the use of non-motorized and battery-operated hand tools.	- Wilderness character - Park operations
Existing Rights-of-Way, Dams, and related structures	Past, ongoing, future	Rights-of-way for two utility-powerline corridors are authorized in potential wilderness per the California Wilderness Act of 1984, Sec 101 (24): 1) a 60-foot-wide corridor running from Moro Rock's summit benchmark to near the Middle Fork Road, and 2) a 60-foot-wide corridor on the west side of Kings Canyon National Park from near Lookout Peak to the Cedar Grove vicinity (approximately 12 and 22 acres, respectively). There are four constructed dams in wilderness. Their purpose is to hold and regulate water runoff for electrical-power generation. The powerlines and dams receive periodic maintenance.	- Wilderness character

Table 74: Past, Current, and Future Actions that Make Up the Cumulative Effects Scenario (continued)

Action or Project	Status	Brief Description	Impact Topics
Lodgepole, Wolverton, and Wuksachi Management Plan	Future	A comprehensive visitor-service and facilities plan is being developed with the overall purpose of improving visitor and administrative services and functions at the Lodgepole, Wolverton, and Wuksachi areas within Sequoia National Park, while ensuring protection of natural and cultural resources. This project could affect wilderness access.	- Visitor use
Mineral King Management Plan	Future implementation plan	This comprehensive planning effort will determine what frontcountry facilities are necessary at Atwell Mill and Mineral King. It could include changing parking-lot configurations, trailhead parking/signage, access-road improvements, and maintenance activities. This project could affect wilderness access.	- Visitor use
Generals Highway Project	Past, ongoing, and future	The NPS, in cooperation with Central Federal Lands Highway Division of the Federal Highway Administration, will be resurfacing, restoring, and rehabilitating 7 miles of Generals Highway between Deer Ridge and Wolverton Road and the 1.3-mile Wolverton Road to the trailhead parking lot. This project could affect wilderness access.	- Visitor use
Sequoia National Park Transit System	Past, ongoing, and future	The existing transit system in Sequoia National Park allows for improved opportunities for trailhead access and parking at Crescent Meadow and Wolverton.	- Visitor use
USFS – Land management plans for Sierra, Inyo, and Sequoia national forests and Giant Sequoia National Monument	Past, ongoing, and future	Management plans that could affect visitor use within the parks' wilderness, or in the region, are the USFS wilderness plans for the John Muir, Golden Trout, and Monarch wilderness areas, and the USFS forest plan amendments for the Sierra, Inyo, and Sequoia national forests and Giant Sequoia National Monument (wilderness areas adjacent to these parks). The USFS wilderness plans established restrictions on visitor use, including trailhead quota limits, caps on commercial services, and exit quota limits on Mount Whitney. The ongoing planning efforts would include a recreational-use component in order to balance resource-protection mandates with visitor enjoyment. These plans would enhance visitor experience through preservation of natural conditions, while affecting some visitor activities through the implementation of additional restrictions or regulations. Since many wilderness visitors in Sequoia and Kings Canyon National Parks access wilderness from adjacent USFS-managed areas, these management plans have the potential to affect wilderness use within the parks.	- Wildlife: bears - Visitor use - Fire management - Vegetation: nonnative plants

Table 74: Past, Current, and Future Actions that Make Up the Cumulative Effects Scenario (continued)

Action or Project	Status	Brief Description	Impact Topics
Bear hunting activities outside the parks' boundaries	Past, ongoing, and future	Bear hunting would adversely impact individual bears that are harvested but there would be no long-term population-level impacts, because harvest rates are maintained at a conservative level.	- Wildlife: bears
Golden Trout Recovery Program .	Past, ongoing, and future	The California Department of Fish and Wildlife (CDFW), USFS, USFWS, and NPS are cooperating to recover Little Kern golden trout (federally threatened), California golden trout, and Kern rainbow trout within their historical ranges. Efforts to reverse the decline of these species include improving habitat via eradication of nonnative fish that have the capacity to hybridize with native stocks; restocking with genetically pure fish; restoring damaged critical habitat; and protecting native stocks from habitat deterioration and excessive angler harvest.	- Wilderness character - Special-status species - Visitor use
Yosemite National Park Wilderness Stewardship Plan	Future	The NPS will update the 1989 Yosemite Wilderness Management Plan starting in 2015. The objective is to provide guidance to park operations for the successful management of Yosemite's designated wilderness, which comprises over 95% of the park. This planning effort relates to wilderness use at Sequoia and Kings Canyon National Parks because many park visitors begin their wilderness trips on the John Muir Trail in Yosemite.	- Cultural resources - Visitor use

ASSESSING IMPACTS USING CEQ CONSIDERATIONS

The impacts of the alternatives are assessed using the CEQ definition of the word "significantly" (1508.27), which requires consideration of both context and intensity of impacts:

a) Context – This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short-term and long-term effects are relevant.

b) Intensity – This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:

   1) Impacts that may be both beneficial and adverse. A significant effect may exist even if the federal agency believes that on balance the effect would be beneficial.

   2) The degree to which the proposed action affects public health or safety.

3) Unique characteristics of the geographic area such as proximity to historic or cultural resources, parklands, prime farmlands, wetland, wild and scenic rivers, or ecologically critical areas.

4) The degree to which the effects on the quality of the human environment are likely to be highly controversial.

5) The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

6) The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

7) Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

8) The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places (National Register) or may cause loss or destruction of significant scientific, cultural, or historical resources.

9) The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

10) Whether the action threatens a violation of federal, state, or local laws or requirements imposed for the protection of the environment.

For each impact topic analyzed, an assessment of the potential significance of the impacts according to context and intensity is provided in the "Conclusion" section that follows the discussion of the impacts. Context includes both overall context and resource-specific context. Overall context is presented here in the "General Methodology for Analyzing Impacts" section because it is based on the purpose and significance of the two national park units and applies across all resource topics. Resource-specific context is presented in the "Methodologies for Analyzing Impacts" section under each resource topic, as applicable, and applies across all alternatives. Intensity of the impacts is presented using the applicable factors from the list in (b) above. Intensity factors that do not apply to a given resource topic and/or alternative are not discussed.

WILDERNESS CHARACTER

In this section, impacts on wilderness character are assessed. The analysis includes an evaluation of the potential for the qualities that comprise wilderness character to be altered by each alternative.

Natural, undeveloped, untrammeled: solitude and primitive recreation at Sixty Lake Basin

METHODOLOGY FOR ANALYZING IMPACTS

NPS wilderness-management policies are based on provisions of the 1916 NPS Organic Act, the 1964 Wilderness Act, NPS policies and Director's Orders, and legislation establishing individual units of the national park system. In accordance with the Wilderness Act, wilderness areas "shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness.…" Section 2(c) of the Wilderness Act defines wilderness as "an area untrammeled by man; an area of undeveloped land that retains its primeval character and influence; an area protected and managed to preserve its natural conditions; and, which has outstanding opportunities for solitude or a primitive and unconfined type of recreation."

To define the baseline conditions of wilderness character for Sequoia and Kings Canyon National Parks, the parks' staff developed a Wilderness Character Assessment to describe what is unique and special about the parks' wilderness areas and provide a description of the current state of the wilderness. In addition to describing the special characteristics of the parks' wilderness, the assessment identifies actions or conditions that are or could impact wilderness character. Information for the assessment was derived from surveys, interviews, and a workshop with current and former park employees who have extensive experience in and with the parks' wilderness. It also considers and incorporates public comments from scoping sessions from this wilderness planning effort (Frenzel and Fauth 2014). Alternatives are

evaluated against this baseline to determine the changes that would occur to each quality under each alternative.

TYPES OF IMPACTS ON WILDERNESS CHARACTER

Untrammeled: An untrammeled wilderness is one in which ecological systems and their biological and physical components are autonomous, free from human intervention. By contrast, human actions that restrict, manipulate, or attempt to control the natural world within wilderness degrade the untrammeled quality. Trammeling actions include the removal of nonnative species, intervention in the behavior or lives of native plants and animals, projects to restore the natural conditions of wilderness, and interference in natural processes and energy flows. These actions may be temporary but, while they are in effect, they affect the untrammeled quality of wilderness. Unauthorized trammeling, such as modifying areas for illegal marijuana cultivation, may also affect wilderness character.

Natural: An undegraded natural wilderness quality shows minimal effects of modern civilization upon the ecological systems and their biological and physical components. A natural wilderness comprises landforms, soils, waterways, habitats, species, and terrestrial food webs that are largely intact in their natural state and not influenced by human activities and external threats.

Undeveloped: The Wilderness Act states that wilderness is "an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation," with "the imprint of man's work substantially unnoticeable." The undeveloped quality of wilderness is impacted by the presence of structures and installations, and by the use of motor vehicles or motorized equipment. These developments are also prohibited by Section 4 (c) of the Wilderness Act, and are only permissible if they are "necessary to meet minimum requirements for the administration of the area" as wilderness.

Opportunities for Solitude or Primitive and Unconfined Recreation: The Wilderness Act states in Section 2(c) that wilderness has "outstanding opportunities for solitude or a primitive and unconfined type of recreation." Opportunities for solitude or primitive and unconfined recreation provide visitors a chance to connect with the natural world, to practice traditional skills, and to have transformative personal experiences. Opportunities for solitude can be affected by encounters with other visitors, and changes in management that alter visitor recreation behavior. Developments that support public recreation decrease the primitive quality of wilderness (as well as the undeveloped quality). Restrictions on visitors in wilderness can reduce the unconfined quality of wilderness.

Other Features of Value: Historic and cultural resources serve as reminders that humans have been using the wilderness for centuries. This value can be affected by preservation, removal, or degradation of these resources.

Scientific values would be affected if there is a change to the level and type of research conducted. The NPS does not plan to change science activities under this WSP/FEIS. See appendix P.

IMPACTS OF ALTERNATIVE 1: NO-ACTION / STATUS QUO

Under the no-action alternative, wilderness would continue to be managed under the guidance established by the 2007 *General Management Plan* (GMP), 1986 *Backcountry Management Plan* (BMP) and 1986 *Stock Use and Meadow Management Plan* (SUMMP).

Untrammeled Quality: Overall, the untrammeled quality is well preserved in the parks' wilderness (Frenzel and Fauth 2014); this would be expected to continue. There are small-scale and short-term

adverse effects on this quality from ongoing management activities, which are undertaken primarily with the goal of improving the natural quality. For example, wilderness rangers have removed and restored hundreds of campsites, fire pits, and fire rings to direct use away from sensitive areas and to reduce the signs of human occupation. Trail crews restore braided (short-cut) trails and reroute trails that traverse meadows to restore the natural hydrologic function of the meadow and to eliminate or minimize adverse effects on meadow resources. While these actions take place, there is an adverse impact on the untrammeled quality of wilderness because natural processes are interrupted. Once restoration is complete and manipulation ceases, natural processes would be restored to a more naturally functioning condition in the areas treated. These trammeling effects are short-term, and the continuation of these activities is necessary to improve or preserve the natural quality of wilderness. Another trammeling action that occurs is the mitigation of hazard trees from designated camp areas and around structures located in wilderness. Trees or portions of trees determined to be hazardous can be trimmed, limbed, or cut down to reduce risk to wilderness users and facilities. This is considered a trammeling action as it alters the natural processes (by not allowing the tree to decompose and fall naturally). This results in a short-term trammel. The trees or tree parts are left on site to decompose naturally, which in the long term benefits the natural quality of wilderness.

Eradication of invasive or nonnative species and large-scale meadow restoration projects and other interventions by the parks are discussed under cumulative impacts.

Natural Quality: The no-action alternative would allow for the continued preservation of the natural quality of wilderness. Generally, the primary stressors that degrade the natural quality of wilderness originate from outside the parks (Frenzel and Fauth 2014) and are beyond the ability of the parks to affect. The parks' administrative actions under alternative 1 would continue to protect the natural quality of wilderness through restrictions and regulations on visitor use. For example, existing designated campsites concentrate use, preventing more widely dispersed impacts in surrounding areas. Party size limits or access restrictions in sensitive areas may result in fewer informal trails and reduced use, which also protects the natural quality.

Ongoing recreational use of wilderness can cause adverse impacts on a limited scale. Under alternative 1, recreational campfires would be allowed in 398,829 acres of the total 837,806 acres of wilderness (48% of the wilderness). This results in campfires allowed in 44,212 acres of high-elevation conifer habitat that supports the four subalpine long-lived tree species (whitebark pine [*Pinus albicaulis*], foxtail pine [*P. balfouriana* ssp. *austrina*], limber pine [*P. flexilis*] and Sierra juniper [*Juniperus grandis*]), resulting in potential impacts on these species in those areas from firewood collection. This would affect the natural quality of wilderness by allowing the removal of native vegetation and downed wood of ecological and particular scientific value. Other aspects of visitor use would continue to have little effect on alpine vegetation and special-status plant species under this alternative. There would be continued effects from trampling along trail corridors and travel in off-trail areas. Under current use levels and patterns, vegetation in untrailed alpine areas would remain largely undisturbed and the natural quality would be protected. Similarly, trampling by hikers of plants of conservation concern would be infrequent under current levels and patterns of use. Although species in meadows and uplands could suffer incidental trampling by visitors traveling through meadows or on cross-country routes, this would not be expected to result in population level impacts, and the natural quality of wilderness would continue to be preserved.

There have been alterations on the natural quality of wilderness from the development of informal and formal campsites in wilderness. As stated in chapter 3, campsite condition is used to assess effects of visitor use on the natural quality of wilderness character. The 2006–2007 campsite condition survey revealed that most of the campsites in wilderness were not highly impacted, and that campsite conditions in the wilderness of Sequoia and Kings Canyon National Parks have improved dramatically since the late 1970s. The aggregate campsite impact in 2006–2007 was less by about one-third than what it was in the

1970s. Campsite condition improvements were uniform throughout the parks' wilderness. However, despite these wilderness-wide improvements, campsite impacts are not evenly distributed in the parks. There are more substantial impacts along primary trails (particularly the JMT), and at trail junctions, creek crossings, and along lakeshores.

Wilderness visitation data shows that use levels in the parks are not as high today as use levels were in the 1970s. In addition, there has been widespread adoption of minimum-impact techniques, such as Leave No Trace©, and some activities with high impact potential (e.g., campfire building and traveling with large stock groups) are more tightly regulated than in the past. Also, the parks have taken action to minimize impacts through campsite, trail, and meadow restoration. All of these factors have improved campsite conditions in the parks. Under the no-action alternative, campsite conditions would remain as is or improve in most areas, but the most popular areas would continue to experience adverse impacts.

Although visitor practices in wilderness have improved over the past few decades, resulting in a reduced impact on the natural quality of the parks' wilderness, visitor use would continue to slightly adversely impact this quality in the long term. However, the current visitor management of the parks' wilderness has resulted in a long-term beneficial effect on the natural quality since designation.

Human and stock traffic on trails can cause erosion of soil at an unnatural rate, trample native vegetation, and introduce nonnative plants. Because trails route visitors and stock to specific travelways, concentrating use and impacts, the overall effects on the natural quality are reduced. Appropriate trail design and maintenance can, however, also reduce the effects of human and stock traffic by channeling traffic onto durable or hardened surfaces.

Some studies have found that stock parties contribute more to the physical impact on the natural quality than do hiking parties. Dale and Weaver (1974) examined the effects of horses and hikers in the Rocky Mountains in Montana and found that trails used by stock parties were 2.5 times deeper than trails used only by hikers. Cole (1983) studied campsite impacts in the Bob Marshall Wilderness and found that stock sites were six times as large, with a bare area four times larger than backpacker sites. Stock sites also had more than 10 times as many damaged trees, were more severely compacted, and had more introduced plant species. The greater compaction occurs because stock are heavier than humans and their weight is concentrated on a smaller surface area (Cole 1989a). However, both stock use and overall use was higher in the Bob Marshall Wilderness than in Sequoia and Kings Canyon National Park wilderness areas. The impact of stock on campsite conditions in the Sequoia and Kings Canyon National Parks' wilderness was recently shown to be notably less than that of the Bob Marshall Wilderness (Cole and Parsons 2013).

Stock grazing in the parks can affect the natural quality. Grazing levels would likely continue to be similar to the 10-year average of 6,058 (grazing night average from the years 2003-2012 was derived by subtracting the nights stock were fed supplemental feed from overall stock use nights). Unless use patterns or levels change markedly, grazing would be expected to occur in less than half of the areas open to grazing. In the other half, grazing would rarely occur, despite its allowance. Stock use would continue to be highly variable at the meadow scale, with some meadows having significant use in one year and none the next. Most of the meadows and forage areas open to grazing would continue to be grazed at relatively light intensities, although those that are strategically located along travel routes and in popular destinations would periodically be grazed at moderate to relatively heavy intensities. Grazing affects individual plants, and can result in impacts on vegetation composition and structure, soil stability, and ecosystem processes (McClaran and Cole 1993). Stock use can also increase the potential for the introduction of nonnative species, which can alter the natural quality of wilderness. If the introduced species is highly invasive, the potential for large-scale adverse effects on the natural quality of wilderness is increased. Under the no-action alternative, grazing management would be informed through the

application of grazing capacities based on forage production and site suitability, opening dates, night and head limits, and temporary restrictions as conditions indicated. Monitoring of stock use and meadow condition would continue, including surveys for non-native plants. Continuation of current stock and grazing management policies, including protection of natural processes, visitor education, and restrictions on amounts, timing and locations of grazing and stock use, would continue to protect the natural quality of wilderness.

Human and stock waste can introduce pathogens and nutrients into soils and waterways. As discussed in the water quality section, human and stock use appears to have had little impact on water quality or on the overall health of the aquatic ecosystems in the parks' recent past. Some small but measurable impacts have occurred, especially near the most heavily used mixed-use sites (i.e., used by backpacker and stock parties). The largest measurable impacts on water quality occur during rain events. Contaminant levels taper off quickly after the rain event, and cannot be attributed to particular sources (e.g., human, pack stock, or wildlife). Because wilderness visitation in the parks has generally been stable, there would continue to be few direct adverse effects on water quality under the no-action alternative, and no long-term adverse effect on the natural quality of wilderness.

Wild animals may become conditioned to human presence, which detracts from their wild quality and affects the natural quality of wilderness. Under alternative 1, bears would continue to have benign encounters with people throughout wilderness. Habituation and human/bear conflicts would be most pronounced in areas where quality bear habitat and relatively high levels of human use overlap (e.g., Paradise Valley). Native wildlife, particularly sensitive species, can also be affected by visitor use and administrative actions in their habitat. Yosemite toad populations may be adversely affected by degradation of habitat due to the presence of trails and injury or mortality from human or stock trampling. Under alternative 1, there are few locations where Yosemite toad populations are known to exist near trails; therefore, the overall potential for degradation and trampling under this alternative would continue to be limited.

Mountain yellow-legged frog populations inhabiting areas near trails would continue to be occasionally disturbed during encounters with hikers and stock during the summer months. Mountain yellow-legged frog habitat may be adversely affected by trails and/or stock use. The potential for overall habitat degradation exists; however, impacts would be slight, as management techniques under alternative 1 would continue to minimize impacts on frogs and frog habitat.

Terrestrial invertebrates would continue to be adversely affected by stock grazing within meadows, and by human and stock trampling, particularly along trails. Aquatic invertebrates would continue to be adversely impacted by stock activity downstream from stream fording sites due to increased turbidity from erosion and impacts from stock waste. At the scale of the overall wilderness, trampling and stock grazing impacts on invertebrate populations would be limited because of the relatively small area impacted. However, on a localized scale, measurable impacts would occur. Overall, these effects would not result in a substantial adverse effect on the natural quality of wilderness.

Undeveloped Quality: Overall, the undeveloped quality of the parks is good due to the vastness of wilderness and the limited amount of development in wilderness. Under alternative 1, the level of visitor-management-related developments in wilderness would not change. The number of trails and signs would be maintained to their current standard. Recreational installations such as food-storage boxes, privies and toilets, and designated campsites would continue at current or close to current numbers. Ranger stations, crew camps, and the Redwood Canyon Cabin would be maintained in their current locations. New installations would require a minimum requirements analysis (MRA) and site-specific compliance to determine if these developments are the minimum necessary for the administration of wilderness.

Opportunities for Solitude or Primitive and Unconfined Recreation: The parks' wilderness has outstanding opportunities for solitude and for wilderness-appropriate primitive and unconfined recreation. Visitor-use data from 1990 to 2010 shows that visitation is lower in terms of total numbers of permits, people, and visitor-use days relative to the period between 1970 and 1990. Recent visitation has generally been stable wilderness-wide, but has increased in the Mount Whitney area and along the JMT and the PCT. This has resulted in greater localized crowding, a decrease in solitude along those popular trail corridors and at Mount Whitney. Off-trail areas continue to receive lower use and provide exceptional opportunities for solitude. There would be no change to this under the no-action alternative.

As described in chapter 3, encounters with other visitors can adversely affect opportunities for solitude. In results from the 2011 survey (Watson 2013), 98% of respondents said they noticed the presence of people along the trail. Most respondents indicated it did not detract from their trip; however, 21% said it did detract from their experience. Under the no-action alternative, encounter rates are likely to remain approximately the same. Visitors would continue to encounter other visitors most frequently in the popular locations in wilderness, while off-trail visitors would encounter the fewest visitors.

Management actions can adversely affect this quality of wilderness. Existing restrictions and management actions can affect opportunities for solitude or primitive and unconfined recreation. Campfire restrictions, party size limits, and night limits would continue to be implemented at the parks. These could restrict opportunities for primitive and unconfined recreation, but serve to protect opportunities for solitude by reducing use in certain areas. Other management restrictions that could affect opportunities for primitive and unconfined recreation include the current campfire restrictions, which would continue, and restrictions on stock travel and grazing. Stock would continue to be allowed to travel and graze at currently permissible locations, and the amount and types of commercial services provided would continue at the parks. Visitor interactions with rangers and other park staff, which can reduce solitude and the primitive and self-reliant nature of wilderness, would continue to occur. Thus, opportunities for primitive and unconfined recreation would continue to exist at their current levels.

Trails and signs generally promote opportunities for primitive and unconfined recreation. Though some users believe that trails confine use, visitors have the opportunity to travel off trail in vast areas if they choose. There are currently access restrictions in certain areas for stock and for larger parties, which reduce opportunities for unconfined recreation. Recreational installations such as food-storage boxes, privies and toilets, and designated campsites would continue at current or close to current numbers. Commercial operations at the Pear Lake Ski Hut (winter) and the Bearpaw Meadow High Sierra Camp (summer) would also continue. These facilities support wilderness recreational activities but reduce primitive and self-reliant aspects.

Under current conditions, the parks' wilderness provides outstanding opportunities for solitude and primitive and unconfined recreation, except at a few locations where visitor densities are relatively high and impacts on solitude occur. Under the no-action alternative, no additional restrictions or developments related to visitor-use management would be proposed for wilderness, and overall visitor-use levels are considered to be stable; therefore, there would be no change to opportunities for solitude or primitive and unconfined recreation.

Other Features of Value: Although less than 5% of wilderness has been surveyed for cultural features, hundreds of prehistoric and historic sites have been discovered and assessed. Because the terrain often dictates the location of good campsites, prehistoric and historic sites are often located in or near modern camp areas. Using campsites that have been used by people for centuries may put cultural resources at risk. A subset of historic structures (mostly ranger stations) would continue to be preserved and maintained by park crews while others may be allowed to naturally decay, crumble, or disintegrate. This alternative does not provide for a focused assessment of trails and other historic features; thus, until such

assessment is undertaken under another program or project, the historic features may not be adequately protected.

Wilderness dependent research would continue to be recognized as appropriate and encouraged. Over the past three years, 73% of the parks' permitted research included activities in wilderness. This research covers a wide range of disciplines. The most frequent topics for research in wilderness in the past three years included investigations of vascular plants/plant communities, herpetology (amphibians and reptiles), geology, cave/karst, invertebrates, and fire (behavior, ecology and effects). Proposed research activities would continue to be evaluated on a case-by-case basis, and the scientific values of the wilderness recognized and preserved, resulting in no change under this alternative.

Cumulative Effects

Untrammeled Quality – Many of the trammeling actions of the past have been discontinued or reduced. These include widespread fire suppression, fish stocking, control of forest pathogens and pests, control of predator populations, and large-scale meadow restoration and manipulation. Other trammeling actions are generally decreasing as the parks realize gains from past actions such as managing human/bear conflict through better education and targeted restrictions, focusing on early detection of nonnative species, and the rerouting of trails and other infrastructure away from sensitive areas. Due to its large size and ruggedness, the parks' wilderness today is largely untrammeled and has the appearance of being unimpeded by human actions. The following actions would continue to occur as needed and are not part of this WSP/FEIS, but cumulatively, may impact wilderness character.

Science-based activities that intentionally manipulate the natural processes in wilderness can affect the untrammeled quality. Generally, most research in wilderness is non-manipulative, that is, it includes monitoring or simple sampling actions that have no effect on the untrammeled quality. However, there are several projects that can result in a trammel. Activities, such as the mountain yellow-legged frog research, that include capturing and treating frogs for the chytrid fungus, results in a trammeling action. Also, bighorn sheep monitoring actions that involve capturing, collaring, and translocating sheep in wilderness result in a trammeling action.

Other resource actions that manipulate wilderness include the high-elevation aquatic ecosystem restoration program, which is underway and includes removing nonnative fish from wilderness waters. This project could be expanded in the future, depending on the outcome of an ongoing EIS; this would result in long-term trammeling actions that would restore an aspect of the natural quality of wilderness.

The Halstead Meadow Restoration project was initiated in 2008, with its final phase starting in 2017. Ecological restoration at Halstead Meadow, a portion of which is in wilderness, has five main goals including restoration of the natural quality of wilderness, including landforms, hydrologic processes, wetland vegetation, wetland functions, and the capacity to withstand 10-year flood flows prior to sod establishment. Another meadow restoration project in wilderness being assessed for future action is for Cahoon Meadow. These projects would have a short-term adverse effect on the untrammeled quality while actual restoration work is underway, but there would be a long-term trammel as this project could continue for an extended period of time.

The ongoing nonnative plant eradication program also results in a trammeling action. The trammeling action occurs when nonnative species are controlled by manual pulling, mowing, or herbicide treatment. This program is expected to continue in the long-term.

The ecological restoration program restores landscapes disturbed by human impacts or development. The trammeling action occurs when disturbed landforms are re-contoured close to their pre-disturbance state

to restore natural drainage patterns. Sites may be allowed to revegetate through natural colonization if there is limited disturbance and a nearby seed source. Revegetation techniques could include passive methods, such as applying litter and duff mulch or placing large woody debris, or active methods, such as transplanting from adjacent locations or installing plants propagated in a nursery. Project sites included in the program include marijuana grow sites, wilderness trail relocations, and campsite restorations, all of which result in localized and short-term trammeling.

The parks' Fire and Fuels Management Plan supports the use of prescribed fires, allows for the management of natural fires – either allowing them to burn or suppressing fires when appropriate – and allows for post-burn restoration actions. Fire suppression, prescribed burning, and restoration actions are trammeling actions that can occur in wilderness.

There are four dams in designated potential wilderness additions in the Mineral King area. These dams create a trammeling action by altering the temporal flow and hydrology of the affected area. These dams are likely to continue to exist in wilderness in the long term.

Climate change likely will have effects on ecosystems in the near term that may require intervention or manipulation to meet agency mandates for preservation of ecosystems and their components. State or federal listings of threatened and endangered, sensitive, or high-value species may compel park managers to take additional actions to preserve these species. The extent of these future trammeling actions is unknown at this time so the effects cannot be assessed. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on the untrammeled quality of wilderness would not be significant.

Natural Quality – As stated in chapter 3, many of the agents (airborne pollutants and contaminants) that impact natural conditions in wilderness originate outside of the parks and are not directly controlled by park management actions. Current stressors on the natural quality that are not a result of park activities include air pollution and the resultant influx of contaminants, impacts from nonnative pathogens such as blister rust, and the past introduction of nonnative fish. A key challenge in preserving the natural quality of the parks' wilderness would be to determine what is possible, desirable, and feasible in maintaining ecosystems and biodiversity in the face of a changing climate.

The parks do conduct activities with intent to preserve the natural quality of wilderness. Resources management and scientific activities, mapping, and monitoring programs result in increased knowledge that can lead to better protection of native species and habitats and more strategic wilderness management overall. Therefore, these programs benefit the natural quality of wilderness.

Restoration and nonnative species removal activities (plants and nonnative fish), such as those described under *untrammeled quality*, result in a long-term improvement in the natural quality of wilderness by restoring natural ecosystem functions and protecting native species. Allowing natural fires to burn and implementing a strategic prescribed fire program also results in long-term benefits on the natural quality of wilderness by restoring natural fire to wilderness. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on the natural quality of wilderness would not be significant.

Undeveloped Quality – Apart from the facilities and actions related to wilderness administration and visitor-use management, which are discussed elsewhere as direct effects of the alternatives, there are few facilities or actions in wilderness that affect the undeveloped quality.

Resource management and science, mapping, and monitoring programs (listed previously under the *untrammeled quality*) can result in the use of mechanized equipment and installation of equipment and

survey markers in wilderness, which adversely affects the undeveloped quality. Many of the installations are small (e.g., rebar stakes, survey markers, tree tags or small stream gauges), but there are certain installations that are large and in prominent locations easily noticed by wilderness users (e.g., snow towers, snow pillows). In the future, the demand for additional instrumentation (e.g., stream gauges and snow sensors) may increase as park managers and scientists seek to better understand the effects of climate change in the Sierra Nevada. However, an overall goal of park management is to limit the number of installations to the minimum size and number possible to preserve the undeveloped quality of wilderness, and any requests for installations require a minimum requirements analysis. Scientists may also seek to access their study plots using helicopters. Helicopter transport and landings in wilderness affect the undeveloped quality. All requests to use helicopters for access are handled on a case-by-case basis and must include a minimum requirement analysis.

Other resource management projects may result in adverse effects on the undeveloped quality. Some cave management actions involve the installation of cave gates and cave route markers; these are considered installations that affect the undeveloped quality of wilderness while helping preserve the natural quality of wilderness.

The parks' communications network includes twelve radio repeaters located within wilderness; these periodically require access by helicopter. Powerlines and dams exist and are maintained in designated potential wilderness areas; access to the dams is generally by helicopter. Motorized and mechanized equipment may also be required to maintain the powerlines and dams, as determined through a minimum requirement analysis. Existence of these facilities and the use of motorized equipment to access them affect the undeveloped quality of wilderness. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on the undeveloped quality of wilderness would not be significant.

Opportunities for Solitude or Primitive and Unconfined Recreation – As stated in chapter 3, the parks' wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation; however, there are some factors that may negatively affect this quality.

External factors that adversely affect opportunities for solitude include overflights and the sights and sounds of modern civilization. There have been reductions in some external factors, for example, the number of low-level military overflights has decreased. Other external factors continue to adversely affect opportunities for solitude, such as air pollution and light pollution.

Outside of the developments related to visitor-use management, and visitor and administrative presence in wilderness, the internal factors that may adversely affect opportunities for solitude include the use of helicopters (which can affect the feeling of solitude by altering the natural soundscape) and the presence of research, resource management, and monitoring crews in wilderness, which can increase encounter rates.

Opportunities for primitive and unconfined recreation are primarily affected by actions related to visitor-use management (e.g., campfire restrictions and night limits), which are discussed elsewhere as direct effects of the alternatives. There are few other actions outside of the WSP that can affect these opportunities. Fire management activities may result in reduced access or area closures. Resource management actions, such as the removal of nonnative fish from high-elevation lakes, may limit access to areas temporarily, and fish removals reduce opportunities for angling. There could be area closures for restoration purposes, which reduces the unconfined nature of wilderness.

The USFS manages wilderness in neighboring national forests including the Sierra, Inyo, and Sequoia National Forests. Existing USFS plans have established trailhead quotas, stock-use restrictions, and

commercial service limits. Since these are feeder areas into the parks' wilderness, actions by the USFS to restrict access could result in reduced opportunities for primitive and unconfined recreation in the parks.

Yosemite National Park will be updating their wilderness plan beginning in 2015. The objective of updating the plan will be to provide guidance to park operations for the successful management of Yosemite's wilderness, which comprises over 95% of the park. The plan would address wilderness visitor-use management and the preservation of wilderness character. The plan update would also address the use and operation of the five High Sierra camps in Yosemite National Park. In addition, since many of the parks' wilderness users start trips in Yosemite, it is unknown at this time how that park's plans may affect opportunities for solitude or primitive and unconfined recreation in the wilderness of Sequoia and Kings Canyon National Parks. When considered with past, present, and future actions, this quality would remain stable in the long-term and there would be no significant cumulative effect.

Other Features of Value – Outside of the actions proposed in this WSP/FEIS, there are few management actions that could affect cultural resources in wilderness. All projects that have the potential to affect cultural resources are evaluated prior to project implementation, with a goal of avoiding adverse effects on these resources. Looting and vandalism of cultural sites and features are rare.

The scientific value of the parks' wilderness appears to be increasing, as measured by the number and quality of requests for research permits. Science-based activities permitted in the parks' wilderness (past, ongoing, and future) include activities such as inventory and monitoring, biodiversity surveys, climate change, fire history, and ecological studies. Science-based projects continue to yield results applicable both to park managers and to the wider scientific audience. Mitigating impacts of these activities on other qualities of wilderness character will continue to be necessary to balance the positive effects of scientific research with the adverse effects research has on wilderness character. NPS policies and legal mandates support scientific activities in wilderness provided they are conducted in a manner consistent with wilderness preservation and are assessed through a minimum requirements analysis process. Continuation of research projects and support of these programs would continue to have a beneficial effect on the *Other Features of Value* quality. When considered with past, present, and future actions, this quality would remain stable in the long-term and there would be no significant cumulative effect.

IMPACTS OF ALTERNATIVE 2: PROTECT WILDERNESS CHARACTER BY IMPLEMENTING SITE-SPECIFIC ACTIONS (NPS PREFERRED ALTERNATIVE)

This alternative would protect the parks' fundamental and other important resource values, including wilderness character, while providing for a range of visitor experiences and opportunities similar to current conditions with some additional limits applied in specific popular and sensitive resource areas.

Untrammeled Quality: Similar to the no-action alternative, the primary actions affecting the untrammeled quality under alternative 2 are trail and campsite restoration and the management actions associated with designated campsites. Trail restoration would include addressing erosion issues and restoring informal trails and abandoned trails to natural conditions. These types of actions would be addressed on a case-by-case basis, but where they take place, an impact on the untrammeled quality of wilderness would occur while restoration is underway and natural processes are interrupted. Campsite restoration would occur at Guitar Lake, Kern Hot Spring, and Shepherd Pass Lake – areas that exceed the campsite condition standard that has been established under alternative 2. Campsite restoration would continue to occur as needed, primarily in the areas that receive the most use, such as along popular trail corridors. As with trail restoration, trammeling impacts would occur while restoration is underway and natural processes are interrupted, but once restoration is complete and manipulation ceases, natural processes would be restored to a more naturally functioning condition in the areas treated.

Under alternative 2, 48 food-storage boxes would be retained in the most popular areas of the parks, 25 would be removed, and 13 would be considered for removal. It is possible that food acquisition by bears or other wildlife could increase if visitors fail to properly store food in areas where food-storage boxes were removed. The changes in wildlife behavior could result in the manipulation or destruction of animals, which is a trammeling action.

Park staff would continue to monitor and remove hazard trees if needed in designated campsites, impacting the untrammeled quality of wilderness in those areas by controlling the natural process of tree mortality, decomposition, and replacement. Under alternative 2, hazard-tree removal and the associated interruption of this ecological process could potentially occur at designated camps in Emerald Lake, Pear Lake, Lower Paradise Valley, and Bearpaw Meadow, or at possible future designated camps at Dusy Basin, Kearsarge Lakes basin, Middle and Upper Rae lakes, and Woods Creek Crossing.

All of these site-specific impacts on the untrammeled quality would be of a limited intensity and duration, and wilderness would in general remain dominated by natural processes.

Natural Quality: Under alternative 2, overall visitor-use levels would remain similar to current use levels. On a wilderness-wide scale this alternative would have few detectable effects on the natural quality of wilderness; however, site-specific changes would result in improvement on this quality that would be detectable at a local scale. These local effects result from changes in the way that campfires, food storage, human waste, camping, and hikers and stock use are managed.

New campfire restrictions would be put in place to protect downed wood resources. Campfires would be allowed in 395,710 acres (47%) of the parks' wilderness. This would prohibit campfires on an additional 3,119 acres relative to current restrictions and would protect downed wood resources and improve campsite conditions by reducing the presence of fire rings and tree injuries. However, campfires would continue to be permitted in 35,857 acres of high-elevation conifer habitat that supports the four subalpine long-lived tree species (whitebark pine, foxtail pine, limber pine, and Sierra juniper), perpetuating impacts from firewood collection in those areas.

The reduction in food-storage boxes under alternative 2 could improve vegetation conditions at specific sites where boxes are removed (see table 15 on page 106) because visitors tend to camp near food-storage boxes. However, it is likely that visitors would continue to camp in these areas since they have long been popular camp areas; therefore, any improvements would be minimal. Also, it is possible that food acquisition by bears or other wildlife could increase if visitors fail to properly store food in areas where food-storage boxes were removed. The changes in wildlife behavior could result in the manipulation or destruction of animals, which would be considered an adverse impact on the natural quality of wilderness.

Alternative 2 would reduce the reliance on privies for managing human waste. Seven public-use privies would be removed from the following locations: one at Hockett Meadow, Upper Funston, Middle Paradise, Sphinx, and Bearpaw, and two at Roaring River. One public-use privy would be added at Rock Creek Crossing. If pack-out waste kit tests are successful, five additional public-use restroom buildings or privies would be removed at Eagle Lake, Emerald Lake, Mosquito Lake, Pear Lake, and Twin Lakes. It is conceivable that the elimination of privies in some of these areas could contribute to improper management of waste by some visitors, but because the sites have been selected based on the suitability for cat-holes or carry-out bags, it is not anticipated that these effects would be detectable.

Campsite condition would be gradually improved in three areas (Guitar Lake and Kern Hot Springs, and Shepherd Pass Lake) which fail to meet campsite condition standards.

Stock grazing in the parks can affect the natural quality. Grazing levels would likely continue to be similar to the 10-year average of 6,058 stock nights, and would be expected to occur in approximately 110 forage areas each year. Unless use patterns or levels change markedly, grazing would be expected to occur in less than half of the areas open to grazing. In the other half, grazing would rarely occur despite its allowance. Stock use would continue to be highly variable at the meadow scale, with some meadows having significant use in one year and none the next. Most of the meadows and forage areas open to grazing would continue to be grazed at relatively light intensities, although those that are strategically located along travel routes and in popular destinations would periodically be grazed at moderate to relatively heavy intensities. Grazing affects individual plants, and can result in impacts on vegetation composition and structure, soil stability, and ecosystem processes (McClaran and Cole 1993). Stock use can also increase the potential for the introduction of nonnative species, which can alter the natural quality of wilderness. If the introduced species is highly invasive, the potential for large-scale adverse effects on the natural quality of wilderness is increased. Under this alternative, grazing capacities based on forage production and site suitability would be applied to all park meadows open to grazing. Grazing would be managed through the application of opening dates, night and head limits, and temporary restrictions. Monitoring of stock use and meadow condition would continue, including surveys for non-native plants. Implementation of the stock and grazing management policies described in appendix D, including protection of natural processes, visitor education, and restrictions on amounts, timing and locations of grazing and stock use, would continue to protect the natural quality of wilderness.

Alternative 2 would result in a variety of changes to stock management that could affect the natural quality of wilderness. Trails closed to stock would increase by 25 miles, and 3 additional trail miles would be closed to overnight stock camping. Stock impact trail surfaces, leading to erosion; the reduction in the number of trails open to stock could reduce erosion of trails in these areas. These trail restrictions would also reduce the percentage of meadow area that is open to stock travel from 64% to 54%. New grazing restrictions would reduce the percentage of the parks' meadow area open to grazing from 51% to 48%, which would reduce the percentage of peat-accumulating meadow area open to grazing from 72% to 70% and reduce the percentage of lakeshore meadow open to grazing from 42% to 38%. The extent and severity of trampling, grazing, and nonnative species impacts due to stock use would be expected to be reduced from current levels. Although technically open to stock travel and grazing, much of the wetland and meadow area is inaccessible to stock parties and thus stock use would continue to be concentrated in named forage areas adjacent to maintained trails. Grazing, trampling, and non-native species impacts to the natural quality outside of named forage areas would continue to be rare and of light intensity. The intensity of grazing in named forage areas (and therefore the impact on the natural quality) would be limited by grazing capacities.

Under alternative 2, the current use levels and patterns would likely remain similar to the no-action alternative. Vegetation in untrailed alpine areas would remain largely undisturbed. Similarly, trampling by hikers of plants of conservation concern would be expected to be infrequent under the use levels prescribed under alternative 2. Although species in the meadows and uplands may suffer incidental trampling by visitors traveling through meadows or on cross-country routes, this would not be expected to result in population level impacts, and the natural quality of wilderness would continue to be preserved.

There would continue to be a slight risk to individual Yosemite toads from trampling by hikers and stock. This alternative would limit stock access in some areas that contain Yosemite toad habitat, lowering the chance of disturbance, trampling and habitat degradation. Existing restrictions on stock use in Yosemite toad habitat, including limiting grazing in the Evolution Basin to walking parties with burros and llamas, would continue to provide protection to the integrity of toad breeding areas. Increased protection of Yosemite toad breeding habitat would be provided by restricting grazing in two locations in the Blue Canyon area, and by reducing party size and limiting stock travel to within 100 yards of the trail corridor in the Upper South Fork San Joaquin.

Slight beneficial effects on mountain yellow-legged frogs could occur under alternative 2, as there could be reduced potential for disturbance and trampling of mountain yellow-legged frogs due to encounters with the smaller off-trail party sizes allowed under this alternative. Additionally, mountain yellow-legged frogs could benefit from the restrictions on stock in the Upper Bubbs and Upper Funston watersheds. The potential for injury or mortality to mountain yellow-legged frog individuals from trampling exists under alternative 2; however, effects from trampling are unlikely to result in impacts at the population level. Bighorn sheep would continue to be protected under alternative 2, as research suggests few effects on sheep from visitor or stock use.

It is anticipated that invertebrate population dynamics would remain dominated by natural processes. Changes in hiker and stock use would not result in measurably different impacts on invertebrates than those occurring under current conditions.

Overall, the management actions proposed under alternative 2 would protect the natural quality wilderness-wide, and enhance the natural quality in localized areas.

Undeveloped Quality: Under alternative 2 there would be a reduction in most types of development in wilderness. Twenty-six out of 87 existing food-storage boxes would be removed, and another 13 out of 87 could be removed if testing proves effective. In 10 locations these removals would eliminate all food-storage boxes at the site. In 19 locations, one or more food-storage boxes would remain. Seven out of 21 public-use privies would be removed, five other sites would be tested for privy removal, and one privy would be added at Rock Creek Crossing, resulting in an overall reduction of privies. Alternative 2 would also result in the removal of 23 out of 52 stock hitch rails and 12 out of 54 stock fences and gates. There would be no change in the number of ranger stations and patrol cabins. The Redwood Canyon Cabin would remain, but the associated infrastructure would be removed, restoring a portion of the undeveloped condition to this area. All crew camps would be retained, but the number of installations at each camp would be reduced. These changes would improve the undeveloped quality in many areas of wilderness.

Opportunities for Solitude or Primitive and Unconfined Recreation: Alternative 2 would continue to provide outstanding opportunities for solitude and primitive and unconfined recreation in many areas, but in a few areas additional management controls would reduce the unconfined quality to protect other wilderness qualities.

Alternative 2 would add restrictions on party size, camping locations, and night limits in some popular areas, therefore reducing the opportunities for unconfined recreation in those areas. The elimination of food-storage boxes in some areas would increase the unconfined quality by compelling visitors to be self-reliant in terms of food storage. Likewise, the elimination of privies in some areas would increase the unconfined quality by compelling visitors to be self-reliant in terms of managing human waste. Commercial services would be limited in the Mount Whitney Management Area, improving the unconfined and self-reliant character of that area.

Alternative 2 would apply new visitor encounter standards that would protect opportunities for solitude in most areas, and increase opportunities for solitude in up to five areas that are near or exceed the trail encounter standard: the Mount Whitney area, Roads End, Evolution Basin and Valley, the JMT near Rae Lakes, the trail between Crabtree Ranger Station and Trail Crest, and Sixty Lake Basin Trail. In these areas a variety of management actions could be taken to reduce encounter frequencies, such as reducing night limits, reducing maximum party size, reducing commercial services, lowering trailhead quotas, or other measures. These measures would improve opportunities for solitude but could involve trade-offs in terms of the unconfined quality of recreation in those areas by adding new restrictions that may decrease visitor freedom and spontaneity. Alternative 2 would also reduce the largest allowable stock-party sizes and reduce off-trail party sizes for both stock and hiker parties; however, this would affect only the largest

parties (more than 12) traveling off-trail, which account for less than 1.3% of all overnight visitors (on- and off-trail).

Overall there would continue to be outstanding opportunities for solitude or primitive and unconfined recreation in the parks' wilderness.

Other Features of Value: Under alternative 2, the Mission 66-era ranger station at Bearpaw Meadow, a potentially contributing element to the National Register-eligible cultural landscape, would be removed and relocated and replaced with a new ranger station. Depending on the determination of effects for historic properties, the removal would result in a beneficial or adverse effect on this feature. There would be no changes proposed for scientific activities, which would protect this quality wilderness-wide.

Cumulative Effects: Cumulative effects from past, present, and foreseeable future actions that have the potential to affect wilderness character include research, resource management and monitoring, and administrative actions and management actions in adjacent wilderness areas as described under alternative 1. There are also external threats to wilderness character such as overflights, air pollution, and light pollution.

Untrammeled Quality – Under alternative 2, there would continue to be short- and long-term trammeling associated with wilderness resource management and science-based activities for the purposes of protecting and restoring the natural quality of wilderness. When considered with the ongoing trammeling in wilderness from other programs, and potential increases in trammeling as a result of changing climatic conditions, it is likely that this quality would continue to be impacted in the future. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on the untrammeled quality of wilderness would not be significant.

Natural Quality – This alternative would improve some aspects of natural quality and adversely affect others in localized areas. Overall, limitations and management actions proposed under this alternative would have long-term beneficial effects on natural quality in the popular areas, and result in little change to the natural quality wilderness-wide. When considered with past, present, and future actions related to visitor use and administration of wilderness, the natural quality of wilderness would remain good, and would improve slightly in popular areas. External factors, such as climate change and air pollution, would continue to adversely affect this quality. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on the natural quality of wilderness would not be significant.

Undeveloped Quality – Under alternative 2, there would be a reduction in development related to visitor use management. It is likely that there would continue to be installations added to the wilderness for the purposes of science or resources management activities, if determined necessary through the minimum requirements analysis process. However, these impacts are small when compared with the lack of development in the majority of the parks' wilderness. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on the undeveloped quality of wilderness would not be significant.

Opportunities for Solitude or Primitive and Unconfined Recreation – There are few past, present, and future actions that adversely affect this quality. There may be short-term closures associated with resource management, research, and fire activities, and some slight effects on solitude as a result of visitors encountering resource, fire crew members, or other park employees; however, when considered with past, present, and future actions, along with the actions proposed in alternative 2, this quality would continue to be preserved. Considered together, there would be no meaningful additive or interactive effects between

these cumulative actions and actions under this alternative. Cumulative impacts on this quality of wilderness would not be significant.

Other Features of Value – A contributing element to the National Register-eligible cultural landscape at the Bearpaw Meadow High Sierra Camp would be removed (the ranger station). This would result in a long-term, localized adverse impact on the cultural landscape; however, the remaining cultural landscape would remain in place, and other cultural sites in wilderness would continue to be protected, so there would be no cumulative effect. There would be no changes proposed for scientific activities resulting in a continued beneficial effect on the value of this quality wilderness-wide. When considered with past, present, and future actions, this quality would remain stable in the long-term and there would be no significant cumulative effect.

IMPACTS OF ALTERNATIVE 3: PROVIDE MORE OPPORTUNITIES FOR PRIMITIVE RECREATION

This alternative would increase opportunities for visitor use and primitive recreation by allowing higher levels of visitor use than the no-action alternative. To accommodate increased use, this alternative would provide more facilities and more restrictions on visitor behavior relative to current conditions.

Untrammeled Quality: Similar to the no-action alternative, the primary actions affecting the untrammeled quality that are associated with alternative 3 include trail and campsite restoration, and campsite management actions. Trail restoration would include addressing erosion issues and restoring informal trails and abandoned trails to natural conditions. These types of actions would be addressed on a case-by-case basis, but an impact on the untrammeled quality of wilderness would occur where they take place while restoration is underway and natural processes are interrupted.

Campsite restoration would occur at those areas where campsite condition standards are exceeded. Under this alternative that would include Guitar Lake and the Shepherd Pass Lake area. Campsite restoration would continue to occur as needed, primarily in the areas that receive the most use (e.g., popular trail corridors). As with trail restoration, trammeling impacts would occur while restoration is underway and natural processes are interrupted, but once restoration is complete and manipulation ceases, natural processes would be restored to a more naturally functioning condition in the areas treated.

Park staff would continue to monitor and remove hazard trees in designated campsites, impacting the untrammeled quality of wilderness in those areas by controlling the natural process of tree mortality, decomposition, and replacement. Under alternative 3, hazard-tree removal could potentially occur at designated camps.

All of these site-specific impacts on the untrammeled quality would be of a limited intensity and duration, and the wilderness would in general remain dominated by natural processes.

Natural Quality: Under alternative 3, daily trailhead quotas would be increased by up to 10%; however, on a wilderness-wide scale this alternative would result in few detectable impacts on the natural quality of wilderness. Localized improvements on the natural quality could occur as a result of changes in the way that trails, campfires, food storage, human waste, camping, and hiker and stock use are managed.

More than any other alternative, this alternative would result in additional trail development across wilderness. To accommodate the increased use, more trails would be upgraded to Class 3, which could result in a localized adverse impact on the natural quality along these trail corridors while trail work is being accomplished, and a long-term effect as Class 3 trails have a larger footprint than Class 2 trails. These upgrades to these existing trails would result in more structural integrity and sustainability, reduced

erosion and improved trail conditions in the long-term; therefore, there would be limited long-term adverse effects on the natural quality.

New campfire restrictions would be put in place to protect downed wood resources. Campfires would be allowed in 293,840 acres or 35% of the parks' wilderness. The prohibition of campfires on an additional 105,000 acres relative to current restrictions would protect downed wood in these areas and improve campsite conditions by reducing the presence of fire rings and tree injuries. However, campfires would continue to be permitted in 13,126 acres of high-elevation conifer habitat that supports the four subalpine long-lived tree species (whitebark pine, foxtail pine, limber pine, and Sierra juniper), perpetuating impacts from firewood collection in those areas.

Under alternative 3, all existing food-storage boxes would be retained and up to an additional 35 food-storage boxes would be placed at key locations along the JMT. Because visitors tend to camp near food-storage boxes, the increase in food- storage boxes would adversely affect vegetation conditions at specific sites where boxes are installed (see the "Alternative 3, Element 4: Food Storage" section of chapter 2). However, it is also possible that food acquisition by bears or other wildlife could decrease in areas where food-storage boxes would be installed. The resulting changes in wildlife behavior would be considered a beneficial effect on the natural quality of wilderness.

Alternative 3 would add privies at popular areas (e.g., Heather Lake and Rock Creek Crossing) for managing human waste. Four public-use privies would be removed from the following locations: Knoll Camp, Sliding Box Camp, Middle Paradise, and Upper Funston. New privies would be considered for Dusy Basin, Evolution Valley, Guitar Lake, Kearsarge Lakes basin, Mineral King lake basins, Middle and Upper Rae lakes, Redwood Canyon, Woods Creek Crossing, and other points along the JMT and PCT. The additional privies would likely contribute to improved management of waste in these popular use areas.

Camping in designated campsites would continue to be required at certain areas, and additional designated sites would be established in selected popular areas. No new impacts on soils or vegetation are anticipated because these areas are already impacted by visitor use. New designated campsites would concentrate campsite impacts and reduce dispersed use, thus reducing impacts from new camp areas. Campsite conditions would gradually improve at Guitar Lake and Shepherd Pass Lake.

Stock grazing in the parks can affect the natural quality. Grazing levels would likely be greater than the 10-year average of 6,058 stock nights. Unless use patterns or levels change markedly, grazing would be expected to occur in less than half of the areas open to grazing. In the other half, grazing would rarely occur, despite its allowance. Stock use would continue to be highly variable at the meadow scale, with some meadows having significant use in one year and none the next. Most of the meadows and forage areas open to grazing would continue to be grazed at relatively light intensities, although those that are strategically located along travel routes and in popular destinations would periodically be grazed at moderate to relatively heavy intensities. Grazing affects individual plants, and can result in impacts on vegetation composition and structure, soil stability, and ecosystem processes (McClaran and Cole 1993). Stock use can also increase the potential for the introduction of nonnative species, which can alter the natural quality of wilderness. If the introduced species is highly invasive, the potential for large-scale adverse effects on the natural quality of wilderness is increased. The potential nonnative species impacts on meadows would decrease with the closure of more park meadows to stock access, although greater stock use could increase propagule pressure.

Under this alternative, grazing capacities based on forage production and site suitability would be applied to all park meadows open to grazing. Grazing would be managed through the application of opening dates, night and head limits, and temporary restrictions. Monitoring of stock use and meadow condition

would continue, including surveys for non-native plants. The natural quality of wilderness would continue to be protected by implementation of the stock and grazing management policies described in appendix D, including protection of natural processes, visitor education, and restrictions on amount, timing and locations of grazing and stock use.

Alternative 3 involves changes to stock management that could affect the natural quality of wilderness. Trails closed to stock would increase by 27 miles, and an additional 9 miles would be closed to overnight stock use. Stock has been shown to impact trail surfaces, leading to erosion of trails. The reduction in the number of trails open to stock would reduce erosion of trails in these areas. These actions would reduce the percentage of meadow area which is open to some form of stock travel and thus subject to trampling impacts from 64% to 55%. The percentage of the parks' meadow area open to grazing would be reduced from 51% to 37% which would reduce the percentage of peat-accumulating meadow area from 72% to 53% and reduce the percentage of lakeshore meadow open to grazing from 42% to 27%. There would be a decrease in the extent but an increase in the severity of trampling, grazing, and nonnative species impacts due to stock use, as higher use would be concentrated in fewer destinations. Although technically open to stock travel and grazing, much of the wetland and meadow area is inaccessible to stock parties and thus stock use would continue to be concentrated in named forage areas adjacent to maintained trails. Grazing, trampling, and non-native species impacts to the natural quality outside of named forage areas would continue to be rare and of light intensity. The intensity of grazing in named forage areas (and therefore the impact on the natural quality) would be managed by the implementation of grazing capacities as described in appendix D.

Stock would not be allowed off-trail except in four areas: on the Hockett Plateau, on the Monarch Divide, in the Roaring River drainage, and along the western side of the Kern River watershed south from the Chagoopa Plateau. Grazing would not be allowed off-trail except at Ansel Lake, Chagoopa Treehouse Meadow, Crytes Lakes, Laurel Creek basin, Long Meadow (Ferguson Creek), Sugarloaf Creek confluence, and West Fork Ferguson Creek. Additional meadow closures are listed in chapter 2 under alternative 3.

The resulting changes in stock management would be considered, overall, a beneficial effect on the natural quality of wilderness in specific areas where trails and meadows are closed to stock travel and stock is not allowed to graze.

This alternative allows for an increase in use, but this use is not expected to result in a substantial increase in off-trail use. Any significant increase in levels of use or change in patterns of visitor use would be expected to result in increased trampling and/or grazing impacts on alpine vegetation. Similarly, trampling of the plants of conservation concern by hikers would be expected to be infrequent under the use levels prescribed under alternative 3. Although species in the meadows and uplands may suffer incidental trampling by visitors traveling through meadows or on cross-country routes, this would not be expected to result in population level impacts, and the natural quality of wilderness would continue to be preserved. Under alternative 3, impacts on Yosemite toads, mountain yellow-legged frogs, invertebrates and bighorn sheep would be similar to alternative 2. Impacts would be localized, or to individuals, and no measurable impacts would occur at a population level.

Overall, the management actions proposed under alternative 3 would protect the natural quality wilderness-wide, and enhance or improve the natural quality of wilderness on a localized scale.

Undeveloped Quality: Under alternative 3, there would be an overall increase in development. The number of crew camps, privies and food-storage boxes would increase. The Redwood Canyon Cabin would be retained. There would be a slight reduction in development with the removal of grazing structures in areas closed to grazing; 14 hitch rails and 5 fences/gates would be removed. One new fence

would be constructed. Under alternative 3, there would be more development in wilderness than the other alternatives, resulting in a long-term adverse impact on this quality.

Opportunities for Solitude or Primitive and Unconfined Recreation: Alternative 3 would result in improvements to opportunities for primitive and unconfined recreation in many areas, but in a few areas additional management controls would reduce the unconfined quality to protect other wilderness qualities. Alternative 3 would also allow for increased overall wilderness use, reducing the opportunity for solitude, particularly in popular areas.

The addition of food-storage boxes in some areas would decrease the unconfined quality by reducing visitors' need to be self-reliant in terms of food-storage. Likewise, the addition of privies in some areas would decrease the unconfined quality by reducing the visitors need to be self-reliant in terms of managing human waste. Alternative 3 would add restrictions on camping locations and night stay limits, therefore reducing the unconfined recreation quality in those specific areas. Commercial services would increase, thereby degrading the unconfined and self-reliant character of that specific aspect, although commercial services would possibly allow more visitors to experience the primitive quality of wilderness.

Alternative 3 would apply new visitor encounter standards that would somewhat protect opportunities for solitude in most areas; however, encounter frequency would be expected to be higher than under alternative 2. There are no areas that exceed the trail encounter standards, but three areas are near standard: Roads End, Evolution Basin and Valley, and the Sixty Lake Basin Trail. In these areas a variety of management actions could be taken to reduce encounter frequencies, such as reducing night limits, reducing maximum party size, reducing commercial services, lowering trailhead quotas, or possibly other measures. These measures would improve opportunities for solitude but could involve trade-offs in terms of the unconfined quality of recreation in those areas. Under alternative 3, more encounters would be anticipated around new food-storage boxes. Increases in the provisions of commercial services would also lead to more encounters. Additional encounters with maintenance crews would be anticipated with increased crew camps and the additional Class 3 trails on a more frequent maintenance schedule. Overall, the number of encounters would increase in popular areas and along trails and reduce opportunities for solitude and self-reliance.

Other Features of Value: Under alternative 3, the Mission 66-era ranger station at Bearpaw Meadow, a potentially contributing element to the National Register-eligible cultural landscape, would be removed. Depending on the determination of effects for historic properties, the removal would result in a beneficial or adverse effect on this feature. There are no proposed changes to scientific activities, which would protect this value wilderness-wide.

Cumulative Effects: The past, present, and foreseeable future projects in the parks' wilderness and nearby USFS lands that affect wilderness character would be the same as described under alternatives 1 and 2.

Untrammeled Quality – Under alternative 3, there would continue to be short- and long-term trammeling associated with wilderness resource management and restoration activities for the purposes of improving the natural quality of wilderness. When considered with the ongoing trammeling in wilderness from other programs, and potential increases in trammeling as a result of changing climatic conditions, it is likely that the untrammeled quality would continue to be impacted in the future; but on a localized basis. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on the untrammeled quality of wilderness would not be significant.

Natural Quality – This alternative would improve some aspects of the natural quality (e.g., further restricting where campfires are allowed) and adversely affect others in localized areas (e.g., allowing increased visitor use and party sizes). Overall, limitations and management actions proposed under this alternative would result in little change to the natural quality wilderness-wide. When considered with past, present, and future actions related to visitor use and administration of wilderness, the natural quality of wilderness would remain good, and would improve slightly in popular areas. External factors, such as climate change and air pollution, would continue to adversely affect this quality. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on the natural quality of wilderness would not be significant.

Undeveloped Quality – Under alternative 3, increased development in wilderness would result in a long-term adverse impact on this quality. It is likely that there would continue to be installations added to the wilderness for the purposes of science or resources management activities, if determined necessary through the minimum requirements analysis process. When considered with past, present, and future actions, this quality would continue to be adversely impacted because there would be more installations in wilderness; however, these impacts are small when compared with the lack of development in the majority of the parks' wilderness. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on the undeveloped quality of wilderness would not be significant.

Opportunities for Solitude or Primitive and Unconfined Recreation – There are few past, present, and future actions that adversely affect this quality. There may be short-term closures associated with resource management, research, and fire activities, and some slight effects on solitude as a result of visitors encountering resource, fire crew members, or other park employees. When considered with past, present, and future actions, along with the actions proposed in alternative 3, opportunities for primitive and unconfined recreation would improve, and opportunities for solitude would be negatively impacted in localized areas. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on this quality of wilderness would not be significant.

Other Features of Value – A contributing element to the National Register-eligible cultural landscape at the Bearpaw Meadow High Sierra Camp would be removed (the ranger station). This would result in a long-term, localized adverse impact on the cultural landscape; however, the remaining cultural landscape would remain in place, and other cultural sites in wilderness would continue to be protected, so there would be no cumulative effect. There would be no changes proposed for scientific activities. When considered with past, present, and future actions, this quality would remain stable in the long-term and there would be no significant cumulative effect.

IMPACTS OF ALTERNATIVE 4: EMPHASIZE UNDEVELOPED QUALITY AND NON-COMMERCIAL RECREATION

This alternative would protect wilderness character by emphasizing opportunities for solitude and self-reliant recreation in a relatively undeveloped wilderness setting. The majority of wilderness would be managed for self-directed exploration and self-reliant travel.

Untrammeled Quality: Similar to the other alternatives, the primary actions affecting the untrammeled quality associated with alternative 4 include trail and campsite restoration. Trail restoration would include addressing erosion issues, and restoring informal trails and abandoned trails and trail segments back to natural conditions. These types of actions would be addressed on a case-by-case basis but, where they take place, an impact on the untrammeled quality of wilderness would occur while restoration is underway and natural processes are interrupted.

Campsite restorations would occur at those areas where campsite condition standards are exceeded. Under alternative 4, these include camp areas at Guitar Lake, Hockett Meadow, Kern Hot Spring, and Shepherd Pass Lake. Amphitheater Lake currently meets the standard set under this alternative, but may require restoration if site conditions decline. Campsite restoration would continue to occur as needed, primarily in the areas that receive the most use (e.g., popular trail corridors). As with trail restoration, trammeling impacts would occur while restoration is underway and natural processes are interrupted, but once restoration is complete and manipulation ceases, natural processes would be restored to a more naturally functioning condition in the areas treated.

Under alternative 4, all designated campsites would be removed and those areas could be restored, resulting in a short-term trammel to improve the natural conditions. In addition, the hazard tree removal program would be halted at these locations and natural processes would be restored to a more naturally functioning condition in areas treated. All food-storage boxes would be removed, and some site restoration would occur in these areas. It is possible that food acquisition by bears or other wildlife could increase if visitors fail to properly store food in areas where food-storage boxes were removed. The changes in wildlife behavior could result in the manipulation or destruction of animals, which is a trammeling action.

All of these site-specific impacts on the untrammeled quality would be of a limited intensity and duration, and wilderness would in general remain dominated by natural processes.

Natural Quality: Under alternative 4, the overnight capacities would be lowered slightly from current conditions by reducing daily entry quotas at specific trailheads. This alternative would result in few detectable effects on the natural quality of wilderness. However, site-specific changes in response to reduced numbers would result in improvements on this quality that would be detectable at a local scale. The local effects result from changes in food storage, human waste, and campsite management. The more substantial effects would result from the changes in campfire restrictions and lower levels of commercial use that would occur as a result of implementing this alternative.

Campfires would be prohibited wilderness-wide. This would protect downed wood, and improve campsite conditions by reducing the presence of fire rings and tree injuries, thus improving the natural quality in large areas of wilderness where campfires were previously allowed.

Under alternative 4, all food-storage boxes would be removed. Visitors tend to congregate around food-storage boxes and create localized vegetation impacts. Natural conditions could improve in localized areas where food-storage boxes are removed and vegetation is reestablished. However, it is likely that visitors would continue to camp in these areas since they have long been popular camp areas; therefore, any improvements would be minimal. In addition, if visitors do not properly store their food, wildlife encounters could increase and result in changes to wildlife behavior and the need for more intervention by park staff. The changes in wildlife behavior could result in the manipulation or destruction of animals, which would be considered an adverse impact on the natural quality of wilderness.

Alternative 4 would result in the removal of all privies and restrooms. It is conceivable that the elimination of privies could contribute to improper management of waste by some visitors. This could impact the natural quality in localized areas by contaminating soil or water or by affecting aesthetic qualities (e.g., the presence of toilet paper and human waste).

Under alternative 4, there would be no designated campsites in wilderness. It is likely that visitors would continue to use the formerly designated areas, but some sites could be restored to natural conditions. If site restoration occurs, this would result in a long-term beneficial effect on the natural quality in localized areas. Campsite condition would be gradually improved in four areas (Guitar Lake, Kern Hot Springs, and

Shepherd Pass Lake, and Hockett Meadow), each of which fail to meet campsite condition standards. In these areas a variety of management tools could be employed, including campsite restoration, reduction of the night stay limit, establishment of designated camps, reduction in party size limits for overnight camping, or reduction in trailhead entry quotas for trails serving those camping areas. These management actions would be applied until monitoring shows these areas to be within the campsite condition standard.

Alternative 4 would result in changes to stock management that could affect the natural quality of wilderness on a large scale by disallowing commercial and administrative stock use off-trail, and by eliminating grazing throughout the wilderness. Trails closed to stock would increase by 100 miles, and 37 fewer miles would be closed to overnight stock use. Stock has been shown to impact trail surfaces, leading to erosion. The reduction in the number of trails open to stock could reduce erosion of trails in these areas. Private stock parties would be allowed to travel in four off-trail areas, but commercial and administrative stock would not be allowed off-trail. The closure of the four off-trail areas to commercial and administrative stock would not be expected to result in changes in observed impacts, as use of these areas is currently infrequent and uncommon. Taken together, these actions would reduce the percentage of meadow area which is open to some form of stock travel and thus subject to trampling impacts from 64% to 44%. All grazing of stock would be prohibited, reducing the percentage of meadow area open to grazing from 51% to 0%. This would reduce the percentage of peat-accumulating meadow area open to grazing from 72% to 0% and reduce the percentage of lakeshore meadow open to grazing from 42% to 0%.

Grazing and trampling impacts on meadows and wetlands would be almost entirely eliminated. Nonnative species impacts on meadows and wetlands would be expected to decrease overall, although there could be a chance for increased impacts from introduced nonnative plant species in some areas if non-treated feed products were inadvertently used. The number of areas used for the holding and feeding of stock would by necessity increase with the prohibition on grazing. Should stock supported parties elect to camp in alpine areas, this could result in increased local, severe impacts on alpine vegetation. The inherent difficulty of holding animals in treeless areas, however, would be expected to limit such use in alpine locales.

Under alternative 4, due to the grazing prohibition, it is expected that there would be reduced stock use off trail, but off-trail use by hikers would likely remain similar to the no-action alternative. Vegetation in untrailed alpine areas would remain largely undisturbed. Any significant increase in levels of use or change in patterns of visitor use would be expected to result in increased trampling impacts on alpine vegetation. Similarly, trampling of the plants of conservation concern by hikers would be expected to be infrequent under the use levels prescribed under alternative 4. Although species in the meadows and uplands may suffer incidental trampling by visitors traveling through meadows or on cross-country routes, this would not be expected to result in population level impacts, and the natural quality of wilderness would continue to be preserved.

This alternative would limit stock access in many areas that contain Yosemite toad and mountain yellow-legged frog habitat, lowering the chance of trampling and habitat degradation. There would continue to be a slight risk to individual Yosemite toads and mountain yellow-legged frogs from trampling by hikers and stock. Bighorn sheep would continue to be protected under alternative 4, as research shows little effect on sheep from visitor or stock use.

Impacts on invertebrates are primarily related to trampling impacts on trail corridors, in camp areas, and in meadows. The impacts would continue to be measurable at a localized level but undetectable at the overall scale of wilderness. It is anticipated that invertebrate population dynamics would remain dominated by natural processes. Changes in hiker and stock use would not result in measurably different impacts on invertebrates than those occurring under current conditions.

Overall, the management actions proposed under this alternative would have long-term, beneficial effects on natural quality in a large portion of wilderness by prohibiting campfires and grazing and would enhance the natural quality in localized areas.

Undeveloped Quality: Under alternative 4, the level of development would be reduced more than in any other alternative. All 87 food-storage boxes would be removed. All existing privies and restrooms would be removed and no new privies would be constructed. Seven ranger stations and two patrol cabins would be removed, and there would be no long-term crew camps. The Bearpaw Meadow High Sierra Camp and the Redwood Canyon Cabin would be removed. All facilities associated with recreational stock use would be removed.

Bridges on Class 2 trails would be evaluated (e.g., Cartridge Creek Bridge, East Creek Bridge, Granite Creek/Upper Middle Fork Kaweah Bridge, and Big Arroyo Bridge on the Lower Kern Trail) and could be removed in the future.

These changes would improve the undeveloped quality in the wilderness by reducing the number of facilities and installations.

Opportunities for Solitude or Primitive and Unconfined Recreation: As stated in previous alternatives, the parks' wilderness offers outstanding opportunities for solitude or primitive and unconfined recreation. Alternative 4 would result in site-specific improvements in opportunities for solitude and primitive and unconfined recreation in many areas, but additional management controls would reduce the unconfined quality in order to protect other wilderness qualities.

Alternative 4 would add restrictions on party size, camping locations, and night limits in some popular areas, reducing the unconfined recreational quality in those areas. The elimination of food-storage boxes and privies would improve the unconfined quality by compelling visitors to be self-reliant in terms of food storage and human-waste management, respectively. Commercial services would be reduced wilderness-wide, and commercial and administrative stock use would be prohibited off-trail, reducing opportunities for primitive recreation, but improving the unconfined and self-reliant character overall. However, since off-trail travel by stock users is currently infrequent and uncommon, this restriction would affect low numbers of visitors.

Alternative 4 would apply new visitor encounter standards that would protect opportunities for solitude in most areas, and increase opportunities for solitude in up to six areas that are near or exceed the trail encounter standard: the Crabtree Ranger Station to Trail Crest, Evolution Basin and Valley, the JMT near Rae Lakes, Mount Whitney area, and Sixty Lake Basin Trail. In these areas a variety of management actions could be taken to reduce encounter frequencies, such as reducing night limits, reducing maximum party size, reducing commercial services, lowering trailhead quotas, or other measures. These measures would improve opportunities for solitude but could involve trade-offs in terms of reducing the unconfined quality of recreation in those areas.

Party sizes would be reduced for hikers and stock users both on- and off-trail. This would slightly reduce opportunities for primitive and unconfined recreation by adding additional restrictions to all users, but would increase opportunities for solitude as visitors would encounter smaller party sizes off-trail.

Overall, there would continue to be outstanding opportunities for solitude or primitive and unconfined recreation in the parks' wilderness.

Other Features of Value: Under alternative 4, all structures affiliated with the Bearpaw Meadow High Sierra Camp (a National Register-eligible historic district), including the ranger station would be

removed. The Redwood Meadow Ranger Station, the Tyndall Creek Ranger Station, and the Simpson Meadow Patrol Cabin would be removed. These removals would result in localized, long-term, adverse effects on the historic and cultural features of wilderness. Removing the only High Sierra camp from the parks' wilderness would be an adverse effect. There would be no changes proposed for scientific activities, which would protect this quality wilderness-wide.

Cumulative Effects: Cumulative effects from past, present, and foreseeable future actions that have the potential to affect wilderness character include research, resource management and monitoring, administrative actions and management actions in adjacent wilderness areas as described under alternative 1. There are also external threats to wilderness character such as overflights, air pollution, and light pollution.

Untrammeled Quality – Under alternative 4, there would continue to be short- and long-term trammeling associated with wilderness resource management and restoration activities for the purposes of restoring the natural quality of wilderness. When considered with the ongoing trammeling in wilderness from other programs, and potential increases in trammeling as a result of changing climatic conditions, it is likely that this quality would continue to be impacted in the future. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on the untrammeled quality of wilderness would not be significant.

Natural Quality – This alternative would improve some aspects of natural quality and adversely affect others in localized areas. Overall, limitations and management actions proposed under this alternative would have long-term beneficial effects on natural quality in the popular areas, and result in a slight improvement on the natural quality in large portions of wilderness. When considered with past, present, and future actions related to visitor use and administration of wilderness, the natural quality of wilderness would remain good, and would improve slightly in a larger area of the wilderness. External factors, such as climate change and air pollution, would continue to adversely affect this quality. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on the natural quality of wilderness would not be significant.

Undeveloped Quality – Under this alternative, there would be a reduction in development related to visitor-use management wilderness-wide, resulting in a long-term beneficial effect on the undeveloped quality. It is likely that there would continue to be installations added to the wilderness for the purposes of science or resources management activities, if determined necessary through the minimum requirements analysis process. However, these impacts are small when compared with the lack of development in the majority of the parks' wilderness. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on the undeveloped quality of wilderness would not be significant.

Opportunities for Solitude or Primitive and Unconfined Recreation – There are few past, present, and future actions that adversely affect opportunities for solitude or primitive and unconfined recreation. There may be short-term closures associated with resource management, research, and fire activities, and some slight effects on solitude as a result of visitors encountering resource, fire crew members, or other employees; however, when considered with past, present, and future actions, along with the actions proposed in alternative 4, this quality would continue to be preserved. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on this quality of wilderness would not be significant.

Other Features of Value – Under this alternative, one National Register-eligible historic district (Bearpaw Meadow High Sierra Camp) and three National Register listed or eligible historic structures would be removed. This would result in a long-term, localized adverse impact on this quality. There would continue

to be representative historic ranger stations located in wilderness, but the only historic High Sierra Camp in the parks' wilderness would be removed. The level of impacts could be mitigated through the documentation of the resources prior to removal. Other cultural resources would continue to be protected in wilderness. There would be no changes proposed for scientific activities, resulting in a continued beneficial effect on the value of this quality wilderness-wide. When considered with past, present, and future actions, overall this quality would continue to be protected and there would be no significant cumulative effect.

IMPACTS OF ALTERNATIVE 5: EMPHASIZE OPPORTUNITIES FOR SOLITUDE

This alternative would protect wilderness character by reducing overall overnight visitor-use levels wilderness-wide, resulting in the enhancement of opportunities for solitude and unconfined recreation while reducing opportunities for primitive recreation.

Untrammeled Quality: Similar to the other alternatives, effects on the untrammeled quality that are associated with wilderness management include trail and campsite restoration. Trail restoration would include addressing erosion issues, and restoring informal and abandoned trails and trail segments back to natural conditions. These types of actions would be addressed on a case-by-case basis, but an impact on the untrammeled quality of wilderness would occur where they take place while restoration is underway and natural processes are interrupted.

Campsite restoration would likely occur at campsite areas that are currently out of standard based on the measures for campsite conditions. These areas include Amphitheater Lake, Atwell-Hockett Trail, 11393 Lakes, Guitar Lake, Hockett Meadow, Kern Hot Spring, JMT-Simpson Junction, LeConte Ranger Station, Lower Dusy Lakes, Middle Dusy Basin, Shepherd Pass Lake, lakes above Tyndall, and South Dusy Lakes. Campsite restoration would continue to occur as needed, primarily in the areas that receive the most use (e.g., popular trail corridors). As with trail restoration, trammeling impacts would occur while restoration is underway and natural processes are interrupted, but once restoration is complete and manipulation ceases, natural processes would be restored to a more naturally functioning condition in the areas treated. Under alternative 5, all designated campsites would be removed and those areas could be restored, resulting in a short-term trammel to improve the natural conditions. In addition, the hazard tree removal program would be halted at these locations and natural processes would be allowed to continue without management interference. All food-storage boxes would be removed, and some site restoration would occur in these areas. It is possible that food acquisition by bears or other wildlife could increase if visitors fail to properly store food in areas where food-storage boxes were removed. The changes in wildlife behavior could result in the manipulation or destruction of animals, which is a trammeling action.

All of these site-specific impacts on the untrammeled quality would be of a limited intensity and duration, and wilderness would in general remain dominated by natural processes.

Natural Quality: Under alternative 5, overall visitor-use levels would be reduced; however, on a wilderness-wide scale this alternative would have few detectable effects on the natural quality of wilderness. The local improvements would result from changes in campfire, food storage, human waste, camping, and stock-use.

Campfires would be allowed in 425,276 acres of 837,806 acres, or 51% of the parks' wilderness. This would increase the area open to campfires by 26,447 acres from current restrictions; the reduction in use levels would make it possible to allow more areas to be open to campfires. Campfires would be allowed in 37,144 acres of high-elevation conifer habitat that support the four subalpine long-lived tree species (whitebark pine, foxtail pine, limber pine, and Sierra juniper), perpetuating impacts on these species from firewood collection in those areas.

Under alternative 5, all food-storage boxes would be removed. Visitors tend to camp near food-storage boxes, creating localized impacts on vegetation. However, even after the removal of the food-storage boxes, it is likely that visitors would continue to camp in these areas since they have long been popular camp areas. In addition, if visitors do not properly store their food, wildlife encounters could increase and result in changes to wildlife behavior and the need for more intervention by park staff. The changes in wildlife behavior could result in the manipulation or destruction of animals, which would be considered an adverse impact on the natural quality of wilderness.

Under alternative 5, all privies and restrooms would be removed. It is conceivable that the elimination of privies could contribute to improper management of waste by some visitors. This could impact the natural quality in localized areas by contaminating soil or water or by affecting aesthetic qualities.

Under alternative 5, there would be no designated campsites in wilderness. It is likely that visitors would continue to use the areas, but some sites could be restored to natural conditions. If site restoration occurs, this would result in a long-term beneficial effect on the natural quality in localized areas. Campsite conditions would be gradually improved through restoration at sites currently out of standard under this alternative, including at Amphitheater Lake, Atwell-Hockett Trail, 11393 Lakes, Guitar Lake, Hockett Meadow, Kern Hot Spring, JMT - Simpson Junction, LeConte Ranger Station, Lower Dusy Lakes, Middle Dusy Basin, Shepherd Pass Lake, and South Dusy Lakes areas.

Stock grazing in the parks can affect the natural quality. Grazing levels would likely be less than the current 10-year average of 6,058 stock nights. Unless use patterns or levels change markedly, grazing would be expected to occur in less than half of the areas open to grazing. In the other half, grazing would rarely occur, despite its allowance. Stock use would continue to be highly variable at the meadow scale, with some meadows having significant use in one year and none the next. Most of the meadows and forage areas open to grazing would continue to be grazed at relatively light intensities, although those that are strategically located along travel routes and in popular destinations would periodically be grazed at moderate to relatively heavy intensities. Grazing affects individual plants, and can result in impacts on vegetation composition and structure, soil stability, and ecosystem processes (McClaran and Cole 1993). Stock use can also increase the potential for the introduction of nonnative species, which can alter the natural quality of wilderness. If the introduced species is highly invasive, the potential for large-scale adverse effects on the natural quality of wilderness is increased. Under this alternative, grazing capacities based on forage production and site suitability would be applied to all park meadows open to grazing. Grazing would be managed through the application of opening dates, night and head limits, and temporary restrictions. Monitoring of stock use and meadow condition would continue, including surveys for non-native plants. The natural quality of wilderness would continue to be protected by implementation of the stock and grazing management policies described in appendix D, including protection of natural processes, visitor education, and restrictions on amounts, timing and locations of grazing and stock use.

Alternative 5 would make a variety of changes to stock management that could affect the natural quality of wilderness. Trails closed to stock would increase by 22 miles, and trails closed to overnight stock camping would increase by 5 miles. In addition, the four off-trail travel areas would be closed to stock travel. Stock have been shown to impact trail surfaces, leading to erosion of trails. The reduction in the number of trails open to stock could reduce erosion of trails in these areas. These actions would reduce the percentage of meadow area which is open to some form of stock travel and thus subject to trampling impacts from 64% to 43%. The percentage of the parks' meadow area open to grazing would be reduced from 51% to 37% which would reduce the percentage of the peat-accumulating meadow area open to grazing from 72% to 51% and reduce the percentage of lakeshore meadow open to grazing from 42% to 25%. The extent and severity of trampling, grazing, and nonnative species impacts would be expected to decrease with lower overall stock use due to fewer areas open to grazing.

Although technically open to stock travel and grazing, much of the wetland and meadow area is inaccessible to stock parties and thus stock use would continue to be concentrated in named forage areas adjacent to maintained trails. Grazing, trampling, and non-native species impacts to the natural quality outside of named forage areas would continue to be rare and of light intensity. The intensity of grazing in named forage areas (and therefore the impact on the natural quality) would be limited by grazing capacities.

Under alternative 5, the current use levels would be reduced. Vegetation in untrailed alpine areas would remain largely undisturbed. Trampling of the plants of conservation concern by hikers would be expected to be infrequent under the use levels prescribed under alternative 5. Although species in the meadows and uplands may suffer incidental trampling by visitors traveling through meadows or on cross-country routes, this would not be expected to result in population level impacts, and the natural quality of wilderness would continue to be preserved.

Under alternative 5, impacts on Yosemite toads, mountain yellow-legged frogs, invertebrates and bighorn sheep would be reduced with the overall reduction in use and further restrictions in off-trail travel and grazing by stock, and reduced party sizes. The reduction in visitor use and the closures of areas to stock would reduce the potential trampling impacts on the toads, frogs and invertebrates. There still could be some adverse effects on individuals, but these effects would not result in impacts at the population level. Bighorn sheep would continue to be protected under alternative 5, as research shows little effect on sheep from visitor or stock use. Overall, the management actions proposed under alternative 5 would protect the natural quality wilderness-wide, and enhance the natural quality in localized areas.

Undeveloped Quality: Under this alternative, there would be a reduction in developments in wilderness. All food-storage boxes, privies, and restrooms would be removed. Five ranger stations would be removed. The Redwood Canyon Cabin would be removed and the Bearpaw Meadow High Sierra Camp would be reduced in size. Twenty-eight out of 52 hitch rails and 18 out of 54 drift fences and gates would be removed. One gate would be added. These changes would improve the undeveloped quality in many areas of wilderness.

Opportunities for Solitude or Primitive and Unconfined Recreation: Alternative 5 would result in improvement to opportunities for solitude and decrease opportunities for primitive and unconfined recreation throughout wilderness due to decreases in the number of visitors allowed in the wilderness.

Under alternative 5, daily quotas would be reduced by 30%. Existing destination quotas at Emerald and Pear lakes would be discontinued. New destination quotas may be implemented in the future for specific popular areas. A day-use permit system with quotas would be implemented to control levels of use at popular destinations. Reduced quota levels would result in increased opportunities for solitude in wilderness, but would decrease opportunities for primitive and unconfined recreation.

The elimination of food-storage boxes would increase the unconfined quality by compelling visitors to be self-reliant in terms of food-storage. Likewise, the elimination of privies would increase the unconfined quality by compelling visitors to be self-reliant in terms of managing human waste. Commercial services would be reduced wilderness-wide, improving the unconfined and self-reliant character of wilderness.

Alternative 5 would apply new visitor encounter standards that would protect opportunities for solitude in most areas, and increase opportunities for solitude in up to six areas that are near or exceed the trail encounter standard for this alternative. These areas include Mount Whitney, Roads End, Rae Lakes/JMT (multiple), Crabtree Ranger Station to Trail Crest, Evolution Basin and Valley, Sixty Lake Basin Trail, Mineral King Valley, Rae Lakes Loop (lower portion), the Mount Langley approach, and the west side of Kearsarge Pass. In these areas a variety of management actions could be taken to reduce encounter

frequencies, such as reducing night limits, reducing maximum party size, reducing commercial services, lowering trailhead quotas, or other measures. These measures would improve opportunities for solitude but could involve trade-offs in terms of reducing the unconfined quality of recreation. Overall use would be reduced, but there would continue to be outstanding opportunities for solitude or primitive and unconfined recreation in the parks' wilderness.

Other Features of Value: Under alternative 5, the Bearpaw Meadow High Sierra Camp would be reduced in size. The Bearpaw Meadow Ranger Station, a contributing element to the National Register-eligible cultural landscape, would be removed, reducing the value of this feature. The alternative would result in localized, long-term, adverse effects on the historic and cultural features of wilderness. There would be no changes proposed for scientific activities, which would protect this quality wilderness-wide.

Cumulative Effects: Cumulative effects from past, present, and foreseeable future actions that have the potential to affect wilderness character include research, resource management and monitoring, administrative actions and management actions in adjacent wilderness areas. There are also external threats on wilderness character as described previously.

Untrammeled Quality – Under alternative 5, there would continue to be short- and long-term trammeling associated with wilderness resource management and restoration activities for the purposes of restoring the natural quality of wilderness. When considered with the ongoing trammeling in wilderness from other programs, and potential increases in trammeling as a result of changing climatic conditions, it is likely that this quality would be continue to be adversely affected in the future. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on the untrammeled quality of wilderness would not be significant.

Natural Quality – This alternative would improve some aspects of the natural quality and adversely affect others in localized areas. Overall, reduced visitor use levels proposed under this alternative would have few detectable effects on the natural quality wilderness-wide. When considered with past, present, and future actions, the natural quality of wilderness would remain good, and would improve slightly, particularly in popular areas. External factors, such as climate change and air pollution, would continue to adversely affect this quality. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on the natural quality of wilderness would not be significant.

Undeveloped Quality – Under this alternative, there would be a reduction in development wilderness-wide resulting in a long-term beneficial effect on the undeveloped quality. It is likely that there would continue to be installations added to the wilderness for the purposes of science or resources management activities, if determined necessary through the minimum requirements analysis process. However, these impacts are small when compared with the lack of development in the majority of the parks' wilderness. Considered together, there would be no meaningful additive or interactive effects between these cumulative actions and actions under this alternative. Cumulative impacts on the undeveloped quality of wilderness would not be significant.

Opportunities for Solitude or Primitive and Unconfined Recreation – There are few past, present, and future actions that adversely affect this quality. There may be short-term closures associated with resource management, research, and fire activities, and some slight effects on solitude as a result of visitors encountering resource, fire crew members, or other park staff. However, when considered with past, present, and future actions, along with the actions proposed in alternative 5, this quality would continue to be preserved. Considered together, there would be no meaningful additive or interactive effects between

these cumulative actions and actions under this alternative. Cumulative impacts on this quality of wilderness would not be significant.

Other Features of Value – A contributing element to the National Register-eligible cultural landscape at the Bearpaw Meadow High Sierra Camp would be removed (the ranger station). This would result in a long-term, localized adverse impact on a cultural landscape. However, the remaining cultural landscape would remain in place, and other cultural sites in wilderness would continue to be protected, so there would be no cumulative effect. There would be no changes proposed for scientific activities resulting in a continued beneficial effect on the value of this quality wilderness-wide. When considered with past, present, and future actions, this quality would remain stable in the long-term and there would be no significant cumulative effect.

CONCLUSION

All of the alternatives result in continued trammeling in wilderness from restoration actions, but at a localized scale. All of the alternatives allow for continued trammeling related to restoring campfire rings, with alternative 4 resulting in the most restoration activities; as there would be a complete elimination of campfires in wilderness. Removing some or all food-storage boxes in alternatives 2, 4, and 5 could result in trammeling actions if bear management activities are needed as a result of increased human-bear encounters. Alternatives that allow for the continuation or expansion of designated campsites (alternatives 1, 2, and 3), would have additional trammeling related to hazard tree removal actions. Overall, the impacts on the untrammeled quality from any of the alternatives would be of a limited intensity and duration, and wilderness would remain dominated by natural processes. The trammeling actions are highly localized, short-term, and of limited intensity, therefore the trammeling effects under any of the action alternatives would not be considered significant.

Generally the primary stressors that degrade the natural quality originate from outside the parks. Recreational use of wilderness can cause impacts on a limited scale. Park actions, such as limiting campfires to lower elevation areas, trail and campsite restoration, and managing or limiting grazing to protect meadow resources, preserve the natural quality. The natural quality of wilderness would continue to be preserved under all alternatives, but alternatives 4 and 5 may best preserve the natural quality by disallowing campfires and grazing wilderness wide (alternative 4), and disallowing all off-trail travel by stock (alternative 5). The adverse effects on the natural quality as a result of the actions in the alternatives considered in this plan would occur at a local scale. The effects would be mitigated to reduce adverse impacts; therefore, no potential for significant effects on the natural quality exists under any of the action alternatives.

The number of installations and structures would be reduced in all of the alternatives but alternatives 1 and 3. Alternative 3 would result in more development in wilderness and therefore would result in the most adverse effects on this quality. Alternative 4 reduces development the most, resulting in the most beneficial effect on this quality. Alternatives 2 and 5 would result in a decrease in privies and food-storage boxes resulting in a slight improvement to this quality when compared to the no-action alternative. For all but alternative 3, the level of development in the parks' wilderness would remain constant or be reduced; therefore there is no potential for significant effects. However, alternative 3 would result in a significant increase in the level of development in the parks' wilderness.

The parks' wilderness has outstanding opportunities for solitude and for wilderness-appropriate primitive and unconfined recreation. However, there are currently areas considered out-of-standard with regard to encounter rates or campsite conditions. Opportunities for solitude would improve in the long-term under alternatives 4 and 5 due to lower visitor use, and solitude could be adversely affected under alternative 3 due to increased visitor use. Under alternative 2, effects on this quality wilderness-wide would be similar

to the no-action alternative with a slight improvement in opportunities for solitude in the most popular areas. All alternatives would provide opportunities for primitive and unconfined recreation. Under alternatives 4 and 5, opportunities for primitive and unconfined recreation would decrease due to lower visitor and commercial use levels. Under alternative 2, opportunities for primitive and unconfined recreation would remain at levels similar to the no-action alternative. Under alternative 3, opportunities would increase due to increases in trailhead quotas. Opportunities for solitude or primitive and unconfined recreation would be available under all alternatives; therefore there is no potential for significant effects under any alternative.

Alternatives 2, 3, 4, and 5 all result in the removal of one or more historic features from wilderness. Alternative 4 would result in the removal of three historic ranger stations and the historic Bearpaw Meadow High Sierra Camp, while alternatives 2 and 5 would remove one historic ranger station. These removals would result in localized, long-term, adverse effects on the historic and cultural features of wilderness. The level of impacts could be mitigated through the documentation of the resources prior to removal. Other cultural resources would continue to be protected in wilderness. All of the alternatives allow for continued science and research activities in wilderness. Overall, changes to other features of value would be minimal, and no potential for significant effects exists under any of the action alternatives.

SOILS

METHODOLOGY FOR ANALYZING IMPACTS

Impacts to soils were assessed by reviewing existing literature and characterizing the effects based on the types of impacts that could occur, and the analyzing factors that could contribute to soils impacts under each alternative. Soils are susceptible to several types of physical and chemical impacts including erosion, compaction, contamination, and direct removal. Visitor use and management action are potential sources of each of these types of impacts, although the timing of visitor use and site-specific soil conditions are important determinants of soils impacts. There are also a variety of ways in which potential soils impacts can be avoided or mitigated, including trail design and maintenance which plays a key role in reducing the potential for adverse soils impacts from recreational use. In general, the potential for adverse soils impacts is associated with the amount of visitor use, but because of factors related to timing, site conditions, and various forms of mitigation, there is little difference among the alternatives in terms of the potential for adverse impacts on soils.

TYPES OF IMPACTS ON SOILS

Erosion: Erosion can be defined as a process of detachment and transport of soil. It is strongly impacted by four factors: 1) climate, 2) topography, 3) soil, and 4) land use (Renard et al. 1997).

Climate – principally precipitation but sometimes wind – drives erosion. Important precipitation characteristics that drive erosion include rainfall intensity (how hard it rains) and rainfall amount (how much it rains). In the Sierra Nevada, rainfall varies seasonally. Most precipitation occurs in the fall, winter, and spring, with extended rainless periods during the summer. Additionally, much of the precipitation in the winter comes in the form of snow. In the case of snow, intensity is low but an effective rainfall amount can cause extreme erosion as the accumulated water of multiple snow storms can be released quickly during spring rain on accumulated snow. Climate can also increase erosion through freeze-thaw cycles. When moist soils freeze, tightly packed particles are forced apart and many of the cohesive bonds are broken. When thawed, these soils are less cohesive for a time and thus more susceptible to erosion (Ferrick and Gatto 2005).

Topography can enhance erosion when runoff accumulates from expansive upslope areas and is focused along a few preferential flow paths. A large area upslope of a point yields longer slope lengths. Slope steepness also contributes to erosion. Steeper slopes allow water flowing across the surface to reach higher velocities. Faster waters can move more and larger soil particles.

Some soils are naturally more erodible than others. Soils are made up of a combination of organic materials and differing proportions of rock, sand, silt, and clay. The erodibility of different soils is a function of the relative abundance of rock, sand, silt, clay, and organic content, and can be determined by laboratory experiments (Wischmeier and Mannering 1969). Clays are less erodible due to their cohesive properties; sands are less erodible due to their size and mass. Silts, on the other hand, are highly erodible. They lack the cohesive properties of clays and are small enough in size to easily be transported by water flowing across the land.

Land use influences erosion by potentially modifying the vegetation that covers the soil. Vegetative cover intercepts the falling raindrop and dissipates its energy before allowing what does not evaporate to flow or drip slowly onto the soil below. Vegetation also limits soil particle detachment by forming dense root masses. An abundant root system locks soil particles that would otherwise be transported by flowing water. Land use can also modify the soil properties by reducing particle sizes (grinding) and increasing particle detachment prior to the onset of precipitation.

Land use, and grazing in particular, in peat-accumulating wetlands can have significant impacts to soils. Where deep hoof prints are formed or local water tables are lowered, peat can be exposed to an oxidizing atmosphere, which leads to desiccation and decomposition. Where vegetation is removed, lower plant production can disrupt the peat-forming processes. Where oxidation exceeds productivity, soil carbon is lost (Cooper et al. 2005).

Erosion is indicative of a system out of balance, where the energy available to move sediment is greater than the energy required to move sediment. Reduced infiltration, flow concentration, and increased slope contribute to increased energy availability; decreased particle size and particle detachment reduce energy requirements; and vegetation loss both increases energy availability and reduces energy requirements. Once a system is out of balance, erosion will continue until balance is restored (Wells et al. 2009).

Compaction: Soil compaction can be defined as the reduction of interstitial space that results in an increase in bulk density. Simply stated, compaction can occur any time weight is applied to a soil and the soil particles are squeezed together.

Soil compaction is generally seen as having an adverse impact in the natural environment because it disrupts almost all of the ecological benefits that soils provide (Kozlowski 1999). Compacted soils are more impervious to infiltrating precipitation. Water applied to compacted soils does not soak in but flows downslope as surface flow where it can lead to increased erosion when it reaches uncompacted soils. Also, compacted soils can be barriers to root development and compacted soils are often unvegetated. Organisms that rely on soil for habitat are often excluded from compacted soils, and by restricting the flow of air through compacted layers, the underlying soils are excluded from atmospheric exchange.

Contamination: The introduction of any foreign material to a soil can be considered contamination. In wilderness, soils are vulnerable to atmospheric deposition of a range of contaminants including fertilizers, pesticides, and mercury. Some of these airborne contaminants may be generated from local or regional sources, but some research suggests that global wind patterns can deliver contaminants from sources around the globe.

Wilderness soils are also subjected to direct contamination from sources within wilderness. Humans and stock excrete waste products onto or into the soils. In addition to being possible sources for biological contaminants such as *Escherichia coli* (*E. coli*), *Campylobacter*, and *Giardia*, waste products can introduce trace amounts of chemical contaminants such as pharmaceutical by-products. These contaminants have been measured in water quality samples (see the water quality section of this chapter) and it is likely that they are introduced in the soil as well.

Some fire and fire suppression activities can impact soils and cause contamination. In all cases, prescribed burns in the parks are designed to mimic or restore natural fire regimes; however, some areas that have undergone a prolonged absence of fire may experience unnaturally altered soil properties following prescribed fire activities. Rarely, chemical fire retardants may be used in wilderness when there is a significant threat to life or property. In all cases, planned and unplanned fire-related management activities in wilderness will follow minimum-impact guidelines and are discussed in depth in the *Fire and Fuels Management Plan* (2013).

Direct Removal: Soils can be impacted by actions that directly remove natural soils and deposit them elsewhere. Visitors may disrupt natural soils in this way when constructing cat-holes or when modifying camping areas for tent sites or other purposes. Wilderness managers may also directly remove soils in the process of installing signs or food-storage boxes, maintaining trails, or completing projects like relocating a ranger station. While these direct removals are effectively permanent, they are highly localized; therefore, they typically have very limited consequences in terms of subsequent soil impacts or impacts on vegetation.

FACTORS THAT CONTRIBUTE TO SOIL IMPACTS

Visitor and wilderness management activities can have adverse impacts on soils. Impacts on soils tend to be concentrated along trail corridors, campsites, and other attractions such as vistas, ranger stations, and near food-storage boxes. Human foot traffic is generally seen as the method of overland locomotion that causes the least impact (Pickering 2010). The intensity of impacts can vary widely depending on a complex relation between the characteristics of the trail (or lack of a trail in the case of cross-country travel), the environment, and the type of use that the trail receives (Cole 1987). In an overview of previously published literature, Pickering (2010) found a general agreement in the literature that the higher the elevation, the less resistant the soils are to impact, thus alpine areas are more susceptible to adverse impacts. However, throughout wilderness, foot traffic has limited impacts on soils.

The timing of visitor use also plays an important role in potential impacts. The Mediterranean-type climate generally means hot, dry summers and cool, wet winters. Excessively dry and excessively wet material is more susceptible to erosion and compaction. Both local and seasonal variations determine antecedent soil moisture conditions.

Impacts due to recreational and administrative stock use are similar to those from foot traffic, particularly in terms of soil compaction, erosion, loss of ground cover, and trail widening; however, the severity of impacts due to hoof traffic are potentially much greater than those resulting from foot traffic (Pickering 2010). Local settings also play a role in determining the extent of potential impacts. For example, wet meadows and stream crossings are more vulnerable to soil impacts related to visitor use than most other wilderness settings. A GIS analysis using the best available data reveals that there are 990 trail-stream crossings (fords) in the parks. Trails that cross streams perpendicularly can lead to bank or edge-of-field-type gully development (Poesen et al. 2003). A similar analysis indicates that there are 108 miles of trail within 100 feet of a stream in the parks. Trails that parallel streams can lead to a loss of vegetation and bank failure. Table 75 lists how many of these stream crossings and trail-miles are open to stock among alternatives. As discussed above, these numbers provide a measure of potential erosion due to alterations

in land use, but there is little information about climate, topography, or soils at these locations. Additionally, it is uncertain how more or less open fords or trails would disperse or concentrate stock impacts to soils. As a result, changes in soil erosion at these locations cannot be predicted accurately for each alternative and distinctions are not made in the individual alternative assessments below.

Altered nutrient cycling in soils due to stock use is also a potential concern, because the dispersion of nitrogen and phosphorous in the natural system can be altered by manure and urine if quantities are large enough (Edwards et al. 1999; Westendorf 2009). However, studies of managed grazing in Sierra Nevada montane meadows similar to those found in the parks have concluded that there is minimal impact on most nutrient pools due to moderate grazing (Blank and Morgan 2010). There are approximately 23,000 acres of meadow within these parks. Experience has demonstrated that named forage areas receive almost all of the stock visits. These named forage areas would be the most likely to experience increases in compaction and altered nutrient cycling regimes. Table 75 lists the acres of named forage areas open to stock grazing across the alternatives.

Studies reveal that increases in bare ground may result from stock grazing (Cole et al., 2004). It is possible that the bare ground is a result of compaction and altered nutrient cycling rather than foraging. Cole et al. (2004) revealed that during a four-year study in Yosemite National Park, bare ground in moderately grazed areas increased on average between 7% and 14% depending on meadow type. Like compaction and nutrification, increases in bare ground would be expected to occur in named forage areas open to stock grazing (table 75).

Table 75: Streams and Named Forage Areas Subjected to Potential Stock Impacts

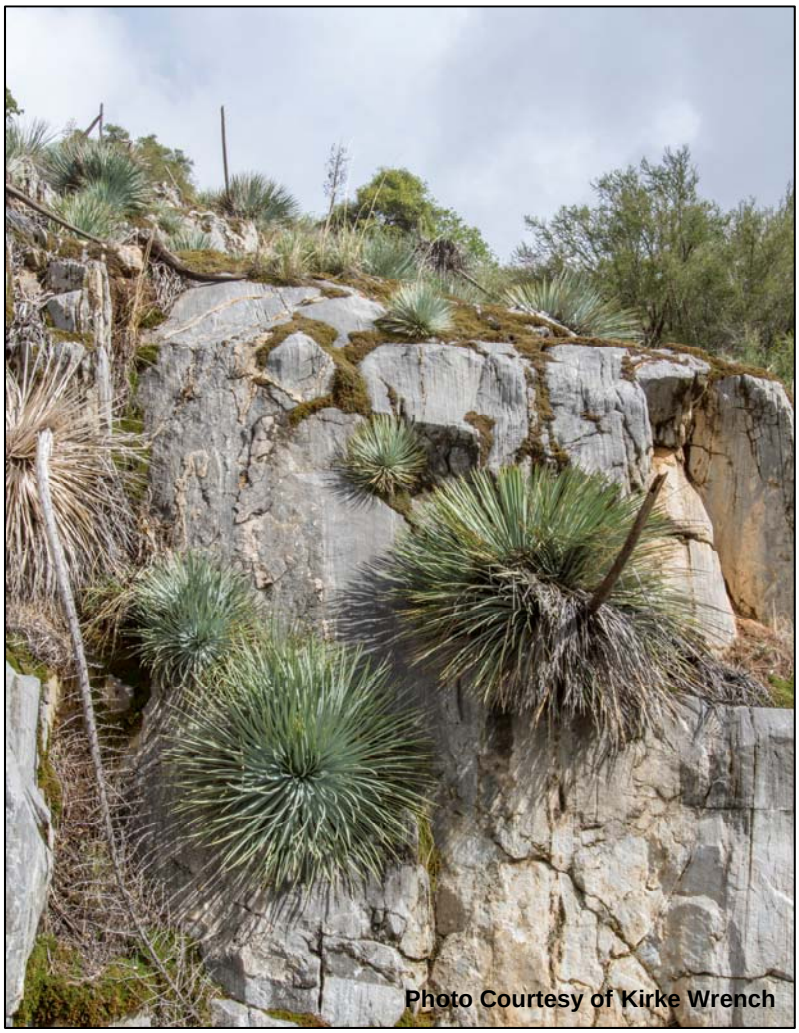
Sites of Potential Impact	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Number of Trail-stream Crossings Open to Stock	762	677	691	507	686
Miles of Trail Open to Stock within 100 feet of Streams	87	78	79	59	78
Acres of Named Forage Areas Open to Stock Grazing	6572	5763	5540	0	5484

In most cases, regardless of what has created the impacts, the impacts on soil can persist long term. Site preparation, such as proper site or route selection, surface hardening and water control features can reduce impacts on trails; however, complete restoration is difficult after impacts have occurred.

However, within the parks' wilderness, preliminary results from ongoing soil surveys indicate no evidence of significant compaction, contemporary or historical, within the parks' meadows. The surveys noted biologic activity within the soils that may contribute to resistance to and recovery from stock induced compaction (Cathy Scott pers. comm., 2014). It is recognized that stock, and horses in particular, make more sediment available for erosion per user when compared to hikers (Pickering et al. 2010). Deluca et al. (1998) and Cole (1987) found that the relationship between the amount of traffic and trail erosion was curvilinear; that is, initial trail traffic is much more impactful than subsequent traffic. Evidence of this relationship is often apparent in National Parks in the form of informal trails where a few

initial visitors taking a cross-country route can quickly form a well-worn trail that encourages others to follow. These studies considered use levels far below levels seen in Sequoia and Kings Canyon National Parks, and the studies lasted for a short period of time. However, if the relation holds true at high use levels and for long time intervals, then it is likely that trail erosion would approach a maximum level at very low visitation numbers and that the changes in visitor-use levels considered in this plan would not have a significant impact on total trail erosion.

To mitigate erosion, it is important to identify potential or incipient erosion and take action to maintain or achieve balance. Rapid identification of and response to deteriorating trail condition is essential to limiting soil impacts. Standards and best management practices exist to guide maintenance efforts. Rerouting trails to lower grade slopes, surface hardening, and water bars are all effective tools that allow managers to limit impacts on soils. In the case of meadows, the Stock Use and Meadow Monitoring and Management Strategy (appendix D) establishes standards of acceptable vegetation removal and bare ground. Vegetation and soil moisture conditions are used to establish grazing opening dates for meadows open to grazing in the parks' wilderness.



Yucca in the foothills

Like erosion, soil compaction can result from all types of visitor use and from administrative activities; it is recognized that stock can result in slightly greater compaction per user when compared to hikers because of their greater weight (Cole 1989a). Perhaps more than erosion, soil compaction is responsible for loss of vegetation along trails as water and roots are inhibited from entering the smaller pore spaces. Compacted soils are often armored against erosion, but they can deliver excess overland runoff to uncompacted soils, which results in increased erosion at that point.

Compaction is best mitigated by prevention. This can be accomplished by proper site selection for trails, campsites, and facilities. It is unlikely that medium gravel-sized particles or larger can be mobilized and compacted by human or hoof impacts; therefore, trails preferentially located on gravel or larger sediments will experience minimal compaction. Management actions to reverse compaction are limited, but compaction can be alleviated through natural processes if the impacting activity is removed. Successive freeze-thaw cycles, root wedging, and animal burrowing can naturally restore compacted soils.

Soil contamination in the parks' wilderness is often the result of excreted waste deposited by humans and stock. Microbial contaminants such as total coliforms, *E. coli*, *Campylobacter*, and *Giardia* can be found in excreted waste deposited on and within soils. Human and stock urine and feces are often rich in nitrogen and phosphorous and to a lesser extent can contain residual pharmaceutical compounds. These contaminants have been the subject of water quality studies in the parks, but they have not been analyzed in soil samples. Contamination due to human and stock is discussed at greater length in the "Water Quality" section of this chapter.

Contamination mitigation includes a reduction of waste either through the reduction of visitors and stock or the adoption of pack-out waste kits. Waste contamination mitigation also includes strategies to disperse waste widely so the concentration levels do not reach an impactful level or to concentrate waste in pre-selected areas that have the capacity to store or decompose the waste. Cat-holes and privies, respectively, disperse and concentrate waste throughout wilderness. In each case, proper site selection is essential to minimizing the adverse effects.

Prescribed fire activities may alter soil properties beyond the range of natural variability in areas that have seen long periods of fire exclusion. These fires would tend to be larger and hotter and may alter soil properties such as hydrophobicity (MacDonald and Huffman 2004), soil water pH (Murphy et al. 2006), or microbial biomass (Mabuhay et al. 2006).

Science in these parks has shown a marked increase in nitrate in surface waters persisting for more than one year following chemical fire retardant application (Tobin et al. 2103). Nitrate is one of a number of byproducts of chemical fire retardant, and it is possible that the nitrate is stored in the soil during dry periods and remobilized during runoff events.

Direct removal includes digging holes for waste disposal ranging from individual cat-holes to administrative privies. While the excreted waste associated with this type of impact is discussed above, the direct removal and relocation of soil is, in itself, a disturbance. Visitors can contribute to the direct removal of soil when they level their campsite or dig fire pits. Similar soil impacts can be attributed to the installation or removal of administrative structures such as ranger stations. The installation and maintenance of trail systems directly contribute to the direct removal of soil. The impacts of trail systems and maintenance are discussed below.

Visitor-related, direct-removal of soil in wilderness is generally limited to small-scale excavations such as cat-holes or other minor campsite improvements. Larger scale direct removal efforts are most often restricted to administrative activities such as privy construction, ranger station improvements or removals, and trail maintenance. With few exceptions, the direct removal of soil occurs as a consequence of management actions aimed at mitigating other soil impacts. Efforts to mitigate impact due to direct removal of soil include: proper site selection, an effort to limit scope and scale of impacts on only the area necessary, and a cost-benefit analysis weighed against the impact that the direct removal is intended to mitigate.

IMPACTS OF TRAILS SYSTEMS AND MAINTENANCE

Trails are a primary recreation resource facility on which recreation activities are performed and provide access to areas without roads (Marion and Leung 2001). Trails tend to concentrate visitor impacts along specific corridors and convey visitors to pre-determined locations within wilderness. Trails are subjected to erosion, compaction, and contamination due to visitor and administrative use; trail maintenance activities often rely on direct removal of soil and rock. A properly designed trail system in many ways relies on applying direct removal (i.e., physical alteration) impacts in a thoughtful, pre-defined manner to reduce the occurrence of other impact types from appearing randomly across the landscape in the future.

A comprehensive and resource-based trail maintenance program is an important mitigating factor in limiting impacts on soils along trails. Rapid identification of and response to deteriorating trail condition is essential in limiting soil impacts. Standards and best management practices would guide maintenance efforts. Rerouting trails to lower grade slopes, surface hardening, and water bars are all effective tools that allow managers to limit impacts on soils.

Under all action alternatives (alternatives 2, 3, 4, and 5), a Trails Management Plan would be adopted. Similar in approach to the USFS trails management program, the parks would establish a trail classification system to inform the management of trails throughout wilderness. Trail classification level is often closely correlated with visitor use and can form a positive reinforcement cycle. Increasing visitor use, and the accompanying impacts, often demands greater levels of trail construction and maintenance. As trails are constructed and maintained at higher levels, they will encourage increased visitor use. A well-founded trail management and classification system can help managers frame trail assessment and inventory strategies, select the proper trail classification corresponding to current and anticipated visitor use, and apply proven prevention and mitigation measures at vulnerable trail segments. Overall, the results from the implementation of the trail management and classification system on soils would be beneficial and widespread, though there may be localized adverse effects if trails selected for downgrading continue to have high levels of use. The trail management and classification system more fully describes the new proposed trail management and classification system and impact mitigation strategies and is included as an appendix to this plan (appendix K).

IMPACTS OF ALTERNATIVE 1: NO-ACTION / STATUS QUO

As discussed above, visitors, the use of stock and administrative activities impact soils in many of the same ways. Because wilderness visitation in the parks has been stable or declining over the last few decades, it is reasonable to assume that the current observed conditions are in near-equilibrium with sources of impacts. Since alternative 1 makes no changes to the management of the parks' wilderness, it is likely that the prevailing environmental conditions would persist under this alternative.

Cumulative Effects: Other than those ongoing projects and activities associated with the administration of wilderness (e.g., trail maintenance and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on soils.

The projects that may affect soils that are separate from projects proposed by this WSP/FEIS include research and resource management projects that result in soil disturbance. One project that affects soils on a wilderness-wide basis is the Natural Resources Conservation Service soils mapping project that is occurring through 2016. Determining soil type requires excavating hundreds of holes to examine the soil and to take samples across the entire geographic area of the parks. The excavated holes are small and refilled after the sampling is completed; therefore, the impact is adverse but temporary.

The resource management projects with the potential to effect soils include the restoration of Halstead Meadow (ongoing), the proposed restoration of Cahoon Meadow, and the ongoing restoration of illegal marijuana grow sites. These types of activities may result in temporary adverse effects during project work (e.g., soil disturbance during project work) but generally result in beneficial effects on soils once the areas are restored to natural conditions.

Fire management activities, such as allowing fires to burn or suppressing fires, including the use of fire retardant, can affect soils by altering soil properties. Since this alternative proposed no changes to the management of wilderness, except for the determination of the proper levels and types of commercial services, there would be no significant cumulative impacts associated with the alternative.

IMPACTS OF ALTERNATIVE 2: PROTECT WILDERNESS CHARACTER BY IMPLEMENTING SITE-SPECIFIC ACTIONS (NPS PREFERRED ALTERNATIVE)

In general, this alternative seeks to maintain visitation into the parks' wilderness. Therefore, the impacts from continued visitor use would be similar to current conditions as described under alternative 1.

Alternative 2 allows for continued, regular trail maintenance in accordance with the Trail Management and Classification System (appendix K). Under this alternative, many trails would be maintained at their current level, but site-specific actions could be taken to downgrade trail maintenance levels. In general, a reduction in maintenance levels would mean a reduction in erosion mitigation practices such as water bars or surface hardening; however, care would be taken when selecting trails for downgrade and many erosion impacts could be avoided. This alternative also allows for the establishment of new Class 1 trails (upgrading designated unmaintained routes or formalizing informal trails) to protect resources. Wilderness-wide, impacts from the alternative are not substantially different from the status quo (alternative 1) with some localized adverse impacts where trails are downgraded and some localized beneficial effects where new trails are established.

Under this alternative, some food-storage boxes would be removed and some may be relocated. The removal of food-storage boxes and potential restoration of the removal areas would benefit soils by reducing soil compaction and erosion potential in localized areas. If food-storage boxes are relocated to new areas, there would be localized adverse effects on soils in the construction area, and in the long-term compaction would occur because of increased use around the site. This alternative provides for the removal of privies and restrooms that are non-functional, or those in inappropriate locations, and installation of new privies may be considered for day use areas. The use of pack-out waste kits would be recommended or required in selected areas. The removal of privies and/or restrooms and subsequent restoration of the privy sites would benefit soils by reducing soil compaction and erosion potential in localized areas. If new privies are constructed, there would be localized adverse effects on soils in the construction area and in the long-term compaction would occur because of increased use around the privy sites. The use of pack-out waste kits would benefit the soils in localized areas because there would be no need to disturb soils for privy construction or for burying of human waste in these areas.

This alternative would recommend camp areas for stock users, and may result in the creation of formal stock-only campsites. If the selected sites are resilient to stock impacts then this would focus the area of effect in those designated camp areas, benefiting soils in locations where stock camping would be prohibited.

This alternative provides for similar levels of stock use throughout wilderness. As a result, some impacts on soils, especially compaction, devegetation, incision, and widening of trails would occur. Wilderness wide, impacts would be small, with the potential for more substantial adverse impacts at a few specific sites. These sites would generally be limited to especially steep or wet sections of the most utilized trails in wilderness, and in wet areas such as stream crossings in meadows. There would similar impacts as under alternative 1 from soil compaction at campsites, but there could be increased impacts at camping tie-up areas where areas are closed to grazing. Effective monitoring of meadows in accordance with the Stock Use and Meadow Monitoring and Management Strategy protocols (appendix D), ranger patrols, and visitor reports would provide necessary information to minimize the impacts by restricting access and use. By closing selected sites to grazing, it would deter camping or holding of stock in meadows in these areas.

Cumulative Effects: This alternative reduces development, but allows for continued grazing, and would result in similar numbers of visitors and stock, wilderness-wide, as current conditions. Similar numbers of visitors would result in little change to wilderness soils.

Other than those ongoing projects and activities associated with the administration of wilderness (e.g., trail maintenance and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on soils. The projects that may affect soils that are separate from projects proposed by this WSP/FEIS include research and resource management projects that result in soil disturbance. The majority of other past, present, and future foreseeable projects in wilderness have no potential for effects on soils, but several projects do have such potential, including the soils mapping project, the Cahoon Meadow Restoration, the Halstead Meadow Restoration, restoration activities related to illegal marijuana grow sites, and fire management activities, as described for alternative 1.

This alternative would result in impacts that are not substantially different from the status quo (alternative 1) with some localized adverse impacts where trails are downgraded and some localized beneficial effects where new trails are established. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

IMPACTS OF ALTERNATIVE 3: PROVIDE MORE OPPORTUNITIES FOR PRIMITIVE RECREATION

In general, this alternative would allow for increased visitation in wilderness. As a result, adverse impacts on soils may increase slightly.

Trail maintenance is an important mitigating factor in limiting impacts on soils along trails. Alternative 3 allows for continued, regular trail maintenance in accordance with the Trail Management and Classification System for Sequoia and Kings Canyon National Parks (appendix K). It also allows for the improvement of trail conditions in many areas of the parks. Improved trail conditions, including better route selection, surface hardening, and runoff control structures would mitigate many potential increases in adverse impacts along trails.

This alternative would add food-storage boxes in strategic locations, primarily in areas that visitors already tend to camp and congregate. This alternative also provides for installation of new privies in busy locations, and requires pack-out kits in the Mount Whitney area. If new food-boxes are added, and new privies are constructed, there would be localized adverse effects on soils in the construction area, and long-term adverse effects from soil compaction around the food-storage box and privy sites as a result of increased visitor use. The use of pack-out waste kits would benefit the soils in localized areas because there would be no need to disturb soils for privy construction or for burying of human waste in these areas.

With increased visitor use levels, the potential for adverse impacts on soils also increases. While impacts would be minimal wilderness-wide, some isolated sites could experience additional impacts resulting from the establishment of additional camp areas and increased informal trailing. This alternative would establish formal camp areas for stock users. If the selected sites are resilient to stock impacts then this would focus the area of effect in those designated camp areas, benefiting soils in locations where stock camping would be prohibited.

This alternative provides for an increase in stock-party size throughout wilderness. As a result, some impacts on soils, especially compaction, devegetation, incision, and widening of trails would occur. Wilderness wide, impacts would be small, with the potential for more substantial adverse impacts at a few specific sites. These sites would generally be limited to especially steep or wet sections of the most utilized trails in wilderness, and in wet areas such as stream crossings in meadows. There would be increased soil compaction at campsites, and at camping tie-up areas. This alternative would lead to an

increased potential for bank or edge-of-field gully development, especially in meadows. Effective monitoring of meadows in accordance with the Stock Use and Meadow Monitoring and Management Strategy protocols (appendix D), ranger patrols, and visitor reports would provide necessary information to minimize the impacts by restricting access and use. At the wilderness scale, many of the impacts would be offset by reducing off-trail grazing in four large sections of the parks. By closing selected sites to grazing, it would deter camping and holding of stock in meadows in these areas.

Cumulative Effects: This alternative allows for more visitors and increased stock use, resulting in adverse impacts on soils. But, these impacts would be temporary and in isolated areas, and the net effect would be minimal. The majority of other past, present, and future foreseeable projects in wilderness have no potential for effects on soils, but several projects do have such potential, including the soils mapping project, the Cahoon Meadow Restoration, the Halstead Meadow Restoration, restoration activities related to illegal marijuana grow sites, and fire management activities, as described under alternative 1. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

IMPACTS OF ALTERNATIVE 4: EMPHASIZE UNDEVELOPED QUALITY AND NON-COMMERCIAL RECREATION

This alternative seeks to maintain or slightly reduce visitation into the parks' wilderness. As a result, adverse impacts on soils may decrease slightly overall from reduced use.

This alternative calls for some trails to be maintained in their current condition while allowing for upgrades or downgrades to trails as appropriate. If trails are selected for upgrades and downgrades appropriately, (i.e., naturally stable trails downgraded and naturally vulnerable trails upgraded), then there would be beneficial effects. A reduction in maintenance could potentially result in degraded soil conditions should a downgraded trail selection be inappropriate.

Food-storage boxes would be removed, thus potentially reducing a focal point of human use, though the placement of food-storage boxes was initially based on existing camp areas so the resulting improvements to soil conditions would be minimal. This alternative also eliminates privies and restrooms in wilderness; this would reduce concentrated use and it would shift the burden of responsible waste disposal to individual visitors. In the event that non-compliance begins to degrade soils, restrooms in high-use areas could be returned to service. The use of pack-out waste kits would benefit the soils in localized areas because there would be no need to disturb soils for privy construction or for burying of human waste in these areas.

All designated campsites would be removed and sites could be rehabilitated under this alternative, reducing soil compaction and erosion potential in localized areas.

This alternative would close many areas of the parks to commercial stock use. It would also eliminate grazing for all user types park-wide. It is likely that these restrictions would lead to reduced use by stock wilderness-wide. As a result, some beneficial effects could be expected. Impact intensity would be low, with the greatest beneficial effects seen along steep trail segments that are particularly vulnerable to erosion, and at trail-stream crossings in wet meadows. While there is little evidence of substantial gully development in meadows under current conditions, reducing hoof traffic in meadows would reduce the likelihood of future edge-of-field gully initiation. This alternative also calls for the removal of administrative pastures in wilderness, which would provide beneficial effects on soils in these areas by removing administrative stock use from these pastures.

Cumulative Effects: This alternative calls for a decrease in visitor use, restricts commercial access, and eliminates grazing wilderness-wide. These changes could result in a reduction of impact intensities wilderness-wide; but as there are no recognized threats to soils under current conditions, the net benefit would be minimal. The majority of other past, present, and future foreseeable projects in wilderness have no potential for effects on soils; but several projects do have such potential, including the soils mapping project, the Cahoon Meadow Restoration, the Halstead Meadow Restoration, restoration activities related to illegal marijuana grow sites, and fire management activities. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

IMPACTS OF ALTERNATIVE 5: EMPHASIZE OPPORTUNITIES FOR SOLITUDE

Under this alternative, visitor use would be reduced from current levels. Fewer visitors could result in fewer effects from visitor use overall, such as the development of informal trails and new campsites.

This alternative calls for most trails to be to be maintained to their current or higher development class. Trail maintenance is an important mitigating factor in limiting impacts on soils along trails. Under this alternative, many trails would be maintained at their current level, but site-specific actions could be taken to downgrade trail maintenance levels. In general, a reduction in maintenance levels would mean a reduction in erosion mitigation practices such as water bars or surface hardening. However, care would be taken when selecting trails for downgrade and many erosion impacts could be avoided. Wilderness-wide, impacts from the alternative are not substantially different from the status quo (alternative 1) with some localized adverse impacts where trails are downgraded, and some localized beneficial effects where new trails are established.

Facilities, such as food-storage boxes and privies, would be removed. This would reduce concentrated use and it would shift the burden of responsible waste disposal and proper food storage to individual visitors. The effects from removing the facilities would be the same as those described under alternative 4.

There would be no designated campsites under this alternative, and no formalized camp areas for stock. If designated campsites are rehabilitated, soil compaction and erosion potential would be reduced in these locations. With reduced overall use, some beneficial effects would be expected. The greatest beneficial effects would be seen along steep trail segments or in off-trail areas that are particularly vulnerable to erosion, and at trail-stream crossings in wet meadows. While there is little evidence of substantial gully development in meadows under current conditions, reducing hoof traffic in meadows would reduce the likelihood of future edge-of-field gully initiation.

Cumulative Effects: This alternative calls for a decrease in the number of visitors and stock wilderness-wide, reduces development, but allows for continued grazing. Fewer visitors would result in a reduction of adverse impacts wilderness-wide; however, the net benefit would be minimal. The majority of other past, present, and future foreseeable projects in wilderness have no potential for effects on soils, but several projects do have such potential, including the soils mapping project, the Cahoon Meadow Restoration, the Halstead Meadow Restoration, restoration activities related to illegal marijuana grow sites, and fire management activities. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

CONCLUSION

Under alternative 1, the soils of the parks' wilderness would continue to be affected through erosion, compaction, contamination, and direct removal from visitor and administrative activities, including stock

use. The action alternatives would result in impacts on soils that are not substantially different than those occurring under current conditions. The amount of visitor use and the amount of stock use would drive changes to the intensity of impacts on soils. Alternative 3 would increase the number of visitors and stock wilderness-wide slightly, alternative 2 would have similar numbers of visitors and stock, and alternatives 4 and 5 would decrease the number of visitors and/or stock. The effects of visitor and administrative activities are not currently posing recognizable threats on soils; therefore, it can be concluded that the minimal beneficial or adverse impacts on soils from the action alternatives would not produce significant impacts on soils.

WATER QUALITY

METHODOLOGY FOR ANALYZING IMPACTS

Impacts on water quality were assessed by reviewing existing literature and characterizing the effects based on the types of impacts that could occur, and the analyzing factors that could contribute to water quality impacts under each alternative. Water quality can be determined by measuring the physical, chemical, and biological indicators that can be affected by both natural and anthropogenic processes. Visitors and stock can impact water quality by introducing sediment, chemical agents, or biological contaminants into water sources. Sediment is introduced through erosion (see "Soils" section of chapter 4), chemical agents can be introduced through personal contact with water sources or contact with human or stock waste, and biological contaminants are introduced through contact with human or stock waste. While research has detected impacts associated with visitor use, no water quality effects have been detected at levels comprising an ecological or human health concern (Clow et al. 2013; Derlet et al. 2008a; Derlet et al. 2008b). Management activities may also result in water quality impacts, but these impacts would be localized. As a result, differences among the alternatives in terms of types and amounts of visitor use would not result in important differences in the resultant water quality, and water quality is expected to remain good under all alternatives.

TYPES OF IMPACTS ON WATER QUALITY

This section analyzes what is known about impacts on water quality as a result of three use types: human, stock, and management actions. Over the years, there have been numerous efforts to assess the water quality in the parks' wilderness. Much of the work has used fecal indicator bacteria as a measure of water quality. The primary emphasis of this work was to investigate the potential health risks of consuming unfiltered water in wilderness, and the possible contamination sources based on visitor-use types and patterns. Occasionally, these studies also had accompanying physical and chemical water quality measurements. In addition to the scientific studies that address water quality questions, a review of the Safety Management Information Systems, an internal NPS employee health reporting database, indicates that employees of the parks have reported seven cases of gastrointestinal distress while on duty in wilderness in the last 15 years (Payne pers. comm., 2014); however, it is not clear if this is a result of waterborne pathogens or unsanitary practices unrelated to wilderness waters.

Biological Impacts of Visitation on Water Quality: Biological impacts of visitor use on water quality in the parks' wilderness have been the focus of a variety of studies conducted in the parks. Biological impacts on water quality due to visitation vary relative to the amount of use. There are many confounding factors that have hampered efforts to attribute impacts on particular types of users. For example, many studies of coliforms in the parks compared mixed-use sites with backpacker-only sites. In all cases, these studies relied on wilderness permit data to identify mixed-use versus backpacker sites. They did not use on-the-ground measurements of how many humans, stock, or wildlife actually visited the area. The studies fail to account for differences in ease of access, remoteness, biological activity, wildlife impacts,

total number of visitors, or the wide variation in the outdoor ethics among individuals. For example, it is reasonable to assume that humans who have little experience or training regarding wilderness hygiene and sanitation have more negative impacts on water quality. It is likely that this subset of inexperienced human visitors most frequently visit "mixed-use" areas because these sites tend to be easier to access, closer to the parks' boundaries, along better maintained trails, and have abundant water among other things. At the same time, "backpacker-only" areas tend to be more remote, harder to access, may be less attractive to wildlife, and have fewer visitors. These visitors are more likely to have experience and knowledge about wilderness hygiene and low impact sanitation measures.

Setting these confounding variables aside, studies suggest that biological impacts of visitation on water quality in the parks' wilderness are limited and that water quality is very good except during storm events. One of the most frequently expressed concerns is the human health risk in wilderness associated with pathogens introduced by wildlife, humans, and/or stock. Most recently Clow et al. (2013) investigated the prevalence and magnitude of fecal indicator bacteria associated with visitor use using current USEPA (2012) standards for water quality assessment. The USEPA standards call for monitoring *E. coli* as an indicator for potential pathogenic threats to human health. Clow et al. (2013) measured *E. coli* at three study site categories determined as 1) minimal use (wildlife-only); 2) backpacker use (backpacker and wildlife); and 3) mixed use (stock, backpacker, and wildlife). Results indicated that water quality in the parks' wilderness is generally good, except during storms, and visitor use appears to have a small influence on stream water quality.

During the Clow et al. (2013) synoptic portion of the water quality study, 72 surface-water sites were sampled, resulting in an average of 2.8 colony-forming units (CFU) per 100 ml of water of *E. coli* at mixed-use sites (n=21), 1.1 CFU/100 ml at backpacker-use sites (n=9), and 0.3 CFU/100 ml *E. coli* in minimal-use sites (n=42). Although there were statistically significant differences between these visitor-use categories, the concentrations are well below standards established by the Water Quality Control Plan for the Tulare Lake Basin, Second Edition (2004). This standard states that in waters designated as REC-1 (which includes the major river systems within these parks) the fecal-coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200 CFU / 100 ml, nor shall more than 10% of the total number of samples taken during any 30-day period exceed 400 CFU / 100 ml. Therefore, it is reasonable to conclude that regardless of the type of visitor use, water quality in Sequoia and Kings Canyon National Parks wilderness is good.

The Clow et al. (2013) study also measured water quality in paired sites located above and below areas with different user types. In backpacker-use areas, Clow determined that there were no significant differences in water quality when comparing the two locations. However, a small adverse impact on water quality below mixed-use areas was found when compared to water above, including an increase of *E. coli*; that was found at an average of 5 CFU/100ml above mixed-use areas and 30 CFU/100ml below mixed-use areas.

In the intensively monitored sites along Whitney Creek, Clow et al. (2013) temporal variation in *E. coli* was measured throughout the basin. Spikes in *E. coli* were associated with storm events large enough to generate overland flow. Some spikes in *E. coli* were above 200 CFU/100ml at the height of the storm runoff. While elevated, these intermittent spikes do not exceed the standard called for in the *Water Quality Control Plan for the Tulare Lake Basin* (2004) because the geometric mean of "not less than five samples for any 30-day period" does not exceed 200 CFU /100 ml. The results of this work support the finding that water quality is most degraded during and immediately following precipitation events large enough to generate overland flow. Adverse impacts associated with mixed-use likely make a negligible contribution to the decline in water quality during runoff events.

Results from this study suggest that mitigation through education would be an effective solution to combating human health risks associated with fecal microbes. Visitors who filter, treat, or avoid drinking water collected during or immediately after large storms would reduce their exposure to pathogens. Risk also tends to decrease with increasing remoteness, and visitors could further reduce their risk by considering the location of water collecting sites in relation to other high-use areas throughout the parks and treating their water accordingly.

In 1987, Suk et al. studied the relationship between human presence and occurrence of Giardia in streams throughout the Sierra Nevada, including within Sequoia and Kings Canyon National Parks. Nationwide, Giardia cysts have been found throughout the year in even the most pristine of surface waters and consumption of as few as 10 cysts have been known to cause infection in humans (USEPA 2009). Suk et al. (1986) sampled 15 locations within the parks and the highest concentration detected in the parks was two giardia cysts in 9 liters of water collected at Guitar Lake below the campground. In total, 14 cysts were found in 1,023 liters of water samples collected in the parks. While there was a statistically significant association between humans and Giardia presence, the concentrations were so low as to pose almost no threat to human health.

Derlet et al. (2004a, 04b, 06, 08a, 08b, 10) and Derlet (2008) have measured elevated concentrations of total coliform (v. *E. coli* specifically) throughout the parks. Derlet attempted to demonstrate a link between types of visitor use and total coliform; however, not all species of coliform produce ill effects and no correlation has been found between total coliform level and human health risks (USEPA 2012). Furthermore, Derlet was unable to follow USEPA standard operating procedures concerning holding times for coliform samples. The Derlet studies also attempted to distinguish between human, stock, and wildlife impacts. There is concern that the studies inaccurately attribute coliforms to specific sources due to ineffective study design and unverified assumptions made about visitor use patterns. Where management actions impact the biological components of water quality, it almost entirely parallels the impacts associated with human and stock visitors. Aside from hiking, camping, and utilizing stock to transport equipment, there are few other management actions that are likely to impact the biological components of water quality.

Chemical Impacts of Visitation on Water Quality: There have been a few studies of chemical impacts of visitation to wilderness water quality. Like the biological impacts, it is difficult to distinguish impacts between use types; however, there are some indications that humans may play a limited role in modifying the chemical properties of water quality, mainly through the introduction of unnatural chemical compounds associated with personal care products. The parks are currently collecting water samples for the USEPA to monitor contaminants of emerging concern (e.g., pesticides, pharmaceuticals, personal-care products, and wastewater indicators). The parks have collected a variety of “grab samples” from lakes and streams inside and outside of wilderness. Preliminary results show that N,N-Diethyl-meta-toluamide (DEET), the active ingredient in many bug repellants, and caffeine, a stimulant found in coffee and many soft drinks, can often be found in measurable quantities in areas where humans frequently visit. Infrequently, traces of prescription, over-the-counter, and illicit drugs can also be found in the parks’ wilderness waters (USEPA 2014). These results are similar to those found in Yosemite National Park (Clow et al. 2011), and it is reasonable to assume that similar conditions can be found throughout the parks’ wilderness. To date, there is no evidence that these chemical contaminants pose any threat to human or ecological health.

Regardless of the source, urine and feces contain, among other things, nitrogen, phosphorus, and potassium. These elements are the main constituents of fertilizers, and where waste is deposited, soils can become enriched in these compounds. Excess nutrients are utilized by terrestrial plants and when they are delivered to waterbodies, they could contribute to increased algae growth. Like humans, stock may contribute a small but measurable quantity of pharmaceuticals and their metabolites to wilderness waters

through urine and feces, but no study has been conducted to verify this assumption. Instead, studies have focused on increases in nitrogen or phosphorous in areas frequented by stock. These studies have been unsuccessful in decoupling human, stock, and wildlife impacts, but it is clear that in many cases water immediately downstream of heavily utilized, mixed-use areas (i.e., areas used by humans and stock) show increases in nitrogen or phosphorous. This is especially true immediately after rainfall events that drive overland flow and shallow surface discharge to waterbodies (Clow et al. 2013). Visitor use, whether it is human or stock, appears to have a small, but measurable impact on water quality.

Where management actions impact the chemical components of water quality, it likely parallels the impacts associated with human and stock visitors. Aside from hiking, camping, and utilizing stock to transport equipment, there are no management actions that are likely to impact the chemical components of water quality.

Management actions that can have impacts to the chemical properties of wilderness waters include prescribed fire and fire suppression activities. Prescribed burns in the parks are designed to mimic or restore natural fire regimes; however, some areas that have undergone a prolonged absence of fire may release unnatural levels of chemical constituents into surrounding waters after prescribed burning. Rarely, chemical fire retardants may be used in wilderness when there is a significant threat to life or property. Scientific studies in Sequoia and Kings Canyon National Parks has shown a marked increase in nitrate in surface waters persisting for more than one year following chemical fire retardant application (Tobin et al. 2013). Nitrate is one of a number of byproducts of chemical fire retardant, and it is presumed that the nitrate is stored in the soil during dry periods and delivered to nearby rivers during runoff events. In all cases, planned and unplanned fire-related management activities in wilderness will follow minimum-impact guidelines and are discussed in depth in the *Fire and Fuels Management Plan* (2013).

The banks of a high-elevation lake

Physical Impacts of Visitation on Water Quality: Humans, stock, and management actions all have similar impact on the physical characteristics of water quality. All user types can impact physical water quality by increasing the rate of soil erosion near water or by directly agitating bottom sediment in lakes and streams. As discussed above, increasing the suspended sediment in water directly impacts other physical characteristics of water.

Trails that cross streams perpendicularly can contribute to bank failure and gully development, as well as direct agitation of bottom sediments. Trails that parallel waterbodies, such as informal fishing trails or trails that circumnavigate lakes can potentially lead to significant bank failures. This can result from direct, catastrophic bank collapse or prolonged

vegetation removal in the riparian zone and subsequent bank undermining and ultimately bank failure. There is little data assessing trail impacts on waterbodies throughout wilderness. The SUMMP and trail crew reports are perhaps best suited to identifying and monitoring impacts that would lead to declining physical water quality. To date, there is no indication, anecdotal or otherwise, that visitation is contributing to significant adverse impacts on physical water quality.

Management actions contribute to erosion and, thereby, affect physical water quality in a variety of different ways. In addition to hiking and using stock to access sites, which are comparable to visitor hiking and stock impacts, land managers can take a variety of actions that are unlike typical visitor impacts. Trail maintenance activities and site modifications, such as installation or removal of ranger stations or privies, are often undertaken with the intention of reducing impacts over the long term; however, short-term increases in sediment yield and a corresponding decrease in physical water quality may result.

IMPACTS OF ALTERNATIVE 1: NO-ACTION / STATUS QUO

As discussed in "Chapter 3: Affected Environment," humans and stock appear to have had little impact on water quality or on the overall health of the aquatic ecosystem when compared to environments with very little use. Some measurable impacts have occurred, especially near the most heavily utilized mixed-use sites; however, the impacts remain below accepted thresholds of health or ecological concern. When impacts have occurred, the duration of altered water quality in most cases is short term, and any introduced microbial contaminants may degrade naturally when exposed to the natural environment. Because wilderness visitation in the parks has been stable or declining over the last few decades, it is reasonable to assume that the current observed conditions are in near-equilibrium with sources of impacts. Alternative 1 makes no changes to the management of parks' wilderness; therefore, it is likely that the prevailing environmental conditions would persist under this alternative.

Cumulative Effects: Other than those ongoing projects and activities associated with the administration of wilderness (e.g., trail maintenance and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on water quality. Most of the effects on water quality result from air pollution from external sources (see the "Water Quality" section of chapter 3).

The projects that may affect water quality that are separate from projects proposed by this WSP/FEIS include research and resource management projects and fire management activities that are located near or within waterbodies. Research projects around and in waterbodies may have a slight effect on water quality as a result of trampling around the shoreline and in the water, leading to increased turbidity. The resource management projects with the potential to effect water quality include the restoration of Halstead Meadow (ongoing) and the proposed restoration of Cahoon Meadow, and the ongoing restoration of illegal marijuana grow sites. These types of activities may result in temporary adverse effects during project work (e.g., increased turbidity during in-water work), but generally result in long-term beneficial effects on water quality once the areas are restored to natural conditions.

One project with the potential to adversely affect water quality, depending on the alternative selected, is the proposed high-elevation aquatics ecosystem restoration project. The proposed project would involve instream work, including netting and electrofishing to remove nonnative fish from selected high-elevation waterbodies. It also includes the proposed use of piscicides in 38 waterbodies. Stream water would be detoxified at the lower end of the treatment site using potassium permanganate. If piscicide use is selected as a treatment method, the piscicide and related potassium permanganate applications would reduce water clarity and contribute new chemical components to stream systems for the application period and in the short-term following application. Depending on environmental conditions (e.g., solar exposure, lake

depth, wind, pH, etc.), most of the chemicals would break down in several days to several weeks (CDFW 2007). Because the project locations are away from the primary visitor-use areas, no additional use of chemicals is proposed under any of the alternatives in this WSP/FEIS, and the effects of the proposed project would be short-term, thus there would be no cumulative impacts on water quality.

Fire management activities, as described previously, particularly when chemical fire retardants are utilized, can alter the chemical composition of surface waters. Nitrate is one of a number of byproducts of chemical fire retardant, and it is presumed that the nitrate is stored in the soil during dry periods and delivered to nearby rivers during runoff events.

Studies suggest that the impacts of visitor use, both stock users and hikers, coupled with impacts from wildlife and other sources of pollution have little impact on water quality and play almost no role in overall ecological health. At times, there can be small but statistically significant increases in many measured constituents, including *E. coli*, in and downstream of the most heavily visited sites. Since this alternative proposed no changes to the management of wilderness, there would be no significant cumulative impacts associated with the alternative.

IMPACTS OF ALTERNATIVE 2: PROTECT WILDERNESS CHARACTER BY IMPLEMENTING SITE-SPECIFIC ACTIONS (NPS PREFERRED ALTERNATIVE)

Under alternative 2, visitor use would remain at about the same levels. Therefore, the impacts from continued visitor use would be similar to current conditions as described under alternative 1.

Alternative 2 calls for the evaluation of existing privies and allows for the installation of new privies in areas where other methods have proven unsuccessful. New privies would result in beneficial effects on water quality in these areas. The removal of existing, failing privies should likewise result in small but beneficial effect on water quality. Expansion of the pack-out waste kit program to additional areas would likely improve water quality in those areas. Indications are that voluntary pack-out waste kits have been widely accepted in Mount Whitney area resulting in a beneficial effect. Expanding the voluntary use of this program would likely provide additional beneficial effects.

Alternative 2 provides for additional limits on stock travel in wilderness. Studies show that there are adverse impacts on water quality in areas that receive the greatest visitation from humans and stock. Therefore, reducing off-trail stock-party size should have a beneficial effect on water quality, but those improvements would be too small to quantify. Improvements would be isolated to areas adjacent and just downstream of the most heavily visited sites.

Alternative 2 also closes some areas to grazing in off-trail (cross-country) locations. Many of the areas to be closed are meadows associated with waterbodies. With the grazing prohibition in place, stock parties would likely avoid lengthy stays near these meadows (See the “Vegetation” section of this chapter). This would reduce the magnitude and frequency of adverse impacts concentrated in selected off-trail meadows. It should also reduce the impact on riparian zones in these locations. Riparian zones act as natural filters and help to improve and preserve water quality. This change should result in a beneficial effect on water quality in the areas proposed for the grazing prohibition

Alternative 2 calls for the prohibition of grazing in selected meadows along trails for resource and social considerations. These closures may also result in a small, beneficial effect on water quality.

Cumulative Effects: This alternative would result in similar numbers of visitors and stock wilderness-wide, reduces development, but allows for continued grazing. Overall, this alternative would result in beneficial effects on water quality. The majority of other past, present, and future foreseeable projects in

wilderness have no potential for effects on water resources, but several projects do have such potential, including the Cahoon Meadow Restoration, the Halstead Meadow Restoration, restoration activities related to illegal marijuana grow sites, the high-elevation aquatics ecosystem restoration program, and fire management activities. The meadows restoration projects and the restoration of illegal marijuana grow sites have the potential for highly localized beneficial effects on water quality. The high-elevation aquatics ecosystem restoration program would result in short-term adverse effects in localized waterbodies if the use of piscicides is approved, but long-term beneficial effects on aquatics species in the restoration sites. Fire management activities, such as allowing fires to burn or suppressing fires, including the use of fire retardant, can affect water quality by changing the chemical composition. Considered together there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

IMPACTS OF ALTERNATIVE 3: PROVIDE MORE OPPORTUNITIES FOR PRIMITIVE RECREATION

Alternative 3 provides for increased visitor use levels in certain areas. Studies indicate that backpackers have some small adverse impact on water quality, and it is reasonable to assume that additional users will likely result in more impacts, but the impacts should remain small and the overall health of the aquatic ecosystem would not be compromised.

Alternative 3 allows for the installation of new privies in high-use areas throughout the parks. The administrative action of installing new privies may impose some small degradation to water quality during the construction phase, but this would be immediately offset by beneficial effects of properly installed privies on water quality in these more popular areas. Additionally, pack-out waste kits would be required in the Mount Whitney area. Indications are that voluntary pack-out waste kits have had been widely accepted and ecologically beneficial in the Mount Whitney area and making their use mandatory would likely provide additional beneficial effects.

Alternative 3 provides for increased stock use in the parks. In most locations, party size limits would increase by five head. Studies show that there is little impact on water quality in areas that receive the greatest visitation from humans and stock. It is reasonable to assume that increasing stock-party size will likely have some negative impact on water quality, but it is unlikely that an increase of five head would result in any measurable increase in impacts. The impacts, where they occur would be short term and isolated to areas adjacent and just downstream of the most heavily visited sites, and generally limited to a period of time immediately following significant rainfall.

Alternative 3 also prohibits grazing in most off-trail locations throughout the parks. Many off-trail grazing sites closed under this alternative are meadows associated with waterbodies. With the grazing prohibition in place, stock parties would likely avoid lengthy stays near these meadows. This should reduce the magnitude and frequency of adverse impacts concentrated in off-trail meadows. It should also reduce the impact on riparian zones in these locations. Riparian zones act as natural filters and help to improve and preserve water quality.

Cumulative Effects: This alternative calls for an increase in the numbers of visitors and stock wilderness-wide, increases development slightly, and allows for continued grazing, though most off-trail areas would be closed to grazing. More visitors and increased stock use would result in a negative impact on water quality, but these would be short-term and in isolated areas; therefore, the net effect would be minimal. The majority of other past, present, and future foreseeable projects in wilderness have no potential for effects on water resources, but several projects do have such potential, including the Cahoon Meadow Restoration, the Halstead Meadow Restoration, restoration activities related to illegal marijuana grow sites, the high-elevation aquatics ecosystem restoration program, and fire management activities. As

discussed previously, the effects from these projects would result in both short- and long-term beneficial and adverse effects on water quality. Considered together there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

IMPACTS OF ALTERNATIVE 4: EMPHASIZE UNDEVELOPED QUALITY AND NON-COMMERCIAL RECREATION

A snow-banked stream

Alternative 4 provides for a slight decrease visitor use levels in certain areas. A reduction in users may result in small beneficial effects, but at a scale too small to measure.

Alternative 4 calls for the removal of all privies and restrooms from wilderness. The public would be required to dig cat-holes, or in more popular areas, required to use pack-out waste kits. Presumably pack-out waste kits would have a use rate slightly less than the privies; therefore, the removal of privies would likely have some small adverse impacts on water quality in popular areas where pack-out kit recommendations are not followed. Indications are that voluntary pack-out waste kits have been accepted in some areas such as around Mount Whitney, with beneficial results. Expansion of the pack-out waste kit program would likely have some beneficial effects on water quality as long as guidelines are followed.

Alternative 4 calls for significantly decreased commercial stock use in the parks. It also eliminates off-trail travel for administrative and commercial stock and closes administrative pastures throughout wilderness. Studies show that there are small, adverse impacts on water quality in areas that receive the greatest visitation from humans and stock. A significant reduction in commercial stock access would likely result in a commensurate reduction in visitors who typically choose to employ the services of commercial stock operators. This coupled with the restriction of administrative use would likely result in some beneficial effects on water quality. In this case, changes in impact intensity may be measurable, but as there are no recognized substantial impacts, the net benefit would be ecologically insignificant.

Alternative 4 also prohibits grazing throughout the parks. Many of the grazing sites closed under this alternative are meadows associated with waterbodies. With the grazing prohibition in place, stock parties would likely avoid lengthy stays near these meadows. This should reduce the magnitude and frequency of adverse impacts concentrated in meadows. It would likely reduce the impacts on riparian areas in these locations. Riparian areas act as natural filters and help to improve and preserve water quality. This

alternative would likely result in some beneficial effects on water quality in the areas previously opened to grazing.

Cumulative Effects: This alternative calls for a decrease in the number of stock, restricts commercial access (and levels of services) and eliminates grazing wilderness-wide. These changes could result in a reduction of impact intensities wilderness-wide but as there are no recognized threats to water quality under current conditions, the net benefit would be minimal. The majority of other past, present, and future foreseeable projects in wilderness have no potential for effects on water resources, but several projects do have such potential, including the Cahoon Meadow Restoration, the Halstead Meadow Restoration, restoration activities related to illegal marijuana grow sites, the high-elevation aquatics ecosystem restoration program, and fire management activities. As discussed previously, the effects from these projects would result in both short- and long-term beneficial and adverse effects on water quality. Considered together there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

IMPACTS OF ALTERNATIVE 5: EMPHASIZE OPPORTUNITIES FOR SOLITUDE

Alternative 5 provides for a reduction of visitor use levels wilderness wide. Wilderness visitors have a small, but adverse impact on water quality. A reduction in users would likely result in small, beneficial effects, but likely at a level below any detectable limits.

Alternative 5 calls for the removal of privies and restrooms wilderness-wide; visitors would be required to use cat-holes and pack-out waste kits would be recommended in some areas. Presumably pack-out waste kits would have a use rate slightly less than the privies; therefore, the removal of privies may have some adverse impacts on water quality in popular areas where pack-out kit recommendations are not adhered to. Indications are that voluntary pack-out waste kits have had been accepted in the Mount Whitney area. Should pack-out waste kits become widely accepted, it would likely result in small, beneficial effects on water quality throughout the parks.

Alternative 5 provides for decreased stock use in wilderness by reducing party size and limiting where stock are allowed to travel. Studies show that there are some small adverse impacts on water quality in areas that receive the greatest visitation from humans and stock. Therefore, reducing stock-party size would likely have some beneficial effects on water quality, but the intensity of impacts would be difficult to quantify.

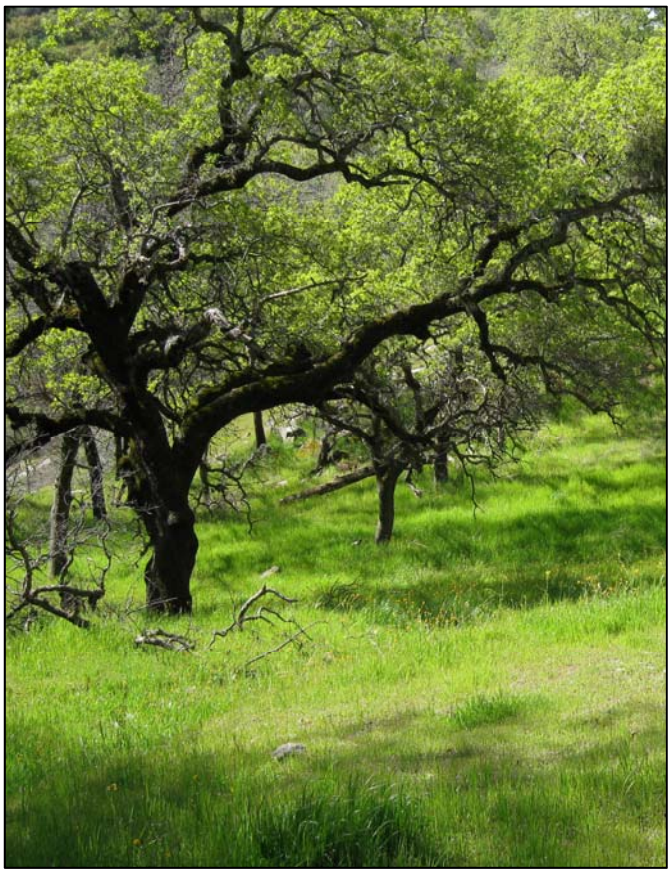
Alternative 5 prohibits off-trail stock use throughout wilderness. Many of the popular, off-trail sites closed under this alternative are meadows associated with waterbodies. This would eliminate impacts due to stock in off-trail locations. It would also reduce impacts on riparian zones in these locations. Riparian zones act as natural filters and help to improve and preserve water quality. This change would likely result in beneficial effects on water quality at off-trail locations. Changes in impact intensity may be measurable, but as there are no recognized threats to ecological health under current conditions, the net benefits of this change is minimal.

Cumulative Effects: This alternative calls for a decrease in the number of visitors and stock wilderness-wide, reduces development, but allows for continued grazing. Fewer visitors would result in a reduction of adverse impacts wilderness-wide; however, the net benefit would be minimal. The majority of other past, present, and future foreseeable projects in wilderness have no potential for effects on water resources, but several projects do have such potential, including the Cahoon Meadow Restoration, the Halstead Meadow Restoration, restoration activities related to illegal marijuana grow sites, the high-elevation aquatics ecosystem restoration program, and fire management activities. As discussed previously, the effects from these projects would result in both short- and long-term beneficial and

adverse effects on water quality. Considered together there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

CONCLUSION

All action alternatives would result in the potential for continued adverse effects on water quality. It is reasonable to assume that the potential for adverse water quality impacts is correlated with amounts of visitor use. Alternatives that allow for increased visitor use, such as alternative 3, may therefore result in detectable increases in water quality impacts, and alternatives that reduce visitor use, such as alternative 5, may result in detectable water quality improvements. However, current water quality conditions found throughout wilderness are generally good, the magnitude of potential effects is small, and potential effects of visitor use would be localized. Water quality changes would not be expected to affect ecologically critical areas. Importantly, biological contamination levels are typically far below the level constituting a risk to public health, and the highest biological contaminant levels result from natural rain events irrespective of the amount or type of visitor use. Therefore, neither adverse nor beneficial significant impacts are anticipated from any of the plan alternatives.



Oak woodland in the foothills

VEGETATION

METHODOLOGY FOR ANALYZING IMPACTS

The NPS Organic Act, which directs parks to conserve "wild life" unimpaired for future generations, is interpreted to mean that native vegetation should be protected and perpetuated as part of the parks' natural ecosystems. NPS *Management Policies 2006* defines the general principles for managing biological resources as maintaining all native plants and animals as part of the natural ecosystem. Natural processes are relied on to control populations of native species to the greatest extent possible and these species are protected from harvesting, harassment, or harm by human activities.

When NPS management actions cause native vegetation to be removed, then the NPS will seek to ensure that such removals will not cause unacceptable impacts on native resources, natural processes, or other resources of the parks. Nonnative plants are not a natural component of the ecosystem and have the potential to have significant effects on native communities. They are managed, up to and including eradication, under the criteria specified in NPS *Management Policies 2006* and NPS-77 (Reference Manual #77: Natural Resource Management). Under Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers issues permits for activities that result in the discharge of dredged or fill material into

waters of the United States, including wetlands. Wetlands are protected from these and other actions through adherence to the guidance provided in *Procedural Manual #77-1: Wetland Protection* (NPS 2012b). Management goals for vegetation include maintaining components and processes of naturally evolving the parks' ecosystems, including natural abundance, diversity, and the ecological integrity of plants and animals.

All assessments of impacts on native vegetation were conducted using the Sequoia and Kings Canyon Vegetation map (NPS 2007b) as the primary data layer. Analysis of impacts on wetland and meadow vegetation also included National Wetland Inventory spatial data (USFWS 1996). Information on the distribution of peat-accumulating wetlands was drawn from the recently completed map of peat-accumulating wetlands in Sequoia and Kings Canyon National Parks (Pyrooz et al. 2014). The evaluation of impacts on wetlands is based on both a quantitative (acreage affected) and a qualitative assessment of how each proposed alternative would affect wetland integrity.

All wetlands within the two parks fall into one of three system types: riverine (rivers, creeks, and streams), palustrine (shallow ponds, marshes, swamps, and sloughs), or lacustrine (lakes and deep ponds). The lacustrine wetland class represents wetlands and deepwater habitats that are situated in topographic depressions or dammed river channels; that lack trees, shrubs, and emergent mosses and lichens over 60% of their area; and that are greater than 20 acres in size.

Discussions of stock use levels and patterns are based on information provided in the *Summary report of stock use and grazing in wilderness meadows, 2012* (Frenzel and Haultain 2013).

To inform discussions of grazing levels and anticipated impacts to vegetation, each forage area was attributed according to vegetation zone (lower montane and woodland or upper montane and subalpine) and whether it was designated as having high logistical value for visitors and/or the parks' staff traveling with stock. For the forage areas open to grazing under each alternative, the total area in acres and count of the number of forage areas in each combination of vegetation zone and logistical value was summarized.

To provide an assessment of current impacts to wetlands and meadows due to grazing under alternative 1, stock use data from 2008–2012 (Frenzel and Haultain 2013) and model productivity values (Ratliff et al. 1987) were used to estimate average annual utilization levels in preferred vegetation types for the parks' forage areas. Productivity estimates based on moisture regime (dry, moist, or wet), elevation, and range condition (good) were multiplied by the total area and the proportion of the area occupied by preferred forage to estimate total forage production in pounds. The total number of stock nights in each year for each forage area was multiplied by the nightly forage consumption (32.5 lbs. per animal night) to obtain total forage consumption. Dividing the total forage consumption by forage production provided an estimate of utilization. The number and acreage of forage areas were then summarized by their estimated utilization. Potential impacts were assessed based on Ratliff (1976, 1980, 1985) for lower montane and woodland forage areas (table 76), and Cole et al. (2004) for upper montane and subalpine forage areas (table 77).

To provide an estimate of expected grazing impacts under alternatives 2, 3, and 5, the number and acreage of forage areas were summarized according to the utilization standards which would be adopted under these alternatives; impacts for each utilization standard were predicted based on Ratliff (1976, 1980, 1985) for lower montane and woodland forage areas (table 76), and Cole et al. (2004) for upper montane and subalpine forage areas (table 77).

Appendix D, the parks' proposed strategy for monitoring and managing stock use in wilderness, provides additional background on how utilization levels are determined and grazing capacities estimated, as well

as a list of those meadows identified as having high logistical value for visitors and/or the parks' staff traveling with stock.

Table 76: Predicted Response of Meadow Attributes for Lower Montane and Woodland Vegetation Types to 25%, 35%, and 45% Utilization[1]

Attribute	Utilization Moist <35% Dry or Wet <25%	Estimated Utilization Moist 35–45% Dry or Wet 25–35%	Utilization Moist >45% Dry or Wet >35%
Residual biomass	More than annual decomposition	More than or equal to annual decomposition	Less than annual decomposition
Productivity[2]	Similar to comparable ungrazed meadow vegetation	Similar to comparable ungrazed meadow vegetation	Less than comparable ungrazed meadow vegetation

[1] Based on Ratliff (1976, 1980, 1985)

[2] Response expected if grazed at this level over extended time frames

Table 77: Predicted Mean Response of Meadow Attributes for Three Upper Montane and Subalpine Vegetation Types to 25% and 35% Utilization*

Attribute	Vegetation Type	25% Utilization, Percentage Change Relative to Ungrazed Conditions	35% Utilization, Percentage Change Relative to Ungrazed Conditions
Productivity	*Carex filifolia*	+2%	-10%
Productivity	*Deschampsia cespitosa*	-11%	-18%
Productivity	*Calamagrostis muiriana*	-10%	-16%
Basal veg cover	*Carex filifolia*	+7%	-16%
Basal veg cover	*Calamagrostis muiriana*	+41%	+14%
Relative graminoid	*Calamagrostis muiriana*	-6%	-12%

*Based on Cole et al. (2004); Predicted response for *Calamagrostis muiriana* is average across treatment years as reported for two, three and four years of grazing in the original study

Analysis of impacts on plants of conservation concern is limited to those species known to occur in meadows used by stock, uplands frequented by cross-country hikers and/or open to cross-country travel by stock, and destinations popular with rock climbers. Distribution data for the species evaluated is derived from the Sequoia and Kings Canyon database of plants of conservation concern, which was created as part of the Natural Resource Condition Assessment (Huber et al. 2013) and updated with information provided through the California Native Plant Society online rare plant inventory (CNPS 2014) and recent surveys of the parks.

TYPES OF IMPACTS ON VEGETATION

The types of impacts associated with vegetation that relate to visitor use and administrative activities in wilderness include direct removal, trampling, grazing, and the indirect effects associated with the introduction of nonnative invasive plant species. These are described in the following section. Because the potential for widespread and significant impacts exists only for wetlands and meadows, high-elevation long-lived trees, park sensitive plant species and alpine vegetation, impacts on these vegetation components are discussed by alternative. Impacts on other park plant species and vegetation assemblages

would be negligible (see the "Impact topics Considered but Dismissed from Further Analysis" section of chapter 1) and will not be discussed.

Direct Removal: In national parks, intentional removal of living vegetation is generally prohibited by the public with two exceptions: harvesting of specific edible plants (as identified in the Superintendent's compendium) and collection of wood for campfires. Vegetation removal for administrative purposes can occur during trail maintenance or construction, in designated campsites, for fire management, for scientific study, for restoration of disturbed areas, and for the removal of invasive plants. Removal of vegetation by grazing animals is addressed as a separate impact topic. Fire management, scientific study, restoration of disturbed lands, and invasive plant removal are addressed through program specific plans and compliance and are not directly affected by the actions in this plan.

Administrative vegetation removal from trail maintenance and construction occur to clear safe routes for travel by removing brush and branches that hang into the trail corridor or plants in the trail tread. Construction of new trail segments has the potential to increase the amount of vegetation removed. Increasing the level of maintenance (trail class) has the potential to remove more vegetation, as the width of the cleared area and the tread increase at higher levels of development. Establishing and maintaining designated campsites may require vegetation to be removed to provide an open camp area or to remove hazard trees.

The most widespread and common form of direct vegetation removal is the collection of wood for campfires. Campfires can cause impacts on vegetation through the removal of firewood and associated trampling that greatly enlarge the area affected by camping activities (Cole 2002). For example, a study in the Sierra Nevada found that campers travel up to approximately 200 feet from the campsite to scavenge for firewood resulting in impacts on vegetation and soils (Davilla 1979). Although collection of smaller pieces of wood for campfires is unlikely to cause adverse impacts, elimination of large woody debris is likely to reduce site productivity, particularly on droughty and infertile soils (Cole 2002) and have a variety of adverse ecological effects (Stokland et al. 2012). Decaying wood has an unusually high water-holding capacity, accumulates nitrogen, phosphorus, and sometimes calcium and magnesium, and is a significant site for nitrogen-fixing microorganisms. Of particular importance, ectomycorrhizal fungi (organisms that develop a symbiotic association with the roots of many plants) that improve the plants' ability to extract water, nitrogen, and phosphate from less fertile soils, are concentrated in decayed wood. It is also the preferred substrate for seedling establishment and subsequent growth of certain species (Cole 2002). Shifts in understory species have also been documented and attributed to disturbance by firewood collection (Saunders 1979). There are also the direct impacts of the campfire itself, which alters organic matter and sterilizes soils in the area of the fire-ring. The severity of the impacts is related to the intensity of the fire (Fenn et al. 1976).

In some low-productivity, high-elevation forest types, fuelwood regeneration does not keep pace with its utilization for campfires resulting in various types of impacts (Davilla 1979). Within the parks results from a woody surface-fuel inventory, sampling campsites in foxtail and lodgepole pine forest in the upper Kern River drainage between 10,400 feet and 11,200 feet, indicated inadequate fuelwood to sustain campfires in these areas (Atkinson et al. 1990). Elsewhere in the Sierra Nevada, Davilla (1979) reports that wood litter production in whitebark pine forest was low compared to adjacent lodgepole pine and mountain hemlock forest.

In general, firewood consumption exceeds productivity in high-elevation whitebark pine forests in the western United States that are popular destinations for visitors (Cole 1989b). Additional impacts may occur at these campsites when available dead and downed wood is limited and visitors resort to removing lower limbs from standing trees or snags for fuelwood (Cole 1989b).

Another feature of high-elevation, low-productivity sites is the occurrence of long-lived subalpine tree species that are valuable aesthetically and as paleo resources, both as living individuals and as remnant wood from trees that have died. Long-lived conifers frequently exist under adverse growing conditions at sites with low productivity (Schulman 1954) and typically accumulate remnant dead wood on the ground that can be much older than any living tree (frequently two or three times older). Remnant dead wood in these subalpine areas, while not actually fossilized, can be many thousands of years old, is an important source of information on past ecological or climatic dynamics, and a valuable resource for dendrochronologists. These resources can be adversely affected by localized site degradation through the consumption of very old remnant wood for campfires as well as by direct damage to the old living trees.

High-elevation conifer forests within the parks are home to four long-lived conifer species (NPS 2007b) that can reach ages in excess of 1,000 years (Brown 1996). These conifers include three subalpine white pine species; whitebark pine, foxtail pine, and limber pine, as well as the upper montane Sierra juniper. Remnant wood from these species can survive for millennia due to a combination of a dry cool environment, rot resistant wood, and low forest turnover rates (Stephenson and van Mantgem 2005). Besides being on low productivity sites, these old trees and remnant wood are found at these high-elevation sites because the probability of natural fire is low (a combination of infrequent fire [Caprio and Swetnam 1995; Swetnam et al. 1998] and small average area burned annually [Caprio 2004]). As a result the probability of a tree being killed or dead wood being consumed by natural fire is much smaller than at the lower elevations.

Scuderi (1987) reported that radiocarbon-dated samples of dead wood from foxtail pine exceed 6,000 years in age. Because this remnant wood can survive for such long periods of time even extremely small impacts, such as burning as fuelwood or removal, compounded over long periods will have significant negative effects. Additionally, specific sites across the elevational gradient over which a species lives may have different scientific value so impacts will vary depending on location. For example, trees at the lower elevational limits of a species distribution are generally more sensitive to precipitation and so are valuable for extracting a record of past rainfall, whereas individuals respond to temperature at high elevations. At elevations above current treeline "ghost forests" of dead trees provide information on long-term changes in treeline due to changing climate over many thousands of years.

Trampling: Trampling impacts are mechanical damage to above or below ground plant parts. Trampling is caused by foot or hoof traffic, stock rolling and pawing, and camp activities. Trampling can reduce leaf area, plant height, and reproductive output (Liddle 1997). These impacts can result in decreased vigor or death of individual plants, changes in species composition, and loss of vegetation.

The relationship between trampling intensity and vegetation impact is curvilinear. The greatest total impacts on vegetation occur at low trampling intensities; additional trampling can continue to impact vegetation but at a lower rate (Cole 1987; Kuss and Hall 1991; Cole 1995a; Marion and Cole 1996; Cole and Spildie 1998). Trampling impacts from an individual horse or mule is 6–10 times greater than an individual hiker, largely due to the greater force applied (Weaver and Dale 1978; Cole and Spildie 1998). Slopes are more susceptible to trampling impacts than flat ground (Weaver and Dale 1978).

Vegetation types differ in their ability to resist and recover from trampling. Structural characteristics are important in determining which plant species are most resistant to trampling and how quickly they recover (Cole 1995b). The characteristics of grass-like plants make them more resistant to trampling impacts than forbs and woody plants such as shrubs and young trees (Cole 1993, Cole 1995b) and grassland and meadow vegetation may tolerate trampling better than the understory of wooded areas (Cole 1987; Cole and Monz 2002). However, meadow and riparian vegetation is especially susceptible to damage to above and below ground structures early in the growing season when soils are wet and plants are undeveloped (Trimble and Mendel 1995; Neuman 1996; McClaran et al. 2013).

In contrast to vascular plants, mosses have poorly developed systems for conducting water and nutrients, and are dependent on the availability of water for reproduction. As a consequence mosses are low-growing in stature and are frequently found in moist environments, although an ability to go into dormancy allows some mosses to inhabit seasonally dry habitats. Lacking a true root system, mosses are held in place by filamentous root-like structures and rely on taking in water directly wherever it comes in contact with the plant. Many mosses thus depend on the surface moisture readily available in wet meadows and fens, as well as along stream courses and in other wetland environments.

The lack of a root system and reliance on surface water availability makes some mosses vulnerable to ground disturbance, as they are unable to 'spring back' from a developed underground root system after being trampled. They are also vulnerable to changes in water temperature that may occur as a result of soil churning, which has potential consequences for their ability to photosynthesize at a rate commensurate with carbohydrate use (Powell et al. 2001). Some mosses, especially those that are relatively ephemeral, can respond positively to disturbance and are known to colonize disturbed soils.

Impacts on vegetation from trampling can persist for decades in mountain environments (e.g., Hartley 1999; Willard et al. 2007). Impacts on soils from trampling can have the most severe effect on vegetation. Soils may be compacted, which decreases water infiltration, gas exchange, and rooting of plants (Trimble and Mendel 1995) that can decrease plant cover and vigor. At high use levels, mechanical impacts on soils can result in erosion. In meadows, erosion and channel incision can change the hydrological characteristics that determine local vegetation patterns (Allen-Diaz 1991). Lower water tables can cause the local loss of species that depend on high water tables resulting in a change from wetland vegetation to upland vegetation.

Actions that increase the amount of visitors will generally increase total trampling impacts. Actions that concentrate foot and stock travel to existing trails and routes, or concentrate campers in existing sites have the potential to decrease total impacts. Actions that move traffic and camps to less tolerant vegetation types or steeper slopes could increase impacts. Actions that affect stock users behavior have the potential to change trampling impacts more than those that affect hiker behavior on a per-capita basis; overall changes will be a function of the number of users affected. Actions that increase visitation early in the growing season have the potential to increase impacts.

Trampling of wetland and meadow vegetation by human traffic largely occurs along trails that pass through meadows, along riparian corridors and lakeshores where campers pass through for water or to fish, and where visitors set up camps on or adjacent to meadow or riparian vegetation.

Grazing: Grazing by stock impacts vegetation both through trampling (discussed above) and defoliation. Grazing has both direct impacts on individual plants and indirect impacts on vegetation composition, structure, and ecosystem processes (McClaran and Cole 1993).

Defoliation of individual plants results in a reduction of photosynthetic tissues. The loss of foliage to stock grazing can decrease plant productivity (Stohlgren et al. 1989; Cole et al. 2004) and plant cover (Olson-Rutz 1996a; Cole et al. 2004).

Horses, mules, burros and llamas are selective grazers. Under the low intensity typical of recreational grazing areas, forage availability within a meadow area generally exceeds demand giving stock a choice in where they graze (patch grazing, McClaran and Cole 1993). The horses and mules that make up most of the stock use in the parks strongly select for tender grass-like species (Olson-Rutz 1996a), even when these have already been grazed extensively (Fleurance et al. 2001). Selective grazing alters the balance of other species interactions, such as competition. Depending on the duration and intensity of grazing, this can lead to declines in the abundance of grass-like species and increases in the abundance of forbs. The

establishment of shrubs or trees in meadows (e.g., Dull 1999; Berlow et al. 2002) and invasion of nonnative species (discussed separately) are special cases of compositional changes that can be promoted by grazing. Grazing animals redistribute biomass and nutrients (Blank et al. 2006) that may also have an indirect impact on vegetation by favoring some species over others.

Stock grazing in Evolution Meadow

The magnitude of impacts depends largely on grazing intensity measured by how much herbage is removed. Utilization, the proportion of plant production grazed by stock, is a measure of intensity that is a good predictor of vegetation impacts (Cole et al. 2004). The total amount of grazing required to reach a given utilization increases with productivity. In mountain meadows, productivity generally decreases with elevation, decreases at extremes of soil moisture, and decreases with a greater proportion of early seral plant species (Ratliff 1985). All else being equal, the total amount of grazing that a meadow can tolerate before impacts occur is higher in larger meadows, at lower elevations, at intermediate moisture levels, and where there is a greater proportion of late seral species.

Decreases in productivity and plant cover have been reported to have a relationship with grazing intensity that is curvilinear (Olson-Rutz 1996b, McClaran 2000) but may be approximately linear within a limited range of intensity (Cole et al. 2004). Low intensity grazing may have no detectable impact on species composition and bare ground in Sierra Nevada meadows (Hopkinson et al. 2012, Lee 2013). As grazing intensity increases, bare ground and productivity impacts may develop before changes to species composition (McClaran 2000, Cole et al. 2004). Interannual variation in snowpack may also interact with grazing intensity to determine impacts (Lee 2013). Grazing impacts occur within a growing season but may persist after grazing ends (Olson-Rutz 1996b, Cole et al. 2004).

Different kinds of vegetation may be sensitive to different grazing impacts. Dry meadows may be more susceptible to decreased productivity and losses of vegetation cover than wetter meadows (Cole et al. 2004, Lee 2013, but see Stohlgren et al. 1989). Moist meadows may be more susceptible to changes in species composition than wet or dry meadows (Cole et al. 2004).

Actions that increase the number of grazing stock will increase total grazing impacts. Actions that increase grazing intensity on a site increase the potential for productivity losses, loss of total vegetation cover, and compositional changes.

Nonnative Plant Species: The probability and success of nonnative plant establishment in the parks' wilderness is primarily dependent on two factors: disturbance and propagule pressure. Disturbances that reduce native plant cover and create bare soil allow nonnative plant species to take advantage of the newly available light, moisture, and nutrients and become established (Richardson and Pysek 2006). Nonnative plant establishment is most successful in the parks in areas of current and past natural and human-caused disturbance such as roads, trails, developed areas, stock corrals, recent fires, helicopter landing sites, camps, and riparian sites (Gerlach et al. 2003, Tu et al. 2013). To establish in a disturbed site, nonnative plant propagules (seeds or propagative root or stem fragments) need to be introduced to the site, and the more propagules that arrive, the more likely it is that nonnative plants will establish, even in undisturbed vegetation (Von Holle and Simberloff 2005). This principle is known as "propagule pressure." In the parks' wilderness, propagules can be moved by visitors and staff on hiking boots, gear, and clothing; by helicopter; by stock in fur, hooves, or manure; or by imported materials such as stock feeds, gravel, and equipment.

Where alternatives differ in the amount of disturbance or propagule pressure, they will have different probabilities of nonnative plant establishment. Alternatives that allow less stock grazing and less area open to stock travel would have lower-severity disturbance, less extensive disturbance, and lower propagule pressure. Alternatives that have lower quotas and smaller group sizes would decrease both propagule pressure and the severity of localized disturbance. Fewer maintained trails and ranger stations would decrease the extent of trail corridors and disturbed area available for nonnative plant introductions, but more importantly would decrease the administrative support activities (stock support; helicopter support; tools, supplies, and people moving between frontcountry and wilderness) that have the potential to move nonnative plant propagules.

While all recreational and administrative activities have the potential to increase the spread of nonnative species, those that create the most disturbance and carry the most propagules have the highest risk. Stock create more severe and extensive soil disturbance than do hikers (Weaver and Dale 1978). A variety of seeds have been found to germinate from horse manure (Quinn et al. 2008), including velvet grass (*Holcus lanatus*) (Cosyns et al. 2005), with peak passage of viable seed two to four days after ingestion (Vander Noot et al. 1967; St. John-Sweeting and Morris 1990). Equestrian trails and camps have been found to have more nonnative plants than those that do not allow horses (Campbell and Gibson 2001, Cole and Hall 1992, but see Marcus et al. 1998).

While studies of mid- to high-elevation Sierra meadows suggest that significant nonnative plant invasions may be rare (D'Antonio et al. 2004; Hopkinson et al. 2013), where they do occur they can displace native wetland plants and require significant resources to control. The most ecologically disruptive and costly invasive plant infestations to manage in recent years have been perennial grass infestations in mid-elevation meadows, such as velvet grass infestations on the floor of the Kern Canyon. These infestations were likely caused by an intersection of factors that favor nonnative plant establishment: mid-elevation wetlands (approximately 7,000 feet and below), high stock use (including trail crew and ranger stock), and propagule pressure (adjacent sources of invasive plants). In the last decade, parks staff have detected several other nonnative perennial grasses in mid-elevation wilderness meadows that are causing or have

the potential to cause significant ecological impacts, including reed canarygrass (*Phalaris arundinacea*) and smooth brome (*Bromus inermis*) in Sugarloaf Meadow and orchard grass (*Dactylis glomerata*) in meadows and moist locations in LeConte Canyon, Palisade Creek, and Bubbs Creek. These are all common pasture grasses. Alternatives that restrict stock travel to trails and that do not allow (or reduce) grazing in meadows will decrease the probability that this suite of invasive perennial grasses will become established in mid-elevation wilderness meadows.

Measures to reduce disturbance and prevent the introduction of nonnative plant propagules will never be 100% successful. To protect native ecosystems, new introductions need to be detected early and eradicated before they establish a large seed bank and develop into large infestations. The probability of detection is higher along trail corridors and in established campsites than in off-trail areas and in meadows. Therefore, the chance of detecting and eradicating new introductions of invasive, nonnative plants early is higher in alternatives that restrict stock travel to trails and that prohibit (or reduce) grazing in meadows. Similarly, alternatives that restrict stock travel to trails and that prohibit (or reduce) grazing in meadows will decrease the probability that invasive perennial grasses will become established in mid-elevation wilderness meadows.

FACTORS THAT CONTRIBUTE TO VEGETATION IMPACTS

The primary factors that contribute to vegetation impacts include trampling from hikers, backpackers, and stock (from either recreational or administrative sources), grazing by stock, nutrient loading from human and stock waste, the introduction of nonnative invasive plant species by hikers and stock, the collection of firewood for campfires, and the creation or maintenance of infrastructure that supports visitor recreation (trails, campsites, ranger stations, food-storage boxes, etc.).

All mitigation measures and best management practices related to the protection of soils and water would also protect vegetation in the parks, as those measures would work to reduce or eliminate impacts on vegetation. These mitigation measures and best management practices are common to all action alternatives. The impact intensity of each alternative assumes employment of the mitigation measures and best management practices, as they are considered components of the alternatives.

Appendix D presents the parks' proposed strategy for monitoring and managing stock use in wilderness, which includes an overview of monitoring protocols and management tools focused on detecting changes and minimizing impacts associated with the use of recreational and administrative stock.

Appendix N presents the parks' prevention, early detection, and rapid response strategy to protect native ecosystems from invasive nonnative plants.

Where impacts on populations of plants of conservation concern are detected, actions are taken to redirect or shift use to protect the plants at risk. Documenting locations of plants of conservation concern and noting and mitigating impacts is an integral part of conducting plant surveys and monitoring of hiker and stock impacts in wilderness.

IMPACTS COMMON TO ALL ALTERNATIVES

All of the actions that would contribute to vegetation impacts are common to all alternatives, with the exception of stock grazing, which would be prohibited under alternative 4. Thus there would be little change in the impacts on vegetation, but there could be increases or decreases in the intensity and magnitude of the impacts across the alternatives.

IMPACTS OF ALTERNATIVE 1: NO-ACTION / STATUS QUO

Wetlands and Meadows: Trampling of wetland and meadow vegetation by human traffic would continue to occur along trails that pass through meadows, along riparian corridors and lakeshores where campers pass through for water or to fish, and where visitors set up camps on or adjacent to meadow or riparian vegetation. While these impacts can be locally severe, they are currently insignificant at the landscape scale and this would be expected to remain the case. If visitation increases in certain destinations (as periodically occurs in response to news articles, guidebooks, and information shared through social media) local trampling impacts could increase. The development of informal trails would continue to pose potential risks to adjacent wetlands, which would be mitigated through visitor education, trail reroutes, or restoration.

Trampling and grazing of wetland and meadow vegetation by administrative and recreational stock would continue. Stock access and grazing would continue to be managed and monitored according to the 1986 SUMMP and BMP.

Stock would continue to be allowed in the wilderness of the parks on trails and in areas where they are currently permitted under the 1986 SUMMP and BMP, including the four cross-country stock areas (Hockett, Monarch Divide, Roaring River, and portions of the Kern Canyon).

Individual meadows would continue to be closed to grazing or have night, head or use level restrictions imposed under the Superintendent's authority to impose temporary restrictions on visitor use in order to protect sensitive resources.

Parties traveling with stock would continue to have access to up to 64% of the meadow area in the parks, with 51% of all meadow area open to grazing. The meadows that would remain open to grazing contain 72% of the peat-accumulating meadow area and 42% of lakeshore meadow length. Up to 46% of lacustrine features, 76% of palustrine features, 97% of riverine features, and 64% of all wetland features are in areas that would remain open to stock travel. Within the area open to stock access, up to 46% of lacustrine features, 64% of palustrine features, 81% of riverine features, and up to 51% of all wetland features are in areas open to grazing.

Table 78: Alternative 1 – Values are Percentages of Row (Meadow Type) Totals

Meadow Type	Open to Stock Access; Open to Grazing	Open to Stock Access; Closed to Grazing	Closed to Stock Access
Fen	81%	9%	10%
Fen/wet meadow	73%	17%	10%
Wet meadow	55%	15%	30%
Moist meadow	43%	9%	48%
Dry meadow	49%	12%	39%
All meadow types	51%	13%	36%
Peat-accumulating area	72%	17%	11%
Lakeshore meadow	42%	10%	48%

Table 79: Alternative 1 – Values are Percentages of Row (System) Totals for Each Kind of Wetland Feature (Linear or Area)

System	Open to Stock Access Open to Grazing		Open to Stock Access Closed to Grazing		Closed to Stock Access	
	Linear	Area	Linear	Area	Linear	Area
Lacustrine	46%	29%	0%	12%	54%	59%
Palustrine	45%	64%	12%	12%	43%	24%
Riverine	49%	81%	16%	16%	35%	3%
Total	**48%**	**52%**	**14%**	**12%**	**38%**	**36%**

Although technically open to stock travel and grazing, much of the wetland and meadow area is inaccessible to stock parties and thus stock use would continue to be concentrated in named forage areas adjacent to maintained trails. Grazing, trampling, and non-native species impacts to wetland and meadow vegetation outside of named forage areas would continue to be rare and of light intensity; therefore grazing and trampling impacts to wetland and meadow vegetation outside of named forage areas would be negligible.

Capacities, night and head limits, and other tools would continue to be used to manage the intensity of grazing impacts. Utilization values of 30–40% would be used to estimate default grazing capacities, which would be modified where monitoring data provides additional information.

In any given year, a relatively small subset of all popular meadows would have grazing limits — based on estimated capacities — imposed through the superintendent's compendium. Actual utilization levels would reflect annual stock use patterns and productivity, which varies from year to year in response to both weather and use levels.

Administrative use of stock would likely remain at current levels and would occur in the same areas as the level of trail development and maintenance would not change. Commercial stock use could continue at current levels, but may decline or increase in response to socioeconomic drivers. Private use would likely continue at current levels or could continue to decline. Therefore, overnight stock use in the parks would be expected to remain similar to the 10-year average of 6,775 stock nights.

Grazing levels would likely continue to be similar to the 10-year average of 6,058 stock nights. If the increasing trend in the use of supplemental feed continued, there could be a slight overall reduction in grazing and thus in grazing and trampling impacts on meadows and wetlands.

Past use levels in named forage areas provide an estimate of grazing impacts under alternative 1 (tables 80 and 81). Grazing would likely continue to occur in approximately 43% of the meadow area open to grazing.

Table 80: Number and Meadow Area in Lower Montane and Woodland Forage Areas Grazed at Three Utilization Levels*

Alternative 1	Estimated utilization Moist <35% Dry or Wet <25%		Estimated utilization Moist 35–45% Dry or Wet 25–35%		Estimated utilization Moist >45% Dry or Wet >35%	
Vegetation Zone	Number of Forage Areas	Forage Area Acres	Number of Forage Areas	Forage Area Acres	Number of Forage Areas	Forage Area Acres
Lower Montane & Woodland	52	274	2	11	8	42

*based on 2008–2012 stock use data and modeled productivity values

In 52 lower montane forage areas (totaling 274 acres) estimated utilization would likely continue to be less than 35% in moist meadows, or less than 25% in dry or wet meadows (and less than 10% in 44 forage areas with an area of 209 acres). The amount of foliage left ungrazed at these levels would be greater than the amount of herbage which would be expected to decompose annually; productivity would be expected to be similar to comparable ungrazed meadow vegetation.

In two lower montane forage areas (totaling 11 acres) utilization would likely continue to be 35–45% in moist meadows or 25–35% in dry or wet meadows. The amount of foliage left ungrazed at these levels would be approximately equal or slightly more than the amount of herbage which would be expected to decompose annually; productivity would be expected to be similar to comparable to ungrazed meadow vegetation.

In nine lower montane forage areas (totaling 42 acres) estimated utilization would likely continue to be greater than 45% in moist meadows and greater than 35% in dry or wet meadows. The amount of foliage left ungrazed at these levels would be less than the amount of herbage which would be expected to decompose annually; productivity would be expected to be lower than comparable ungrazed meadow vegetation.

Table 81: Number and Meadow Area in Upper Montane and Subalpine Forage Areas Grazed at Three Utilization Levels*

Alternative 1	Estimated utilization <25%		Estimated utilization 25–35%		Estimated utilization >35%	
Vegetation Zone	Number of Forage Areas	Forage Area Acres	Number of Forage Areas	Forage Area Acres	Number of Forage Areas	Forage Area Acres
Upper Montane and Subalpine	168	5858	13	264	8	123

*based on 2008–2012 stock use data and modeled productivity values

In 168 upper montane and subalpine forage areas (totaling 5858 acres), estimated utilization would likely continue to be less than 25% (and less than 10% in 144 forage areas with an area of 5501 acres). Utilization less than 25% in dry *Carex filifolia* vegetation would, on average, increase productivity by 2% or more and increase basal vegetation cover by 7% or more relative to ungrazed vegetation. In moist to wet *Deschampsia cespitosa* vegetation, utilization less than 25% would, on average, decrease productivity by less than 11% relative to ungrazed vegetation. Utilization less than 25% in moist *Calamagrostis muiriana* vegetation would, on average, reduce productivity by less than 10%, increase basal vegetation

cover by more than 41%, and decrease relative graminoid cover by less than 6% relative to ungrazed vegetation.

In 13 upper montane and subalpine forage areas (totaling 264 acres), estimated utilization would likely continue to be between 25% and 35%. This level of utilization in dry *Carex filifolia* vegetation would, on average, change productivity by +2 to -10% and change basal vegetation cover by +7 to -16% relative to ungrazed vegetation. In moist to wet *Deschampsia cespitosa* vegetation, this level of utilization would, on average, reduce productivity by 11–18% relative to ungrazed vegetation. This level of utilization in moist *Calamagrostis muiriana* vegetation would, on average, reduce productivity by 10–16%, increase basal vegetation cover by 14–41%, and decrease relative graminoid cover by 6–12% relative to ungrazed vegetation.

In eight upper montane and subalpine forage areas (totaling 124 acres), estimated utilization would likely continue to be greater than 35%. This level of utilization in dry *Carex filifolia* vegetation would, on average, reduce productivity by more than 10% and reduce basal vegetation cover by more than 16% relative to ungrazed vegetation. In moist to wet *Deschampsia cespitosa* vegetation, this level of utilization would, on average, reduce productivity by more than 18% relative to ungrazed vegetation. This level of utilization in moist *Calamagrostis muiriana* vegetation would, on average, reduce productivity by more than 16%, increase basal vegetation cover by less than 14%, and decrease relative graminoid cover by more than 12% relative to ungrazed vegetation.

Because horses and mules are selective grazers and overall grazing pressure is light, grazing impacts would generally be concentrated in one meadow vegetation type within a forage area. Grazing capacities would be based on the area of this preferred vegetation, which is usually less than the area of the entire meadow; therefore, the extent of the most severe predicted impacts to meadow and wetland vegetation would be less than the total meadow area summarized above.

Trampling impacts on meadows would be directly related to grazing, since stock travel through meadows open to access but closed to grazing would continue to be uncommon and infrequent. The timing of grazing would continue to be controlled by a system of opening dates tied to soil moisture and meadow conditions, which would reduce stock-related impacts in wetlands such as deep hoofprints, which are more likely to occur early in the season when soils are wet.

Potential nonnative species introductions would be proportional to the meadow area open to both access and grazing, as species deposited along trails and in camps may be propagule sources for wetlands and meadows. Surveys to provide for the early detection of nonnative species would be conducted as part of routine meadow monitoring and wilderness patrol activities.

Grazing and trampling impacts would continue to be highest in popular meadows along the JMT corridor, in traditional destinations for visitors traveling with stock (such as Roaring River and Hockett Plateau), and in areas serving as foci for trail maintenance and construction crews. Some meadows, such as those in popular destinations such as the Crabtree, Evolution, Hockett, LeConte, Roaring River, and Rock Creek areas, would continue to be periodically closed to access or grazing as needed to meet resource protection needs. Management of grazing levels in the most popular destinations would continue to be informed by site-specific grazing capacities based on the guidelines for utilization levels proposed by Ratliff (1985) and modified to reflect local resource concerns. Such limits would not necessarily be placed on all meadows open to grazing in the surrounding areas; thus, use could shift to nearby meadows which could then lead to an increase in impacts associated with increased grazing pressure. Such impacts may go undetected until the end of the season, in some cases resulting in a delay in management response until the following year. Shifts in use could also result in increased grazing of peat-accumulating wetlands that

are otherwise not preferred by stock, and a potential increase in impacts on the integrity of peat forming vegetation.

Under alternative 1, the overall extent and severity of trampling, grazing, and nonnative species impacts on meadows and wetlands would be expected to remain comparable to current levels. Any significant increase in levels of use or change in patterns of use would be expected to result in increased trampling and/or grazing impacts. These would continue to be detected and mitigated through implementation of the 1986 SUMMP and BMP and routine monitoring by wilderness ranger and meadow monitoring staff. The current monitoring system established by the SUMMP would continue to be employed to track use, document conditions, and provide information for preventing and mitigating impacts. Where monitoring and site assessment indicate a need for a change in use levels or patterns to protect wetland structure or function, management actions including visitor education, local restrictions, or temporary closures would be taken.

High-elevation Long-lived Tree Species: Campfire restrictions in wilderness would continue to range from 9,000 feet in the Kaweah, Tule, and Soda Springs drainages to 10,400 feet in the Kern River drainage, while remaining at 10,000 feet for the Kings and San Joaquin River drainages. In addition, there would continue to be site-specific restrictions in the Kings (Granite Basin and Redwood Canyon), Kaweah (Hamilton Lakes and Mineral King Valley), Kern (above 10,000 feet in Nine Lakes Basin/Big Arroyo, and within 0.25 miles of the food-storage box at Lower Crabtree Meadow), and Tule River (Summit Lake basin and Dillonwood area) drainages. This would limit some impacts on old living trees, the collection of downed wood, and additional trampling from the collection of firewood.

Alternative 1 includes the greatest acreage of high-elevation forest without campfire restrictions where foxtail pine, whitebark pine, limber pine, and Sierra juniper forests exist. Recreational campfires would be restricted in 439,515 total acres of the parks. In wilderness areas of the parks, campfires would be permitted in 44,212 acres of high-elevation conifer habitat that supports the four subalpine long-lived tree species. Considering just the three five-needle conifers (whitebark pine, foxtail pine, and limber pine), this area would be 24,332 acres.

In areas without restrictions, the potential for impacts to the four species exists from campfires and fuelwood gathering. The area of greatest potential for impacts is 1,893 acres around campsites and trails, based on a buffer of 328 feet, the area in which a majority of wilderness visitors are most likely to collect firewood.

The current campfire restrictions also protect the higher-elevation habitat of non-target vegetation classes, which includes portions of the distribution of species such as lodgepole pine (*P. contorta*) and mountain hemlock (*Tsuga mertensiana*). In the Kaweah River drainage, with restriction starting at 9,000 feet, this would include some western white pine (*P. monticola*), and red fir (*Abies magnifica*) forest as well. Under current restrictions this area is approximately 49,262 acres.

Alpine Vegetation: Most of the alpine vegetation in the parks – found in some of the most remote and inaccessible portions of wilderness – is thought to be intact and relatively free from human disturbance. Where visitor use is concentrated, however, the slow-growing, perennial-dominated communities that make up the alpine vegetation can show signs of impact. Due to the short growing season and harsh conditions that characterize the high-elevation environment, recovery from even minor disturbances can take a very long time and impacts can persist.

Direct removal of alpine vegetation occurs infrequently, and is primarily associated with trail maintenance and construction activities. Under this alternative, impacts resulting from these activities would continue at existing levels, resulting in localized impacts on alpine plants.

Trampling of alpine vegetation along trail corridors and in high-elevation camp areas by human traffic would continue to occur. While these impacts can be locally severe, they are currently insignificant at the ecosystem or landscape scale and this would be expected to remain the case.

Most trampling impacts would continue to occur along cross-country routes and in popular destinations where visitor use is concentrated. Areas where such impacts would be expected to continue to be seen would include Dusy Basin, the Mount Whitney area, Upper Darwin Canyon/Lamark Col, Mount Langley, Kearsarge Lakes, and other similar high-elevation basins and routes popular with hikers. However, should other destinations increase in popularity (as periodically occurs in response to news articles, guidebooks, and information shared through social media) local trampling impacts in such areas would be expected to increase. With an anticipated increase in visitation to the Mount Whitney area, trampling impacts on alpine vegetation would be expected to increase along all routes leading into and through the area, especially through Miter Basin, Crabtree Pass, and along the JMT corridor. Increased popularity of Mount Langley, as an easily accessed 14,000+ feet peak, would continue to result in impacts on the sparsely vegetated summit area and along the multiple approach routes; however, these are expected to be mitigated soon by the establishment of a cairned route to the summit. Similarly, the increased popularity of alpine summits along the crest among 'peak baggers' would be expected to lead to increased development of informal trails and trampling of alpine vegetation, both on the summits and along approach routes.

Stock would continue to be allowed in the wilderness of the parks on the same areas and trails, including the four cross-country stock areas (Hockett, Monarch Divide, Roaring River, and portions of Kern Canyon). Under the restrictions established by these plans, 64% of the mapped alpine vegetation in the parks (including alpine meadows, which are also considered under wetland and meadows above) would remain closed to access by stock; 30% would remain open to stock access and grazing, with the remaining 6% open to access but closed to grazing. Trampling impacts on upland alpine vegetation would continue to be largely associated with established trails and routes, since cross-country stock travel through alpine areas is infrequent. In the alpine areas open to overnight use by stock but closed to grazing, such as Dusy Basin and in the Mineral King lake basins, occasional use would be expected to continue with resulting localized trampling and incidental grazing impacts on alpine vegetation. These impacts would be limited to camp areas within 0.5 mile of the trail corridor.

In the alpine meadows, trampling impacts would continue to be associated with grazing, as cross-country travel in these areas is largely restricted and infrequent. The timing of grazing would continue to be controlled by a system of opening dates tied to meadow conditions; these would continue to reduce stock-related impacts such as deep hoof prints, which are more likely to occur early in the season when soils are wet.

Grazing of upland alpine vegetation would continue to occur primarily in the drier meadow types such as the Wright Creek meadow complex along the JMT, in the meadows of the headwaters of the Kern, in the meadows of upper Big Arroyo and Lost Canyon, and in Upper Basin. Grazing of wet alpine meadows would be expected to continue to occur sporadically in individual meadows along the JMT, including in the Twin Lakes and Palisade Lakes basins, and also in the lower Miter Basin area. Grazing of other alpine vegetation types, such as fell-fields, would be infrequent and associated with pass-through travel and in areas where stock can be held and fed but not grazed.

Administrative use of stock would likely remain at current levels and would occur in the same areas as the level of trail development and maintenance would not change. Free-roaming stock used to support trail maintenance activities would continue to graze alpine vegetation in the meadows of the headwaters of the Kern and in Sheep Camp Meadows (north and east of the Tyndall Ranger Station). Under current use levels and patterns, grazing by commercial-outfitter stock would be expected to continue to occur on a

regular basis in the alpine uplands of the Wright Creek drainage, in the meadows of the headwaters of the Kern, and occasionally in the Taboose Pass, Woods Lake, Lower Miter Basin, and Siberian Outpost areas. Private grazing of alpine areas would be expected to remain infrequent and at very low intensities.

Grazing of alpine vegetation in the Evolution Lake basin would continue to be restricted to walking parties with burros or llamas. Because these animal have unshod hooves, consume less forage than horses or mules, and are infrequently used as stock in the parks, trampling and grazing impacts on alpine vegetation would continue to be minimal in this area.

Under current use levels and patterns, vegetation in untrailed alpine areas would remain largely undisturbed. Any significant increase in levels of use or change in patterns of visitor use would be expected to result in increased trampling and/or grazing impacts on alpine vegetation.

Plants of Conservation Concern (Park Sensitive Plant Species): Direct removal of plants of conservation concern would be expected to occur only under very limited circumstances, such as collections made in the course of research, inventory, or monitoring activities. Collection of voucher specimens is strictly regulated through the research permitting and environmental compliance processes to prevent population level impacts. Because the species of concern are by definition rare, the likelihood that they would be encountered by visitors and illegally collected is considered quite low. This would be expected to remain the case under all of the alternatives.

Similarly, trampling of the plants of conservation concern by hikers would be expected to be infrequent under current levels and patterns of use. Although species in the meadows and uplands may suffer incidental trampling by visitors traveling through meadows or on cross-country routes, this would not be expected to result in population level impacts.

Vascular plant species of conservation concern known or suspected to occur in alpine upland areas frequented by cross-country hikers and used occasionally by stock include the following:

- Beautiful pussy-toes (*Antennaria pulchella*)
- Raven's milkvetch (*Astragalus ravenii*)
- Truckee cryptantha (*Cryptantha glomeriflora*)
- Tulare County bleeding heart (*Dicentra nevadensis*)
- Mount Whitney draba (*Draba sharsmithii*)
- Bog stitchwort (*Minuartia stricta*)
- Alpine jewelflower (*Streptanthus gracilis*)

At current visitor-use levels, impacts on these species would be expected to remain infrequent and insignificant at the population level.

If current levels and patterns of recreational rock climbing on the walls of the South Fork Kings River were to continue, incidental impacts on individuals of marble rockmat (*Petrophyton caespitosum*), which grows in crevices and on ledges in the canyon, would be expected to occur. If the area increased in popularity as a climbing destination, with a subsequent increase in the use of existing routes and the development of additional new routes, these impacts could become locally significant and could have measurable impacts on local populations. As the species is also found in remote, off-trail areas not favored by climbers, such impacts would not be expected to result in large-scale losses or declines that could lead to the listing of the species.

Species known or suspected to inhabit areas that are open to cross-country travel by stock include Tulare County bleeding heart (*Dicentra nevadensis*), field ivesia (*Ivesia campestris*), Hockett Meadows lupine (*Lupinus lepidus* var. *culbertsonii*), purple mountain-parsley (*Oreonana purpurascens*), Tulare County rock cress (*Boechera pygmaea*), and Sierra Nevada linanthus (*Leptosiphon oblanceolatus*). As cross-country travel by stock is in general a rare and infrequent occurrence, under current use levels and patterns impacts would be expected to be localized and insignificant at the population level.

Exceptions to this are found along the floor of the lower Kern Canyon, where administrative grazing of the area known as the 'maze' coincides with the habitat of Kern River daisy (*Erigeron multiceps*), and on the Hockett Plateau, where administrative stock tend to roam off trail and can potentially encounter populations of Tulare County bleeding heart (*Dicentra nevadensis*), field ivesia (*Ivesia campestris*), Hockett Meadows lupine (*Lupinus lepidus* var. *culbertsonii*), and purple mountain-parsley (*Oreonana purpurascens*). Based on recent surveys, current use levels and patterns do not appear to be resulting in population level impacts on these species.

Vascular plant species of conservation concern either known to, or having the potential to, inhabit areas in or adjacent to meadows open to grazing by stock include the following:

- mountain bent grass (*Agrostis humilis*)
- beautiful pussy-toes (*Antennaria pulchella*)
- Tulare County rock cress (*Boechera pygmaea*)
- Mingan moonwort (*Botrychium minganense*)
- meadow sedge (*Carex praticola*)
- Bolander's woodreed (*Cinna bolanderi*)
- marsh claytonia (*Claytonia palustris*)
- Tulare County bleeding heart (*Dicentra nevadensis*)
- Mount Whitney draba (*Draba sharsmithii*)
- Oregon fireweed (*Epilobium oreganum*)
- copper-flowered bird's foot trefoil (*Hosackia oblongifolia* var. *cuprea*)
- field ivesia (*Ivesia campestris*)
- Sierra Nevada linanthus (*Leptosiphon oblanceolatus*)
- Hockett Meadows lupine (*Lupinus lepidus* var. *culbertsonii*)
- purple mountain-parsley (*Oreonana purpurascens*)
- rayless mountain butterweed (*Packera indecora*)
- marsh arrow-grass (*Triglochin palustris*)
- alpine jewelflower (*Streptanthus gracilis*)

Based on recent site assessments, impacts on these species are not resulting in large-scale losses or declines that could lead to the listing of any of the species. Under current use levels and patterns, this would be expected to remain the case.

Mosses – The mosses of concern considered in this analysis (*Bruchia bolanderi, Helodium blandowii, Meesia triquetra, Meesia uliginosa,* and *Pohlia tundrae*) all exist in meadow environments. One of these species, *Bruchia bolanderi,* responds positively to disturbance. This species has a short ephemeral life cycle, with spores germinating in the fall and winter, maturing in early spring, and withering by midsummer. *B. bolanderi* thus does well in areas with exposed moist soil and is considered a pioneer species. Under current levels of use, *B. bolanderi* may respond positively to localized trampling by hikers in the moist alpine areas of Dusy Basin, which is currently the only known location for this species in the parks.

Of the remaining four moss species of concern, only *Helodium blandowii* is known to grow in meadows that are open to grazing; this moss has been documented in two meadows in LeConte Canyon. As stock do not trespass into the wettest portions of the fen complex at Big Pete supporting *H. blandowii* unless the forage in the wet meadow area is exhausted, impacts are controlled by limiting the total number of nights available for grazing. When trampling impacts have been observed in the fen portions of the meadow and associated forested fen, additional controls have been put in place through the adaptive management program. Under the no-action alternative, trampling impacts in Big Pete Meadow would continue to be mitigated in this way.

Currently the two species of *Meesia* are known only from two mid-elevation peat-accumulating meadows in the Kaweah River drainage that are not open to stock access or grazing. It is likely that additional occurrences will be documented in other peat-accumulating wetlands as knowledge of mosses and their distribution increases. Any increase in use of peat-accumulating wetlands by stock would thus have the potential to impact these species.

The remaining moss of concern, tundra thread moss (*Pohlia tundrae),* has been documented from a single location in Sequoia National Park in the Upper Miter Basin area. As this basin is expected to remain a popular access route into the Mount Whitney area, the wet meadows that support *P. tundrae* would remain susceptible to trampling impacts by cross-country travelers. Increased use of this area has led to increased trail impacts, resulting in temporary party size restrictions for cross-country travelers in the Miter Basin. As use of this area by stock would continue to be limited to day rides and pass through, impacts on this species from stock would only be expected in the rare incidences when stock left the trail corridor.

Nonnative Plant Species: Current levels of stock use, visitor use, and facility maintenance would be expected to continue; related disturbance and propagule pressure would continue to promote introduction and establishment of new nonnative plant populations; and susceptible ecosystems, such as mid-elevation meadows, would continue to receive stock use. While off-trail travel by stock is very infrequent, off-trail stock travel and grazing would be allowed in four areas, continuing the potential for introducing nonnative plants in areas where early detection would be difficult and costly.

Current mid-elevation meadows open for grazing would continue to be open for grazing, continuing the potential for invasive perennial grasses to establish. In these areas, the threat of plants similar to velvet grass being introduced and becoming established would continue.

Future infestations may not be as large as the velvet grass infestation in the Kern Canyon, since the parks now have a more strategic invasive plant management program and are conducting early detection for new introductions of invasive plants in vulnerable areas. Under alternative 1, the area requiring early detection surveys is highest of all the alternatives.

Unprocessed hay and hay cubes, which have a high chance of carrying viable seeds of both invasive plants and pasture grasses, would continue to be allowed to be carried into wilderness, with certified

weed-free feed recommended but not required. In addition to the more widespread nonnative perennial grass infestations listed previously, smaller introductions associated with hay and hay cube use at hitch rails and stock camps have been frequent at Redwood Meadow (6,000 feet elevation) and in upper Rock Creek (10,600 feet elevation). Nonnative plants found in these two locations include wild oat (*Avena fatua*), ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), cheatgrass (*Bromus tectorum*), bull thistle (*Cirsium vulgare*), long-beaked filaree (*Erodium botrys*), barley (*Hordeum murinum*), common mallow (*Malva neglecta*), and annual bluegrass (*Poa annua*). Such introductions would likely continue in these and other areas due to use of seed-containing hay products.

Cumulative Effects: Other than those ongoing projects and activities associated with the administration of wilderness (i.e., facility and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on vegetation.

The Fire and Fuels Management Program, guided by the *Fire and Fuels Management Plan* completed in 2003, directs management of fires in these parks. The plan supports the use of prescribed fires, allowing fires to burn, suppression where necessary, and follow-up restoration actions. The goals of fire use are to restore and maintain ecosystems, reduce hazard fuels, protect natural and cultural resources, and protect wildland/ urban-interface communities. Fire suppression actions can lead to direct impacts to vegetation, and in the long term the suppression of fire as an ecosystem process can have significant effects on the structure and composition of native vegetation. The actions proposed by this WSP/FEIS would not be expected to interact in any significant way with the potential effects of fire management/suppression activities under the Fire and Fuels Management Program.

The projects that may affect vegetation that are separate from projects proposed by this WSP/FEIS include the high-elevation forest monitoring and wetland monitoring programs, the Halstead and Cahoon meadow restorations, the ecological restoration program, invasive species management plan and activities, and permitted research activities. The high-elevation forest monitoring program works to quantify the current conditions of high-elevation forests in Sequoia, Kings Canyon, and Yosemite national parks. The project is not invasive and the results are beneficial, as it will provide information pertinent to conservation planning. The wetland monitoring program is minimally invasive and will provide information on the structure and function of wetlands that can serve as a reference against which to compare the condition of grazed meadows. The Halstead and Cahoon meadows are two severely impacted meadows in Sequoia National Park. The restoration plans work to recreate natural conditions at the meadows, which will provide a beneficial effect on the native vegetation communities. The invasive management plan includes control, survey, monitoring, treatment, preventive measures, and data management in regards to invasive plant species. Efforts to control invasive species could temporarily impact native vegetation, but the long-term impacts would be beneficial, as they would work to retain natural vegetation communities. Permitted research activities throughout wilderness cover a variety of resources, including vegetation. One of the most frequent topics for research in wilderness in the past three years has been vascular plants/plant communities. Research projects may temporarily disturb vegetation depending on the type of research and the methods of data collecting, but overall, the knowledge gained would be beneficial and could be applied to vegetation management plans.

Since alternative 1 proposed no changes to the management of native or invasive vegetation in wilderness, there would be no significant cumulative impacts associated with the alternative.

IMPACTS OF ALTERNATIVE 2: PROTECT WILDERNESS CHARACTER BY IMPLEMENTING SITE-SPECIFIC ACTIONS (NPS PREFERRED ALTERNATIVE)

Wetlands and Meadows: Trampling of wetland and meadow vegetation by human traffic would continue to occur along trails that pass through meadows, along riparian corridors and lakeshores where campers pass through for water or to fish, and where visitors set up camps on or adjacent to meadow or riparian vegetation. While these impacts can be locally severe, they are currently insignificant at the landscape scale and this would be expected to remain the case. If visitation increases in certain destinations (as periodically occurs in response to news articles, guidebooks, and information shared through social media) local trampling impacts could increase. The development of informal trails would continue to pose potential risks to adjacent wetlands, which would be mitigated through visitor education, trail reroutes, or restoration.

Meadow, stream, and trees

Trampling and grazing of wetland and meadow vegetation by administrative and recreational stock would continue. Stock access and grazing would be managed according to the Stock Use and Meadow Monitoring and Management Strategy described in appendix D.

The trail network would be expanded as some informal and abandoned trails are added to the maintained trail system. A few maintained trails would be closed to parties with stock. The number of trails where stock parties would be limited to day use would increase. In areas open only to day use by stock parties, travel would be limited to within 100 yards of maintained trails. Stock parties would be prohibited from traveling on routes which are not maintained, except in the four areas of the parks where cross-country travel with stock would continue to be allowed.

Taken together, these actions would reduce the percentage of meadow area which is open to some form of stock travel and thus subject to trampling impacts from 64% to 54%.

The following additional locations which are otherwise open to overnight stock use would be closed to grazing: Crabtree Lakes (closed to stock access and grazing above existing camp west of lowest lake), Darwin Meadow proper, Forester Lake Meadow, Guyot Creek Meadows (expanding the existing closure to the meadows east of the trail), Kern Hot Spring Meadow, Kettle Dome (Randle Corral) Meadows, Mineral King basin, Summit Lake Meadow, Upper LeConte Canyon above 10,000-feet elevation, and the Whitney Creek drainage above the Crabtree Ranger Station. Expansion of the grazing closure of Guyot Creek Meadows would protect the steep, peat-accumulating wetlands there from both trampling and grazing impacts.

Meadows in the areas newly closed to stock travel or only open to day-use by stock parties under this alternative would also be closed to grazing. Grazing would continue to be allowed in most areas open to

overnight stock use, although six meadows (Bighorn Plateau and the meadow 0.6 mile south of Bighorn Plateau; Chagoopa Plateau #3 Meadow; Darwin Meadow; Grouse Meadow; Lower Crabtree Meadow; and the wet, recently restored portion of Taboose Pass Meadow) would be closed to grazing for visitor experience and specific resource protection needs.

Overall, the percentage of the parks' meadow area open to grazing would be reduced from 51% to 48%, which would reduce the percentage of peat-accumulating meadow area open to grazing from 72% to 70% and reduce the percentage of lakeshore meadow open to grazing from 42% to 38%.

Up to 46% of lacustrine features, 67% of palustrine features, 90% of riverine features, and up to 55% of all wetland features are in areas open to stock travel. Within the area open to stock travel, up to 46% of lacustrine features, 59% of palustrine features, 81% of riverine features, and up to 47% of all wetland features are in areas open to grazing.

Table 82: Alternative 2 – Values are Percentages of Row (Meadow Type) Totals

Meadow Type	Open to Stock Access; Open to Grazing	Open to Stock Access; Closed to Grazing	Closed to Stock Access
Fen	75%	9%	16%
Fen/wet meadow	68%	17%	16%
Wet meadow	53%	6%	41%
Moist meadow	39%	4%	56%
Dry meadow	44%	5%	51%
All meadow types	48%	6%	46%
Peat-accumulating area	70%	15%	15%
Lakeshore meadow	38%	5%	57%

Table 83: Alternative 2 – Values are Percentages of Row (System) Totals for Each Kind of Wetland Feature (Linear or Area)

System	Open to Stock Access; Open to Grazing		Open to Stock Access; Closed to Grazing		Closed to Stock Access	
	Linear	Area	Linear	Area	Linear	Area
Lacustrine	46%	26%	0%	5%	54%	68%
Palustrine	42%	60%	5%	7%	53%	32%
Riverine	48%	82%	6%	8%	46%	10%
Total	**46%**	**49%**	**6%**	**6%**	**49%**	**45%**

Although technically open to stock travel and grazing, much of the wetland and meadow area is inaccessible to stock parties and thus stock use would continue to be concentrated in named forage areas adjacent to maintained trails. Grazing, trampling, and non-native species impacts to wetland and meadow vegetation outside of named forage areas would continue to be rare and of light intensity; therefore, grazing and trampling impacts to wetland and meadow vegetation outside of named forage areas would be negligible.

Capacities, night and head limits, and other tools described in the Stock Use and Meadow Monitoring and Management Strategy described in appendix D would continue to be used to manage the intensity of grazing impacts.

Grazing capacities would be used to limit the total amount of grazing according to the methods in appendix D. These capacities would be based on meadow size, moisture status, and productivity and adjusted to address site-specific vulnerabilities such as the potential for erosion and the presence of peat-accumulating soils or sensitive species. Utilization limits of 25–45% depending on vegetation zone, moisture level, and logistical value would be used to determine baseline grazing capacities which would be modified where monitoring data provides additional information. These capacities would be applied to all meadows open to grazing. Use of these capacities would reduce grazing and trampling impacts in the most popular destinations. They also would protect areas from increased grazing pressure that might result from displacement of grazing use from nearby meadows that have reached capacity or are otherwise restricted.

Administrative use of stock would likely remain at current levels and would occur in the same areas, although there may be localized and infrequent increase in use associated with the addition of some informal and abandoned trails to the maintained trail system. Commercial stock use could continue at current levels, but may decline or increase in response to socioeconomic drivers or in response to the closure of some trails and meadows to stock. Private use would likely continue at current levels or could continue to decline. Therefore, overnight stock use in the parks would be expected to remain similar to the 10-year average of 6,775 stock nights.

Grazing levels would likely continue to be similar to the 10-year average of 6,058 stock nights. If the increasing trend in the use of supplemental feed continued, there could be a slight overall reduction in grazing and thus in grazing and trampling impacts on meadows and wetlands. Grazing would likely continue to occur in approximately 41% of the meadow area open to grazing, although this could increase due to displacement of grazing use from meadows that have reached capacity or are otherwise restricted to forage areas which are currently unused.

The intensity of grazing in named forage areas (and therefore the extent and severity of impacts) would be limited by the capacities developed according to the methodology described in appendix D. Table 84 summarizes the number of forage areas and meadow vegetation within them which would be subject to grazing impacts.

Table 84: Number of Forage Areas and Meadow Area Open to Grazing under Alternative 2 by Vegetation Zone and Logistical Value Used to Set Limits on Utilization

Alternative 2	Lower Logistical Value		Higher Logistical Value	
Vegetation Zone	**Number of Forage Areas**	**Forage Area Acres**	**Number of Forage Areas**	**Forage Area Acres**
Lower Montane & Woodland	45	225	14	86
Upper Montane & Subalpine	129	4738	41	714
Total	**174**	**4963**	**55**	**800**

In the 14 lower montane forage areas open to grazing with higher logistical value (totaling 86 acres), utilization would be limited to no more than 45% in moist meadows and 35% in dry or wet meadows. The amount of foliage left ungrazed at these levels would be approximately equal to the amount of herbage which would be expected to decompose annually; if grazed to capacity regularly, productivity would be

expected to remain near current levels which may or may not be similar to comparable ungrazed meadow vegetation.

In the remaining 45 lower montane forage areas open to grazing with lower logistical value (totaling 225 acres), utilization would be limited to no more than 35% in moist meadows and 25% in dry or wet meadows. The amount of foliage left ungrazed at these levels would be more than the amount of herbage which would be expected to decompose annually; if grazed to capacity regularly, productivity would be expected to trend towards or be similar to comparable ungrazed meadow vegetation.

In the 41 upper montane and subalpine forage areas open to grazing with higher logistical value (totaling 714 acres), utilization would be limited to no more than 35%. If grazed to capacity regularly, this level of utilization in dry *Carex filifolia* vegetation would, on average, reduce productivity by 10% and reduce basal vegetation cover by 16% relative to ungrazed vegetation. In moist to wet *Deschampsia cespitosa* vegetation, this level of utilization would, on average, reduce productivity by 18% relative to ungrazed vegetation. This level of utilization in moist *Calamagrostis muiriana* vegetation would, on average, reduce productivity by 16%, increase basal vegetation cover by 14%, and decrease relative graminoid cover by 12% relative to ungrazed vegetation.

In the remaining 129 upper montane and subalpine forage areas open to grazing with lower logistical value (totaling 4738 acres), utilization would be limited to no more than 25%. If grazed to capacity regularly, this level of utilization in dry *Carex filifolia* vegetation would, on average, increase productivity by 2% and increase basal vegetation cover by 7% relative to ungrazed vegetation. In moist to wet *Deschampsia cespitosa* vegetation, this level of utilization would, on average, decrease productivity by 11% relative to ungrazed vegetation. This level of utilization in moist *Calamagrostis muiriana* vegetation would, on average, reduce productivity by 10%, increase basal vegetation cover by 41%, and decrease relative graminoid cover by 6% relative to ungrazed vegetation.

Because horses and mules are selective grazers and overall grazing pressure is light, grazing impacts would generally be concentrated in one meadow vegetation type within a forage area. Grazing capacities would be based on the area of this preferred vegetation, which is usually less than the area of the entire meadow. Therefore, the extent of the most severe predicted impacts to meadow and wetland vegetation would be less than the total meadow area summarized above.

Trampling impacts on meadows would be directly related to grazing, since stock travelling through meadows open to access but closed to grazing would continue to be uncommon and infrequent. The timing of grazing would continue to be controlled by a system of opening dates tied to soil moisture and meadow conditions, which would reduce stock-related impacts in wetlands such as deep hoofprints, which are more likely to occur early in the season when soils are wet.

Potential nonnative species introductions would be proportional to the meadow area open to both access and grazing, as species deposited along trails and in camps may be propagule sources for wetlands and meadows. Restrictions on the kinds of feed that may be provided to stock would reduce propagule pressure on meadows to the extent that it replaces untreated feed. Surveys to provide for the early detection of nonnative species would be conducted as part of routine meadow monitoring and wilderness patrol activities.

Grazing levels and associated impacts would continue to be highest in popular meadows along the JMT corridor, in traditional destinations for visitors traveling with stock (such as Roaring River and Hockett Plateau), and in areas serving as foci for trail maintenance and construction crews. Implementation of grazing capacities for all user groups, and formalization of the management process described in appendix

D would reduce the incidence of overgrazing and establish thresholds for management action that would decrease potential for trampling and grazing impacts.

Several actions would mitigate stock impacts in these high use areas. Restricting grazing of Lower Whitney Creek, Lower Soldier Lake, and Upper Vidette meadows to private users only would help prevent overuse of these small but popular meadows. Additional meadow areas along the JMT and HST would also be closed to grazing entirely, which would limit impacts in popular areas. Under the proposed reduction in commercial stock based activities in the Mount Whitney Management Area, meadows in the Whitney and Rock Creek drainages would likely continue to be grazed to capacity, as available forage would be consumed before area-wide commercial use ceilings were reached. Coupled with the closure of Lower Crabtree Meadow, however, the total grazing capacity of the meadows in the area would be reduced and the use of supplemental feed products expected to increase.

Dusy Basin and Rae Lakes would no longer be open to overnight use by stock, which would lead to a decrease in potential trampling impacts from the holding and feeding of animals within 0.5 mile of the trail corridor. As under current use patterns this occurs infrequently, this action would serve to prevent potential impacts should use patterns or levels change.

The maximum number of stock in a party would be reduced to 12 head in the four cross-country stock travel areas and lower in a few locations, resulting in a slight decrease in the potential for trampling and grazing impacts in these areas. Under current use levels and patterns, stock use in these areas is rare; therefore, actual impacts in cross-country travel areas would not be expected to change significantly.

The existing corrals and supporting stock infrastructure in the Mineral King Valley could be relocated or modified to allow for short-term public camping or staging and/or short-term camping by commercial use authorization (CUA) holders. If these actions were taken, there could be short-term construction impacts to the adjacent wetlands, and increases in stock use in the destinations traditionally accessed from this area (Cliff Creek, Big Arroyo, Little Five Lakes, Big Five Lakes, Lost Canyon, Rattlesnake Canyon, Hockett Plateau) although impacts would be mitigated through the management process described in appendix D. Separate environmental compliance would be conducted.

Under alternative 2, overall trampling, grazing, and nonnative species impacts on meadows and wetlands would be expected to be reduced from current levels due to the implementation of meadow-specific grazing capacities and application of site-specific management actions. Any increase in levels of use or change in patterns of use would be expected to result in increased potential for trampling and/or grazing impacts; these would be mitigated using the management tools described in appendix D. The meadow capacities presented in appendix D reflect meadow size, moisture status, and productivity as well as site-specific vulnerabilities such as the potential for erosion and the presence of peat-accumulating soils or sensitive species. The use of these capacities would reduce grazing and trampling impacts in the most popular destinations. They also would protect areas from increased grazing pressure that might result from displacement of grazing use from nearby meadows that have reached capacity or are otherwise closed.

High-elevation Long-lived Tree Species: Greater restrictions on campfires would be put in place to protect old living trees and downed wood resources. Campfire restrictions would remain the same as under current conditions for the San Joaquin, Kings, Kaweah, Tule, and Soda Springs drainages. The campfire restrictions would be lowered 400 feet in the Kern drainage from their current 10,400 feet to 10,000 feet. This constraint would reduce impacts on vegetation in higher elevation areas where firewood is scarce and is not a sustainable resource. In these areas, downed trees would remain in place as a paleo resource and be available for water, nutrients, and potential habitat for seedlings, with trampling of existing vegetation reduced in the search for firewood. Below 10,000 feet, vegetation would continue to

be affected by trampling and firewood collection activities, although site-specific restrictions would be implemented where downed wood resources cannot sustain campfires, including: Hamilton Lakes, Mineral King Valley, Pinto Lake, and Redwood Canyon.

Campfires would be restricted in 442,096 acres of the parks' wilderness while being permitted in 35,857 acres (10.3% of area) of high-elevation conifer habitat that supports the four subalpine or upper montane long-lived tree species (whitebark pine, foxtail pine, limber pine, and Sierra juniper). Considering just the three five-needle conifers, which would primarily be whitebark and foxtail pines, and to a lesser extent limber pine, this area would be 14,768 acres.

The greatest area of impacts from campfires and fuelwood gathering is within 328 feet of campfires and trails. Under alternative 2, these areas would represent approximately 1,322 acres of subalpine or upper montane long-lived tree species habitat that occurs in areas without campfire restrictions.

Proposed campfire restrictions would also protect the higher elevation habitat of non-target vegetation classes, which includes portions of the distribution of species such as lodgepole pine, mountain hemlock, western white pine, and red-fir forests. Under this alternative, this area would be approximately 44,480 acres.

Alpine Vegetation: Direct removal of alpine vegetation occurs infrequently, and is primarily associated with trail maintenance and construction activities. Under this alternative, impacts resulting from these activities would continue at existing levels, resulting in localized impacts on alpine plants.

Trampling of alpine vegetation along trail corridors and in high-elevation camp areas by human traffic would continue to occur. While these impacts can be locally severe, they are currently insignificant at the ecosystem scale, and this would be expected to remain the case.

Most trampling impacts would continue to occur along cross-country routes and in popular destinations where visitor use is concentrated. Areas where such impacts would be expected to continue to be seen would include Dusy Basin, the Mount Whitney area, Upper Darwin Canyon/Lamark Col, Mount Langley, Kearsarge Lakes, and other similar high-elevation basins and routes popular with hikers. However, should other destinations increase in popularity (as periodically occurs in response to news articles, guidebooks, and information shared through social media) local trampling impacts in such areas would be expected to increase. With additional controls on visitor use in the Mount Whitney area, trampling impacts on alpine vegetation would be expected to stabilize along all routes leading into and through the area, especially through Miter Basin, Crabtree Pass, and along the JMT corridor. Increased popularity of Mount Langley, as an easily accessed 14,000+ feet peak, would continue to result in impacts on the sparsely vegetated summit area and along the multiple approach routes; however, these are expected to be mitigated soon by the establishment of a cairned route to the summit. Similarly, the increased popularity of alpine summits along the crest among 'peak baggers' would be expected to lead to increased development of informal trails and trampling of alpine vegetation, both on the summits and along approach routes.

Under proposed restrictions on stock access and grazing, 70% of the mapped alpine vegetation in the parks (including alpine meadows) would be closed to access by stock; 27% would remain open to stock access and grazing; and the remaining 3% open to access but closed to grazing. Stock trampling impacts on upland alpine vegetation would continue to be largely associated with established trails and routes, since cross-country stock travel through alpine areas is infrequent. Restricting stock use to pass-through and day use in Dusy Basin, lower Miter Basin, and Upper Blue Canyon, would prevent trampling impacts outside of the immediate trail corridor and those associated with holding and feeding animals. Although overnight use by stock in these areas is currently infrequent, these restrictions would ensure protection of the alpine vegetation in these areas should use patterns change. Closure of the Baxter Pass Trail to stock

would similarly prevent stock-related impacts on the alpine vegetation along the trail corridor. Trampling of alpine plants by hikers in the Baxter Pass area would continue, as the trail is often indistinguishable and travel over vegetation is unavoidable; under current use levels, such impacts would be localized to the primary route corridor. Should use of the area increase, impacts may become locally severe and require remediation.

In the alpine meadows, trampling impacts would continue to be associated with grazing, as cross-country travel in these areas is largely restricted and infrequent. The timing of grazing would continue to be controlled by a system of opening dates tied to meadow conditions to reduce stock-related impacts such as deep hoof prints, which are more likely to occur early in the season when soils are wet.

Grazing of upland alpine vegetation would continue to occur primarily in the drier meadow types such as the Wright Creek Meadow complex along the JMT, in the meadows of the headwaters of the Kern at Sheep Camp Meadows, in the meadows of upper Big Arroyo and Lost Canyon, and in Upper Basin. Grazing of wet alpine meadows would be expected to continue to occur sporadically in individual meadows along the JMT, including in the Twin Lakes and Palisade Lakes basins. The closure to grazing of Upper LeConte Canyon, Bighorn Plateau, and the wet portion of the Taboose Pass Meadows under this alternative would provide additional protection to these alpine meadows. Grazing of other alpine vegetation types, such as fell-fields, would be infrequent and associated with pass-through travel and in areas where stock can be held and fed but not grazed.

Administrative use of stock would likely remain at current levels and would occur in the same areas, although there may be localized and infrequent increases in use associated with the addition of some informal and abandoned trails to the maintained trail system. Free-roaming stock used to support trail maintenance activities would continue to graze alpine vegetation in Sheep Camp Meadows (north and east of the Tyndall Ranger Station) but not in the meadows of the Lake South America Loop (as this would be open to grazing only by parties with burros or llamas). Under current use levels and patterns, grazing by commercial stock would be expected to continue to occur on a regular basis in the alpine uplands of the lower Wright Creek, in Sheep Camp Meadows, and occasionally in the lower Wallace Creek and Siberian Outpost area. Private grazing of alpine areas would be expected to remain infrequent and at very low intensities.

Grazing of alpine vegetation in the Evolution Lake basin would continue to be restricted to walking parties with burros or llamas. Because these animal have unshod hooves, consume less forage than horses or mules, and are infrequently used as stock in the parks, trampling and grazing impacts on alpine vegetation would continue to be minimal in this area.

Under current use levels and patterns, vegetation in untrailed alpine areas would remain largely undisturbed. Any significant increase in levels of use or change in patterns of visitor use would be expected to result in increased trampling and/or grazing impacts on alpine vegetation.

Plants of Conservation Concern (Park Sensitive Plant Species): Direct removal of plants of conservation concern would continue to be expected to occur only under very limited circumstances, such as collections made in the course of research, inventory, or monitoring activities. Collection of voucher specimens is strictly regulated through the research permitting and environmental compliance processes to prevent population level impacts. Because the species of concern are by definition rare, the likelihood that they would be encountered by visitors and illegally collected is considered quite low.

Similarly, trampling of the plants of conservation concern by hikers would be expected to be infrequent under expected levels and patterns of use. Although species in the meadows and uplands may suffer incidental trampling by visitors traveling through meadows or on cross-country routes, this would not be

expected to result in population-level impacts. The closure of the Baxter Pass Trail to stock travel, and the closure of the Woods Lake basin to grazing by horses or mules, would lead to increased protection of populations of *Astragalus ravenii* and *Streptanthus gracilis* in those areas. Thus, impacts on the seven vascular plant species of conservation concern known or suspected to occur in alpine upland areas frequented by cross-country hikers and used occasionally by stock, listed under alternative 1, would be expected to remain infrequent and insignificant at the population level.

If recreational rock climbing on the walls of the South Fork Kings River were to increase with the opening of the North Dome area to overnight camping, incidental impacts on individuals of marble rockmat (*Petrophyton caespitosum*), which grows in crevices and on ledges in the canyon, could be expected to increase. An increase in the use of existing routes and the development of additional new routes could lead to locally significant trampling impacts which could have measurable impacts on local populations. As the species is also found in remote, off-trail areas not favored by climbers, such impacts would not be expected to result in large-scale losses or declines that could lead to the listing of the species.

Impacts on the seven vascular plant species of conservation concern known or suspected to inhabit areas that are open to cross-country travel by stock, listed under alternative 1, would be expected to remain localized and insignificant at the population level. Exceptions to this are found along the floor of the lower Kern Canyon, where administrative grazing of the area known as the 'maze' coincides with the habitat of Kern River daisy, and on the Hockett Plateau where administrative stock tend to roam off trail and can potentially encounter populations of Tulare County bleeding heart, field ivesia, Hockett Meadows lupine, and purple mountain-parsley. Based on recent surveys, current use levels and patterns do not appear to be resulting in population level impacts on these species. As administrative stock use would not be expected to increase under this alternative, no large-scale losses or declines that could lead to the listing of these species would be expected.

The 18 vascular plant species of conservation concern either known to, or having the potential to, grow in or adjacent to meadows open to grazing by stock are listed under alternative 1. Impacts on these species would continue to be expected to be localized and would not be expected to result in large-scale losses or declines that could lead to the listing of any of the species.

The mosses of concern considered in this analysis (*Bruchia bolanderi*, *Helodium blandowii*, *Meesia triquetra*, *Meesia uliginosa*, and *Pohlia tundrae*) all grow in meadow environments. Specific actions proposed under this alternative that would lead to greater protection of these species from trampling and grazing impacts include the closure of Guyot Creek east of the JMT, which would protect the peat-accumulating wetlands there and the associated moss flora from impacts. The implementation of grazing capacities for all the parks' meadows would also afford greater protection to the moss communities found in peat-accumulating wetlands as the capacities are based on the size of the area suitable for grazing; at relatively low levels of use, stock tend to avoid the wettest areas which support bryophytes.

Expanding the portion of the Miter Basin area open only to pass through and day rides by stock, coupled with the adoption of smaller party sizes for off-trail hikers and riders, would potentially provide additional protection to the habitat of tundra thread moss.

Nonnative Plant Species: Alternative 2 and all action alternatives would include measures to protect native vegetation and soils listed at the end of chapter 2 and further detailed in appendix N. Significantly, these mitigations would require that feed carried into wilderness would be processed pellets, rolled grains, or fermented hay. Baled or loose hay (which has no processing) and compressed hay cubes (which have minimal processing) would not be allowed in wilderness. California or Nevada certified weed free forage

(baled or loose hay, hay cubes, or straw bedding) would be required when hay products are used as supplemental forage or bedding in frontcountry zones.

California certified weed-free forage is field-inspected for nonnative plants on the California and federal noxious weed lists. However, it can still contain species considered desirable for hay production but considered invasive plants in wildlands; such as timothy, oats, barley, velvet grass, orchard grass, and reed canarygrass. In addition, many other plant species listed by the California Invasive Plant Council as invasive nonnative plants that threaten wildlands are not included on the California and federal noxious weed lists. Commercially processed pellets, rolled grains, and fermented hay have a high level of mechanical milling, heat treatment, and/or anaerobic fermentation that reduce live seed content. More risk can be tolerated in frontcountry sites, where the probability of detection is higher and there are fewer barriers to effective treatment of established plants than in wilderness sites, where probability of detection is low and there are more barriers to effective treatment of established plants.

These mitigations would reduce, but not eliminate, propagule introductions associated with stock use. Horses can carry live seed in their guts for several days; St. John-Sweeting and Morris (1991) found that peak seed transmission occurred three to four days after consumption, with some species being transmitted up to 10 days later. Purging of animals on certified weed-free feed, pellets, rolled grains, or fermented hay in advance of wilderness travel would be recommended but not required because it is difficult to enforce. In practice, purging would be implemented for administrative and concessions stock who are held in frontcountry corrals and pack stations and fed certified weed-free hay prior to wilderness travel. However, seeds of common pasture grasses could still be present in the certified weed-free hay and transported in guts of animals to wilderness.

Alternative 2 allows slightly less off-trail stock travel and off-trail meadow grazing than alternative 1, which would slightly lower the potential for introducing nonnative plants in areas where early detection would be difficult and costly. Total stock use would likely remain similar to current levels, but could be reduced slightly in popular use areas such as Rock Creek and Whitney Creek. Disturbance related to visitor use (trailhead quotas and group size) and facility maintenance (trail construction and maintenance, ranger station maintenance) would be similar to current conditions. Due to the implementation of stock-feed restrictions and improved prevention mitigations, overall propagule pressure from stock, visitors, and administrative operations would be lower than it is currently. However, there could be more developed frontcountry stock facilities at west side trailheads, creating more sources for invasive plant transport to wilderness. The overall probability of introductions would be slightly less than current conditions. Probability of introductions to high-value habitats (wetlands) would be slightly lower, since the percentage of meadow area open to grazing would decrease from 51% to 48%. Spatial distribution of impacts would be wide, and difficulty of detection would be similar to current conditions. Nonnative species impacts would be about the same overall.

Cumulative Effects: This alternative calls for similar numbers of visitors and stock wilderness-wide, reduces development, but allows for continued grazing. This alternative would reduce the percentage of meadow area that is open to stock travel from 64% to 54% and reduce the percentage of the parks' meadows open to grazing from 51% to 48%. With the decrease in access, the potential for invasive species spread in meadows would be reduced. Alternative 2 would increase campfire restrictions, which would result in beneficial effects on subalpine trees.

Other than those ongoing projects and activities associated with the administration of wilderness (i.e., facility and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on vegetation. The projects that may affect vegetation that are separate from projects proposed by this WSP/FEIS include the high-elevation forest monitoring program, the wetlands monitoring program, the Halstead and Cahoon meadow restorations, the ecological

restoration program, invasive species management plan and activities, and permitted research activities. The majority of other past, present, and future foreseeable projects in wilderness have no potential for effects on vegetation. The impacts from these seven projects, and of the Fire and Fuels Management Program, are described for alternative 1.

This alternative would result in impacts that are not substantially different from the no-action alternative (alternative 1) with similar visitor use levels and stock restrictions. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

Impacts of Alternative 3: Provide More Opportunities for Primitive Recreation

Wetlands and Meadows: Trampling of wetland and meadow vegetation by human traffic would continue to occur along wet trails that pass through meadows, along riparian corridors and lakeshores where campers pass through for water or to fish, and where visitors set up camps on or adjacent to meadow or riparian vegetation. While these impacts can be locally severe, they are currently insignificant at the ecosystem scale and this would be expected to remain the case. As current visitor-use levels could increase under this alternative, the extent and severity of human trampling of meadow and wetland vegetation would be expected to rise. However, additional infrastructure and increased controls on visitor behavior such as night limits or designated campsites in popular camp areas could offset the increase in visitation. Impacts could increase in severity locally, but it would be unlikely that these impacts would increase enough to be significant at the landscape scale. The development of informal trails would continue to pose potential risks to adjacent wetlands, which would be mitigated through visitor education, trail reroutes, or restoration.

Trampling and grazing of wetland and meadow vegetation by administrative and recreational pack and saddle stock would continue. Stock access and grazing would be managed according to the Stock Use and Meadow Monitoring and Management Strategy described in appendix D.

The trail network would be expanded as some informal and abandoned trails are added to the maintained trail system and become more developed to accommodate increased visitation. Stock travel would be allowed on most maintained trails. The number of trails where stock parties would be limited to day use would increase slightly. In areas open only to day use by stock parties, travel would be limited to within 100 yards of maintained trails. Stock parties would be prohibited from traveling on routes that are not maintained, except in four areas of the parks where cross-country travel with stock would continue to be allowed.

Taken together, these actions would reduce the percentage of meadow area which is open to some form of stock travel and thus subject to trampling impacts from 64% to 55%.

The following additional locations, which are otherwise open to overnight stock use, would be closed to grazing: Crabtree Lakes (closed to stock access and grazing above existing camp west of lowest lake), Darwin Meadow proper, Forester Lake Meadow, Guyot Creek Meadows (expanding the existing closure to the meadows east of the trail), Kern Hot Spring Meadow, Kettle Dome (Randle Corral) meadows, Guitar Lake, Mineral King basin, Summit Lake Meadow, Upper LeConte Canyon above 10,000-feet elevation, and Milestone Creek.

Meadows in the areas newly closed to stock travel or only open to day-use by stock parties under this alternative would also be closed to grazing. In addition, most of the meadows in the four areas open to cross-country travel by stock would be closed to grazing. Within 0.5 miles of trails, grazing would continue to be allowed in most areas open to overnight stock use, although six meadows (Bighorn Plateau

and the meadow 0.6 mile south of Bighorn Plateau; Chagoopa Plateau #3 Meadow; Darwin Meadow; Grouse Meadow; Lower Crabtree Meadow; and the wet, recently restored portion of Taboose Pass Meadow) would be closed to grazing for visitor experience and specific resource protection needs.

Overall, the percentage of the parks' meadow area open to grazing would be reduced from 51% to 37% which would reduce the percentage of peat-accumulating meadow area from 72% to 53% and reduce the percentage of lakeshore meadow open to grazing from 42% to 27%.

Under this alternative, up to 46% of lacustrine features, 68% of palustrine features, 90% of riverine features, and up to 56% of all wetland features would be in areas open to stock travel. Within the area open to stock travel, up to 43% of lacustrine features, 46% of palustrine features, 81% of riverine features, and up to 36% of all wetland features would be in areas open to grazing.

Up to 46% of lacustrine features, 68% of palustrine features, 90% of riverine features, and up to 56% of all wetland features are in areas open to stock travel. Within the area open to stock travel, up to 43% of lacustrine features, 46% of palustrine features, 81% of riverine features, and up to 36% of all wetland features are in areas open to grazing.

Table 85: Alternative 3 – Values are Percentages of Row (Meadow Type) Totals

Meadow Type	Open to Stock Access; Open to Grazing	Open to Stock Access; Closed to Grazing	Closed to Stock Access
Fen	66%	18%	16%
Fen/wet meadow	56%	29%	15%
Wet meadow	42%	18%	39%
Moist meadow	28%	17%	55%
Dry meadow	38%	12%	50%
All meadow types	37%	18%	45%
Peat-accumulating area	53%	32%	15%
Lakeshore meadow	27%	18%	56%

Table 86: Alternative 3 – Values are Percentages of Row (System) Totals for Each Kind of Wetland Feature (Linear or Area)

System	Open to Stock Access; Open to Grazing		Open to Stock Access; Closed to Grazing		Closed to Stock Access	
	Linear	Area	Linear	Area	Linear	Area
Lacustrine	43%	17%	3%	17%	54%	66%
Palustrine	30%	46%	18%	22%	52%	32%
Riverine	39%	81%	15%	9%	46%	10%
Total	**36%**	**36%**	**16%**	**20%**	**48%**	**44%**

Although technically open to stock travel and grazing, much of the wetland and meadow area is inaccessible to stock parties, and thus stock use would continue to be concentrated in named forage areas adjacent to maintained trails. Grazing of wetland and meadow vegetation outside of named forage areas

would continue to be rare and of light intensity; therefore grazing and trampling impacts to wetland and meadow vegetation outside of named forage areas would be negligible.

Capacities, night and head limits, and other tools described in the Stock Use and Meadow Monitoring and Management Strategy described in appendix D would continue to be used to manage the intensity of grazing impacts.

Grazing capacities would be used to limit the total amount of grazing according to the methods in appendix D. These capacities would be based on meadow size, moisture status, and productivity and adjusted to address site-specific vulnerabilities such as the potential for erosion and the presence of peat accumulating soils or sensitive species. Utilization limits of 25–45% depending on vegetation zone, moisture level, and logistical value would be used to determine baseline grazing capacities which would be modified where monitoring data provides additional information. These capacities would be applied to all meadows open to grazing. The use of these capacities would reduce grazing and trampling impacts in the most popular destinations. They also would protect areas from increased grazing pressure that might result from displacement of grazing use from nearby meadows that have reached capacity or are otherwise restricted.

Administrative use of stock would likely remain at current levels or increase slightly since trail development would be greater than current conditions. Commercial stock use would likely increase to meet demand from additional visitation in popular areas and could also increase locally if the Mineral King or Wolverton pack stations were re-opened, although this could be offset somewhat by the new closures or restrictions on stock travel and grazing. Depending if the current trend in private stock use continues, private stock use could continue at current levels or decrease. Overall stock use would be expected to increase relative to the 10-year average of 6,775 stock nights.

Grazing levels would be expected to increase over the 10-year average of 6,058 stock nights, although this could be partially offset if the increasing trend in the use of supplemental feed continued. Grazing would likely occur in more than 55% of the area open to grazing; as increased use levels, reduced acreage open to grazing, and the establishment of capacities would likely combine to shift use to areas which have not been grazed in the last five years.

The intensity of grazing in named forage areas (and therefore the extent and severity of impacts) would be limited by the capacities developed according to the methodology described in appendix D. Table 87 summarizes the number of forage areas and meadow vegetation within them which would be subject to grazing impacts.

Table 87: Number of Forage Areas and Meadow Area Open to Grazing under Alternative 3 by Vegetation Zone and Logistical Value Used to Set Limits on Utilization

Alternative 3	Lower Logistical Value		Higher Logistical Value	
Vegetation Zone	**Number of Forage Areas**	**Forage Area Acres**	**Number of Forage Areas**	**Forage Area Acres**
Lower Montane & Woodland	39	199	14	86
Upper Montane & Subalpine	111	4541	41	714
Total	**150**	**4740**	**55**	**800**

In the 14 lower montane forage areas with higher logistical value (totaling 86 acres), utilization would be limited to no more than 45% in moist meadows, and 35% in dry or wet meadows. The amount of foliage left ungrazed at these levels would be approximately equal to the amount of herbage which would be expected to decompose annually; if grazed to capacity regularly, productivity would be expected to remain near current levels which may or may not be similar to comparable ungrazed meadow vegetation.

In the remaining 39 lower montane forage areas with lower logistical value and open to grazing (totaling 199 acres), utilization would be limited to no more than 35% in moist meadows and 25% in dry or wet meadows. The amount of foliage left ungrazed at these levels would be more than the amount of herbage which would be expected to decompose annually; if grazed to capacity regularly, productivity would be expected to trend towards or be similar to comparable ungrazed meadow vegetation.

In the 41 upper montane and subalpine forage areas with higher logistical value (totaling 714 acres), utilization would be limited to no more than 35%. If grazed to capacity regularly, this level of utilization in dry *Carex filifolia* vegetation would, on average, reduce productivity by 10% and reduce basal vegetation cover by 16% relative to ungrazed vegetation. In moist to wet *Deschampsia cespitosa* vegetation, this level of utilization would, on average, reduce productivity by 18% relative to ungrazed vegetation. This level of utilization in moist *Calamagrostis muiriana* vegetation would, on average, reduce productivity by 16%, increase basal vegetation cover by 14%, and decrease relative graminoid cover by 12% relative to ungrazed vegetation.

In the remaining 111 upper montane and subalpine forage areas (totaling 4,740 acres) with lower logistical value and open to grazing, utilization would be limited to no more than 25%. If grazed to capacity regularly, this level of utilization in dry *Carex filifolia* vegetation would, on average, increase productivity by 2% and increase basal vegetation cover by 7% relative to ungrazed vegetation. In moist to wet *Deschampsia cespitosa* vegetation, this level of utilization would, on average, decrease productivity by 11% relative to ungrazed vegetation. This level of utilization in moist *Calamagrostis muiriana* vegetation would, on average, reduce productivity by 10%, increase basal vegetation cover by 41%, and decrease relative graminoid cover by 6% relative to ungrazed vegetation.

Because horses and mules are selective grazers and overall grazing pressure is light, grazing impacts would generally be concentrated in one meadow vegetation type within a forage area. Grazing capacities would be based on the area of this preferred vegetation, which is usually less than the area of the entire meadow. Therefore, the extent of the most severe predicted impacts to meadow and wetland vegetation would be less than the total meadow area summarized above.

The maximum number of stock in a party would be increased to 25 head throughout most of the parks, resulting in an increase in the potential for trampling and grazing impacts where stock is allowed. Additional head limits in some locations would mitigate some of these impacts in popular or sensitive destinations.

Trampling impacts on meadows would continue to be directly related to grazing, since stock travel through meadows open to access but closed to grazing would be expected to continue to be relatively uncommon and infrequent. Trampling impacts would likely decrease in extent but have the potential for increased local impacts. The timing of grazing would continue to be controlled by a system of opening dates tied to meadow conditions to reduce stock-related impacts in wetlands such as deep hoofprints, which are more likely to occur early in the season when soils are wet.

Potential nonnative species introductions would be proportional to the meadow area open to both access and grazing, as species deposited along trails and in camps may be propagule sources for wetlands and meadows. Potential nonnative species impacts on meadows would decrease with the closure of more of

the parks' meadows to stock access, although greater stock use could increase propagule pressure. Restrictions on the kinds of feed that may be provided to stock would reduce propagule pressure on meadows to the extent that it replaces untreated feed. Surveys to provide for the early detection of nonnative species would be conducted as part of routine meadow monitoring and wilderness patrol activities.

Prohibitions on campfires could decrease stock use in some meadows above 9,000 feet by making these destinations less desirable to stock users.

Grazing pressure would continue to be highest in popular meadows along the JMT corridor, in traditional destinations for visitors traveling with stock (such as Roaring River and Hockett Plateau), and in areas serving as foci for trail maintenance and construction crews. Additional grazing restrictions (head and night limits) and the Stock Use and Meadow Monitoring and Management Strategy described in appendix D would continue to be used to manage the extent and severity of grazing impacts.

Under the proposed reduction in commercial stock based activities in the Mount Whitney Management Area, meadows would likely continue to be grazed to capacity, as available forage would be consumed before area-wide commercial use ceilings were reached. Coupled with the closure of Lower Crabtree Meadow, however, the total grazing capacity of the meadows in the area would be reduced and the use of supplemental feed products expected to increase.

The existing corrals and supporting stock infrastructure in the Mineral King Valley could be relocated or modified to allow for short-term public camping or staging by a contracted concessions service. If these actions were taken, there could be short-term construction impacts to the adjacent wetlands, and increases in stock use in the destinations traditionally accessed from this area (Cliff Creek, Big Arroyo, Little Five Lakes, Big Five Lakes, Lost Canyon, Rattlesnake Canyon, Hockett Plateau) although impacts would be mitigated through the management process described in appendix D. Separate environmental compliance would be conducted.

The overall impact of grazing to meadows would depend on how stock use patterns change in response to the changes in access and grazing restrictions. Fewer meadows would be open to grazing, including some meadows that are popular stock destinations, resulting in less meadow area subject to grazing impacts. There would be little change in actual grazing impacts in the off-trail travel areas which are closed to grazing, as current use levels are extremely low. However, if stock use remains the same or increases in popular areas and stock users graze alternative sites to those closed to grazing under this alternative, grazing intensity could increase (up to established capacities) on the meadows which remain open to grazing. The increase in localized grazing impacts could be moderated by the increased controls on visitor behavior, if stock users carry feed to replace the grazing areas which have been closed, or if stock users shift use to areas that currently receive little stock use.

Under alternative 3, it is most likely that there would be a net increase in grazing and trampling impacts on meadows and wetlands, as higher use would be concentrated in fewer destinations. These impacts would be mitigated using the management tools described in appendix D.

High-elevation Long-lived Tree Species: Wilderness-wide, campfires would be restricted to less than 9,000 feet, making alternative 3 more protective from impacts of firewood collection than alternatives 1 and 2. Alternative 3 would reduce the amount of wilderness area that would allow campfires in the San Joaquin, Kings, and Kern drainages. There would also be site-specific restrictions for areas below this elevation. This would result in 293,840 acres (or approximately 35%) of wilderness in the parks where campfires would be permitted. Overall, alternative 3 includes the second greatest acreage of high-elevation areas with campfire restrictions in area where foxtail pine, whitebark pine, limber pine, and

Sierra juniper occur. Under alternative 3, recreational campfires would be restricted in 543,965 total acres of the parks. In wilderness areas of the parks, campfires would be permitted in 13,126 acres of high-elevation conifer habitat that supports the four subalpine long-lived tree species (whitebark pine, foxtail pine, limber pine, and Sierra juniper). Considering just the three five-needle conifers, which would primarily be whitebark and foxtail pines and to a lesser extent limber pine, this area would be 667 acres.

The greatest area of impacts from campfires and fuelwood gathering is within 328 feet of campfires and trails. Under alternative 3, these areas would represent approximately 607 acres of subalpine or upper montane long-lived tree species habitat that occurs in areas without campfire restrictions.

The proposed campfire restrictions would also protect the higher elevation habitat of non-target vegetation classes, which includes portions of the distribution of species such as lodgepole pine and mountain hemlock. In the Kaweah River drainage, with restriction starting at 9,000 feet, this would include some western white pine and red fir forest as well. Under this alternative this area would be approximately 90,516 acres.

Alpine Vegetation: Direct removal of alpine vegetation occurs infrequently, and is primarily associated with trail maintenance and construction activities. Under this alternative, impacts resulting from these activities would continue at existing levels, resulting in localized impacts on alpine plants.

Trampling of alpine vegetation along trail corridors and in high-elevation camp areas by human traffic would continue to occur. While these impacts can be locally severe, they are currently insignificant at the ecosystem scale and this would be expected to remain the case. The increased visitor use expected under this alternative would likely expand the campsite area subject to such impacts and lead to an increase in impacts in popular areas.

Depending on where they were located, the installation of new food-storage boxes in five alpine areas in Kings Canyon National Park—Dusy Basin, Evolution Lake, Marjorie Lake, Palisades Lake, and Twin Lakes—could result in severe impacts on alpine vegetation in the immediate vicinity of the boxes, with less severe but notable impacts radiating outward along routes used to access the boxes. Increased camping associated with these newly established boxes would also likely result in the removal and trampling of alpine vegetation.

Most trampling impacts would continue to occur along cross-country routes and in popular destinations where visitor use is concentrated. Areas where such impacts would be expected to continue to be seen would include Dusy Basin, the Mount Whitney area, Upper Darwin Canyon/Lamark Col, Mount Langley, Kearsarge Lakes, and other similar high-elevation basins and routes popular with hikers. However, should other destinations increase in popularity (as periodically occurs in response to news articles, guidebooks, and information shared through social media) local trampling impacts in such areas would be expected to increase. With additional controls on visitor use in the Mount Whitney area, trampling impacts on alpine vegetation would be expected to stabilize along all routes leading into and through the area, especially through Miter Basin, Crabtree Pass, and along the JMT corridor. Increased popularity of Mount Langley, as an easily accessed 14,000+ feet peak, would continue to result in impacts on the sparsely vegetated summit area and along the multiple approach routes; however, these are expected to be mitigated soon by the establishment of a cairned route to the summit. Similarly, the increased popularity of alpine summits along the crest among ‘peak baggers’ would be expected to lead to increased development of informal trails and trampling of alpine vegetation, both on the summits and along approach routes.

Under proposed restrictions on stock access and grazing, 69% of the mapped alpine vegetation in the parks (including alpine meadows) would remain closed to access by stock; 15% would remain open to stock access and grazing, with the remaining 16% open to access but closed to grazing. Unless cross-

country stock travel through alpine areas increased in popularity, trampling impacts on upland alpine vegetation would continue to be largely associated with established trails and routes. Restricting stock use to pass through and day use in Dusy Basin, lower Miter Basin, and Upper Blue Canyon, would prevent trampling impacts outside of the immediate trail corridor and those associated with holding and feeding animals. Although overnight use by stock in these areas is currently infrequent, these restrictions would ensure protection of the alpine vegetation in these areas should the expected increase in use under this alternative be realized.

Closure of the Baxter Pass Trail to stock would similarly prevent stock-related impacts on the alpine vegetation along the trail corridor. Trampling of alpine plants by hikers in the Baxter Pass area would continue, as the trail is often indistinguishable and travel over vegetation is unavoidable; under increased use levels, such impacts would be expected to expand beyond the primary route corridor. Such impacts may become locally severe and require remediation.

In the alpine meadows, trampling impacts would continue to be associated with grazing. With closure of most meadows to grazing within the cross-country areas, impacts on the alpine meadows in these areas would be prevented. The timing of grazing would continue to be controlled by a system of opening dates tied to meadow conditions to reduce stock-related impacts such as deep hoof prints, which are more likely to occur early in the season when soils are wet.

Grazing of upland alpine vegetation would continue to occur primarily in the drier meadow types, such as the Wright Creek Meadow complex along the JMT, in the meadows of the headwaters of the Kern at Lake South America and Sheep Camp Meadows, in the meadows of upper Big Arroyo and Lost Canyon, and in Upper Basin. Grazing of wet alpine meadows would be expected to continue to occur more frequently in individual meadows along the JMT, including in the Twin Lakes and Palisade Lakes basins. Grazing of other alpine vegetation types, such as fell-fields, would likely continue to be infrequent, associated with pass-through travel, and in areas where stock can be held and fed but not grazed.

Administrative use of stock would likely remain at current levels or increase slightly since trail development would be greater than current conditions. Free-roaming stock used to support trail maintenance activities would continue to graze alpine vegetation in the meadows of the Lake South America Loop and in Sheep Camp Meadows (north and east of the Tyndall Ranger Station). Under increased use levels and patterns, grazing by commercial stock would be expected to increase in the alpine uplands of the lower Wright Creek, in Sheep Camp Meadows, and in the lower Wallace Creek and Siberian Outpost areas. Private grazing of alpine areas would be expected to remain infrequent and at very low intensities.

Grazing of alpine vegetation in the Evolution Lake basin would continue to be restricted to walking parties with burros or llamas. Because these animal have unshod hooves, consume less forage than horses or mules, and are infrequently used as stock in the parks, trampling and grazing impacts on alpine vegetation would continue to be minimal in this area.

Under increased use levels and expanded use patterns, impacts on vegetation in untrailed alpine areas would be expected to increase both in extent and severity.

Plants of Conservation Concern (Park Sensitive Plant Species): Direct removal of plants of conservation concern would continue to be expected to occur only under very limited circumstances, such as collections made in the course of research, inventory, or monitoring activities. Collection of voucher specimens is strictly regulated through research permitting and environmental compliance processes to prevent population level impacts. Because the species of concern are by definition rare, the likelihood that they would be encountered by visitors and illegally collected would remain quite low.

The potential for trampling of the plants of conservation concern by hikers could rise with the increased levels and patterns of use anticipated under this alternative. Species in the meadows and uplands may be subject to incidental trampling by visitors traveling through meadows or on cross-country routes, although this would not be expected to result in population level impacts, the likelihood of local impacts would increase commensurate with increasing use levels. The closure of the Baxter Pass Trail to stock would lead to increased protection of populations of *Astragalus ravenii* and *Streptanthus gracilis* in that area. Thus impacts on the seven vascular plant species of conservation concern known or suspected to occur in alpine upland areas frequented by cross-country hikers and used occasionally by stock, listed under alternative 1, would be expected to increase in frequency yet remain insignificant at the population level with proper monitoring and mitigation efforts.

Depending on their location, the installation of new food-storage boxes may increase the likelihood of trampling of special status plant populations in the nearby area. Site selection would be subject to survey and evaluation to prevent impacts on any special status plant populations in the vicinity.

If recreational rock climbing on the walls of the South Fork Kings River were to increase with the opening of the North Dome area to overnight camping, incidental impacts on individuals of marble rockmat, which grows in crevices and on ledges in the canyon, could be expected to increase. An increase in the use of existing routes and the development of additional new routes could lead to locally significant trampling impacts which could have measurable impacts on local populations. As the species is also found in remote, off-trail areas not favored by climbers, such impacts would not be expected to result in large scale losses or declines that could lead to the listing of the species.

Impacts on the seven vascular plant species of conservation concern known or suspected to inhabit areas that are open to cross-country travel by stock, listed under alternative 1, would be expected to remain localized and insignificant at the population level. Exceptions to this are found along the floor of the lower Kern Canyon (where administrative grazing of the area known as the ‘maze’ coincides with the habitat of Kern River daisy), and on the Hockett Plateau (where administrative stock tend to roam off trail and can potentially encounter populations of Tulare County bleeding heart, field ivesia, Hockett Meadows lupine, and purple mountain-parsley). Based on recent surveys, current use levels and patterns do not appear to be resulting in population level impacts on these species. Under this alternative, as administrative grazing in these areas would decrease relative to current levels, protection of these species from large-scale losses or declines that could lead to the listing of these species would be increased.

The eighteen vascular plant species of conservation concern either known to or having the potential to grow in or adjacent to meadows open to grazing by stock are listed under alternative 1. Because grazing intensity in meadows would be managed through the implementation of site-specific grazing capacities, impacts on these species would continue to be localized and would not be expected to result in large-scale losses or declines that could lead to the listing of any of the species. The potential for such localized impacts would be expected to increase in frequency and extent with any significant increase in use, as the holding and feeding of animals in camps adjacent to meadows also has the potential to impact special-status plants.

The mosses of concern considered in this analysis (*Bruchia bolanderi*, *Helodium blandowii*, *Meesia triquetra*, *Meesia uliginosa*, and *Pohlia tundrae*) all grow in meadow environments. Specific actions proposed under this alternative that would lead to greater protection of these species from trampling and grazing impacts include the closure to grazing of Guyot Creek east of the JMT, which would protect the peat-accumulating wetlands there and the associated moss flora from impacts. The implementation of grazing capacities for all the parks’ meadows would also afford greater protection to the moss communities found in peat-accumulating wetlands as the capacities are based on the size of the area

suitable for grazing; at relatively low levels of use, stock tend to avoid the wettest areas which support bryophytes.

Expanding the portion of the Miter Basin area open only to pass through and day rides by stock would potentially provide additional protection to the habitat of tundra thread moss.

Nonnative Plant Species: Alternative 3 allows slightly less off-trail stock travel and off-trail stock grazing than alternative 1, which would slightly lower the potential for introducing nonnative plants in areas where early detection would be difficult and costly. Total stock use would likely increase relative to current levels. Disturbance related to increased visitor use (higher trailhead quotas and stock group size) and facility maintenance (more trail construction and maintenance) would be slightly higher than current conditions. Overall propagule pressure would be similar to current conditions due to the implementation of stock-feed restrictions and improved prevention mitigations, but increased propagule pressure from more visitors, new or improved trails, and higher levels of administrative operations (more trail crew camps). There could be additional pack stations at Wolverton and Mineral King, and more developed frontcountry stock facilities at west-side trailheads, creating more sources for invasive plant transport to wilderness. The overall probability of introductions would be about the same as current conditions. Probability of introductions to high-value habitats (wetlands) would be lower, since the percentage of meadow area open to grazing would decrease from 51% to 37%. Spatial distribution of impacts would be wide, and difficulty of detection would be high. Nonnative species impacts would be expected to increase overall, primarily in those areas where visitor use increases significantly.

Cumulative Effects: Alternative 3 would result in an increase in the number of visitors and stock wilderness-wide, would increase development slightly, and would allow for continued grazing; though most off-trail areas would be closed to grazing. This alternative would reduce the percentage of meadow area that is open to stock travel from 64% to 55% and reduce the percentage of the parks' meadows open to grazing from 51% to 37%. With the decrease in access, the potential for invasive species spread in meadows would be reduced. Alternative 3 would increase campfire restrictions, which would result in beneficial effects on subalpine trees when compared to current conditions.

The projects that may affect vegetation that are separate from projects proposed by this WSP/FEIS include the high-elevation forest monitoring program, the wetlands monitoring program, the Halstead and Cahoon meadow restorations, the ecological restoration program, invasive species management plan and activities, and permitted research activities. The majority of other past, present, and future foreseeable projects in wilderness have no potential for effects on vegetation. The impacts from these seven projects are described for alternative 1. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

IMPACTS OF ALTERNATIVE 4: EMPHASIZE UNDEVELOPED QUALITY AND NON-COMMERCIAL RECREATION

Wetlands and Meadows: Trampling of wetland and meadow vegetation by human traffic would continue to occur along wet trails that pass through meadows, along riparian corridors and lakeshores where campers pass through for water or to fish, and where visitors set up camps on or adjacent to meadow or riparian vegetation. While these impacts can be locally severe, they are currently insignificant at the landscape scale and this would be expected to remain the case. As visitor-use levels would decrease under this alternative, the extent and severity of human trampling of meadow and wetland vegetation would be expected to decrease accordingly. The development of informal trails would continue to pose potential risks to adjacent wetlands, which would be mitigated through visitor education, trail reroutes, or restoration.

Grazing of wetland and meadow vegetation by administrative and recreational pack and saddle stock would be prohibited. Trampling of wetland and meadow vegetation by administrative and recreational pack and saddle stock would occur where visitors travel with stock through these habitats. Stock use would be managed according to the Stock Use and Meadow Monitoring and Management Strategy described in appendix D with a focus on managing impacts from confining and feeding stock in camp areas.

Trails would be reduced in number and the network of trails less developed. Stock travel would be allowed on many maintained trails for private and administrative stock users. Many maintained trails would be closed or limited to day use only for commercial users. The number of trails where stock parties would be limited to day use would increase slightly. In areas open only to day use by stock parties, travel would be limited to within 100 yards of maintained trails. Stock parties would be prohibited from traveling on routes which are not maintained, except in four areas of the parks where cross-country travel with stock would continue to be allowed for private parties only. Taken together, these actions would reduce the percentage of meadow area which is open to some form of stock travel and thus subject to trampling impacts from 64% to 44%.

All grazing of stock would be prohibited, reducing the percentage of meadow area open to grazing from 51% to 0%. This would reduce the percentage of peat-accumulating meadow area open to grazing from 72% to 0% and reduce the percentage of lakeshore meadow open to grazing from 42% to 0%.

Under this alternative, up to 46% of lacustrine features, 57% of palustrine features, 88% of riverine features, and up to 47% of all wetland features are in areas open to stock travel.

Table 88: Alternative 4 – Values are Percentages of Row (Meadow Type) Totals

Meadow Type	Open to Stock Access; Open to Grazing	Open to Stock Access; Closed to Grazing	Closed to Stock Access
Fen	0%	74%	26%
Fen/wet meadow	0%	70%	30%
Wet meadow	0%	48%	52%
Moist meadow	0%	35%	65%
Dry meadow	0%	36%	64%
All meadow types	0%	44%	56%
Peat-accumulating area	0%	73%	27%
Lakeshore meadow	0%	37%	63%

Table 89: Alternative 4 – Values are Percentages of Row (System) Totals for Each Kind of Wetland Feature (Linear or Area)

System	Open to Stock Access; Open to Grazing		Open to Stock Access; Closed to Grazing		Closed to Stock Access	
	Linear	Area	Linear	Area	Linear	Area
Lacustrine	0%	0%	46%	28%	54%	72%
Palustrine	0%	0%	39%	57%	61%	43%
Riverine	0%	0%	46%	88%	54%	12%
Total	**0%**	**0%**	**43%**	**47%**	**57%**	**53%**

Although technically open to stock travel, much of the wetland and meadow area is inaccessible to stock parties and thus stock use would continue to be concentrated in areas adjacent to maintained trails. Furthermore, there would be few destinations open to stock travel which would require that stock users travel through meadows and wetlands, thus trampling and non-native species impacts associated with stock use would continue to be concentrated in areas adjacent to maintained trails.

Administrative use of stock would likely be greatly reduced since trail length and development would be much less than current conditions. Commercial stock use would likely be reduced in proportion to the amount of trails and areas closed to commercial stock travel, as well as the increased cost of carrying feed. The current downward trend in private stock use would likely continue or accelerate as private stock users would be less likely than administrative and commercial stock users to overcome the extra logistics and expense of carrying feed. Total stock use would likely decrease greatly relative to the 10 year average of 6,775 stock nights.

Grazing levels would decrease to 0 stock nights from the 10-year average of 6,058 stock nights. Some grazing might occur if animals become untethered, but such incidental grazing would be expected to occur infrequently and associated impacts would be negligible.

There would be nearly complete elimination of trampling impacts on meadow vegetation since stock travel through meadows open to access but closed to grazing would continue to be uncommon and infrequent.

Potential nonnative species introductions are proportional to the meadow area open to access, as species deposited along trails and in camps may be propagule sources for meadows. Increased localized disturbance at sites used to hold and feed stock could become loci for potential nonnative plant introductions; either through the inadvertent use of untreated feed products or from manure. If such plants were allowed to become established, propagules from these areas could then be transported into nearby wetlands or meadows.

Potential nonnative species impacts would decrease overall with the closure of much of the parks' meadows to stock access, although there could be an increase in impacts in the areas of the parks that remain open to stock travel if replacement feed sources increase propagule pressure.

The maximum number of stock per party would be reduced to 15 head on-trail and seven head off-trail, with a few specific exceptions. This would result in a decrease in the potential for trampling impacts where stock is allowed. This could be partially offset by the removal or relaxation of some camping limits, allowing for greater lengths of stay.

A complete ban on campfires, grazing, and the removal of all food-storage boxes, would remove these as factors influencing stock travel. Travel by commercial users would be restricted to fewer locations. The prohibition on grazing would likely decrease stock travel to remote locations requiring long trips where the requirement to carry feed is impractical.

The existing corrals and supporting stock infrastructure in the Mineral King Valley could be relocated or modified to allow for short-term public camping or staging by private or administrative stock users. If these actions were to be considered, short-term impacts would be expected to the adjacent wetlands and separate environmental compliance would be conducted.

Under alternative 4, overall grazing and trampling impacts on meadows and wetlands would be almost entirely eliminated. Nonnative species impacts on meadows and wetlands would be expected to decrease overall, although there could be a chance for increased impacts in some areas if non-treated feed products

were inadvertently used, or due to the increased propagule pressure likely to occur with an increase in volume of carried feed products. The monitoring system described in appendix D would be employed to track use, document conditions, and provide information for preventing and mitigating impacts associated with stock use but not related to grazing. Stock use would continue to be adaptively managed and informed by the results of the stock-use monitoring program, with increased emphasis on the prevention and mitigation of impacts associated with holding and feeding animals.

High-elevation Long-lived Tree Species: Alternative 4 would be the most protective of the alternatives for high-elevation long-lived conifers, as no campfires would be allowed in wilderness. It includes the greatest acreage with campfire restrictions on high-elevation areas that support foxtail pine, whitebark pine, limber pine, and Sierra juniper. Under alternative 4, recreational campfires would be restricted in 837,806 total acres of the parks or 100% of wilderness. It would include all areas of high-elevation conifer habitat where the four long-lived tree species occur within the parks. In addition to these target vegetation classes where campfires would be restricted, the elevational designations specified in the five alternatives will also result in the inclusion of some non-target vegetation classes that fall within the elevational limits. This would include a wide range of vegetation types distributed throughout wilderness from low to high elevations.

Alpine Vegetation: Direct removal of alpine vegetation occurs infrequently, and is primarily associated with trail maintenance and construction activities. Under this alternative, impacts resulting from these activities would be somewhat diminished, as the trail class of some trails would be downgraded. Such impacts on alpine plants would remain localized.

Trampling of alpine vegetation along trail corridors and in high-elevation camp areas by human traffic would continue to occur. While these impacts can be locally severe, they are currently insignificant at the ecosystem scale and this would be expected to remain the case.

Most trampling impacts would continue to occur along cross-country routes and in popular destinations where visitor use is concentrated, although at lower use levels these may be somewhat reduced. Areas where such impacts would be expected to continue to be seen, and potentially increase, would include Dusy Basin, the Mount Whitney area, Upper Darwin Canyon/Lamark Col, Mount Langley, Kearsarge Lakes, and other similar high-elevation basins and routes popular with hikers. However, should other destinations increase in popularity (as periodically occurs in response to news articles, guidebooks, and information shared through social media) local trampling impacts in such areas would be expected to increase. With additional controls on visitor use in the Mount Whitney area, trampling impacts on alpine vegetation would be expected to stabilize along all routes leading into and through the area, especially through Miter Basin, Crabtree Pass, and along the JMT corridor. Increased popularity of Mount Langley, as an easily accessed 14,000+ feet peak, would continue to result in impacts on the sparsely vegetated summit area and along the multiple approach routes; however, these are expected to be mitigated by the establishment of a cairned route to the summit in 2014. Similarly, the increased popularity of alpine summits along the crest among ‘peak baggers’ would be expected to lead to increased development of informal trails and trampling of alpine vegetation, both on the summits and along approach routes.

Under proposed restrictions on stock access, 76% of the mapped alpine vegetation in the parks (including alpine meadows) would remain closed to access by stock, and the remaining 24% would remain open to access. No grazing would be allowed under this alternative. Trampling impacts on upland alpine vegetation would continue to be largely associated with established trails and routes, since cross-country stock travel through alpine areas would be expected to remain infrequent. Restricting stock use to pass through and day use in lower Miter Basin would prevent trampling impacts outside of the immediate trail corridor and those associated with holding and feeding animals. Restricting travel by commercial stock along the trails to Funston Lake, Granite Lake, and over New Army Pass would result in decreased stock

use in these areas, but as use by commercial stock in these areas is currently infrequent, these restrictions would have limited effect on alpine vegetation.

Closure of the Baxter Pass, Colby Pass, Elizabeth Pass, Upper Goddard Canyon, Hell-for-Sure, Sawmill and Shepherd Pass trails as well as the Mineral, Mosquito, Eagle, White Chief, and Monarch Lake basins to all stock would similarly prevent stock-related impacts on the alpine vegetation along those trail corridors. Trampling of alpine plants by hikers in the Baxter Pass area would continue, as the trail is often indistinguishable and travel over vegetation is unavoidable; under lower use levels, such impacts would continue to be localized to the primary route corridor. Should use of the area increase, impacts may become locally severe and require remediation.

The closure of the four off-trail areas to commercial and administrative stock would not be expected to result in changes in observed impacts, as use of these areas is currently infrequent and uncommon.

Trampling of alpine meadows currently open to grazing would largely cease, although low levels of trespass grazing and trampling would be expected. The removal of all drift fences and gates would mean that animals who became untethered would likely roam farther afield than under current conditions, with a possible increase in off-trail trampling impacts as a result. These would be expected to be infrequent.

The number of areas used for the holding and feeding of stock would by necessity increase with the prohibition on grazing. Should stock supported parties elect to camp in alpine areas, this could result in increased local, severe impacts on alpine vegetation. The inherent difficulty of holding animals in treeless areas, however, would be expected to limit such use in the alpine areas.

Free-roaming stock used to support trail maintenance activities would no longer graze alpine vegetation in Sheep Camp Meadows (north and east of the Tyndall Ranger Station), the Lake South America Loop, or any other alpine location. Similarly, grazing of the Siberian Outpost area would cease and impacts on the alpine vegetation there would be reduced. Private use of alpine areas would be expected to remain infrequent and at very low intensities.

Under reduced use levels and patterns and a parks wide prohibition on grazing, vegetation in untrailed alpine areas would remain largely undisturbed.

Plants of Conservation Concern (Park Sensitive Plant Species): Direct removal of plants of conservation concern would continue to be expected to occur only under very limited circumstances, such as collections made in the course of research, inventory, or monitoring activities. Collection of voucher specimens is strictly regulated through the research permitting and environmental compliance processes to prevent population level impacts. Because the species of concern are by definition rare, the likelihood that they would be encountered by visitors and illegally collected would remain quite low.

Similarly, trampling of the plants of conservation concern by hikers would be expected to be infrequent under reduced levels and patterns of use. Although species in the meadows and uplands may suffer incidental trampling by visitors traveling through meadows or on cross-country routes, this would not be expected to result in population level impacts. The closure of the Baxter Pass Trail and the Woods Lake basin to stock travel, would lead to increased protection of populations of *Astragalus ravenii* and *Streptanthus gracilis* in those areas. Thus impacts on the seven vascular plant species of conservation concern known or suspected to occur in alpine upland areas frequented by cross-country hikers and used occasionally by stock, listed under alternative 1, would be expected to remain infrequent and insignificant at the population level.

The removal of all food-storage boxes in wilderness could have an indirect effect on plants of conservation concern if use currently concentrated near the boxes became more dispersed and shifted into areas currently not being used for camping. Such impacts would be expected to be localized and insignificant at the population level.

If recreational rock climbing on the walls of the South Fork Kings River were to increase with the opening of the North Dome area to overnight camping, incidental impacts on individuals of marble rockmat, which grows in crevices and on ledges in the canyon, could be expected to increase. An increase in the use of existing routes and the development of additional new routes could lead to locally significant trampling impacts which could have measurable impacts on local populations. As the species is also found in remote, off-trail areas not favored by climbers, such impacts would not be expected to result in large-scale losses or declines that could lead to the listing of the species.

Impacts on the seven vascular plant species of conservation concern known or suspected to inhabit areas that are open to cross-country travel by stock, listed under alternative 1, would be expected to decrease with the reduction in overall use and additional restrictions on cross-country travel by commercial and administrative stock proposed under this alternative. These impacts would thus remain localized and insignificant at the population level. The potential for impact on the habitat of Kern River daisy, and on the Hockett Plateau, where administrative stock currently tend to roam off trail and can potentially encounter populations of Tulare County bleeding heart, field ivesia, Hockett Meadows lupine, and purple mountain-parsley, would be significantly reduced by the elimination of grazing and the restriction of off-trail use.

The eighteen vascular plant species of conservation concern either known to or having the potential to grow in or adjacent to meadows currently open to grazing by stock are listed under alternative 1. Potential impacts on those species restricted to meadows would be significantly reduced with the elimination of grazing under this alternative. An increase in holding and feeding of stock adjacent to meadows, however, could lead to increased impacts on those species growing near camp areas, especially if hold-and-feed areas were expanded. With proper monitoring and mitigation, such impacts would continue to be expected to be localized and would not be expected to result in large-scale losses or declines that could lead to the listing of any of the species.

Mosses – The mosses of concern considered in this analysis (*Bruchia bolanderi*, *Helodium blandowii*, *Meesia triquetra*, *Meesia uliginosa*, and *Pohlia tundrae*) all grow in meadow environments. The elimination of grazing under this alternative would significantly increase protection of meadow habitat by preventing trampling impacts on wetland mosses.

Expanding the portion of the Miter Basin area open only to pass through and day rides by stock, coupled with the adoption of smaller party sizes for off-trail hikers and riders, would potentially provide additional protection to the habitat of tundra thread moss.

Overall, the elimination of grazing and reduction in overall visitor-use levels would be expected to lead to a decrease in potential impacts on the plants of conservation concern.

Nonnative Plant Species: Alternative 4 would allow off-trail stock travel for private users only and would eliminate grazing in meadows, substantially lowering the potential for introducing nonnative plants in areas where early detection would be difficult and costly. Total stock use would likely greatly decrease relative to current levels. Localized disturbance in hold-feed areas would likely be severe, but overall disturbance related to visitor use (lower trailhead quotas and group size) and facility maintenance (less trail construction and maintenance, less ranger station maintenance) would be much lower than current conditions. Due to the implementation of stock-feed restrictions and improved prevention mitigations,

plus substantially decreased propagule pressure from fewer visitors, fewer trails, and much lower levels of administrative operations (zero long-term established trail crew camps and 9 fewer ranger stations and patrol cabins), overall propagule pressure would be substantially lower than current conditions. This lowering would be slightly offset by the increased risk of introducing nonnative propagules through substantial increases in carried feed. Although frontcountry facilities supporting stock use could be developed for private use, services at the Cedar Grove pack station would be reduced, and no commercial pack stations would be permitted at Wolverton or Mineral King, reducing the frontcountry sources for invasive plant transport to wilderness. Probability of introductions to high-value habitats (wetlands) would be much lower, since no meadows would be grazed, including the administrative pastures in the Kern Canyon, Redwood Meadow, and Roaring River, which have had frequent nonnative plant introductions in the past. Because off-trail stock travel would be prohibited for all but private stock users and meadows would not be grazed, the spatial distribution of impacts and difficulty of detection would be much lower. Alternative 4 would result in substantial beneficial effects on native plant communities from reduced disturbance and reduced nonnative plant propagule pressure.

Cumulative Effects: Alternative 4 calls for a decrease in the number of stock, restricts commercial access (and levels of services) and eliminates grazing wilderness-wide. These changes could result in a reduction of impacts on vegetation wilderness-wide. This alternative would reduce the percentage of meadow area that is open to stock travel from 64% to 44% and reduce the percentage of the parks' meadows open to grazing from 51% to 0%. With the decrease in access, the potential for invasive species spread in meadows would be reduced. Alternative 4 would eliminate campfires in wilderness, which would result in beneficial effects on subalpine trees when compared to current conditions.

The projects that may affect vegetation that are separate from projects proposed by this WSP/FEIS include the high-elevation forest monitoring program, the wetlands monitoring program, the Halstead and Cahoon meadow restorations, the ecological restoration program, invasive species management plan and activities, and permitted research activities. The majority of other past, present, and future foreseeable projects in wilderness have no potential for effects on vegetation. The impacts from these seven projects, and of the Fire and Fuels Management Program, are described for alternative 1. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under alternative 4 that would constitute a significant cumulative effect.

IMPACTS OF ALTERNATIVE 5: EMPHASIZE OPPORTUNITIES FOR SOLITUDE

Wetlands and Meadows: Trampling of wetland and meadow vegetation by human traffic would continue to occur along wet trails that pass through meadows, along riparian corridors and lakeshores where campers pass through for water or to fish, and where visitors set up camps on or adjacent to meadow or riparian vegetation. While these impacts can be locally severe, they are currently insignificant at the landscape scale, and this would be expected to remain the case. As current visitor-use levels could decrease under this alternative, the extent and severity of human trampling of meadow and wetland vegetation would be expected to decrease. The development of informal trails would continue to pose potential risks to adjacent wetlands, which would be mitigated through visitor education, trail reroutes, or restoration.

Trampling and grazing of wetland and meadow vegetation by administrative and recreational pack and saddle stock would continue. Stock access and grazing would be managed according to the Stock Use and Meadow Monitoring and Management Strategy described in appendix D.

The trail network would be similar in length to current conditions, but less developed. Stock travel would continue to be allowed on most maintained trails. The number of trails where stock parties would be limited to day use would increase slightly. In areas open only to day use by stock parties, travel would be

limited to within 100 yards of maintained trails. Stock parties would be prohibited from traveling on routes which are not maintained, and the four areas of the parks where cross-country travel with stock is currently allowed would be closed to stock travel.

These actions would reduce the percentage of meadow area which is open to some form of stock travel and thus subject to trampling impacts from 64% to 43%.

Meadows in the areas newly closed to stock travel, or only open to day use by stock parties under this alternative would also be closed to grazing. Grazing would continue to be allowed in most areas open to overnight stock use, although a handful of meadows would be closed to grazing for specific resource protection needs.

Overall, the percentage of the parks' meadow area open to grazing would be reduced from 51% to 37% which would reduce the percentage of the peat-accumulating meadow area open to grazing from 72% to 51% and reduce the percentage of lakeshore meadow open to grazing from 42% to 25%. Up to 43% of lacustrine features, 51% of palustrine features, 90% of riverine features, and up to 42% of all wetland features are in areas open to stock travel. Within the area open to stock travel, up to 43% of lacustrine features, 45% of palustrine features, 82% of riverine features, and up to 35% of all wetland features are in areas open to grazing.

Table 90: Alternative 5 – Values are Percentages of Row (Meadow Type) Totals

Meadow Type	Open to Stock Access; Open to Grazing	Open to Stock Access; Closed to Grazing	Closed to Stock Access
Fen	66%	9%	25%
Fen/wet meadow	56%	11%	33%
Wet meadow	41%	6%	53%
Moist meadow	27%	5%	68%
Dry meadow	37%	7%	57%
All meadow types	37%	6%	57%
Peat-accumulating area	51%	9%	40%
Lakeshore meadow	25%	6%	68%

Table 91: Alternative 5 – Values are Percentages of Row (System) Totals for Each Kind of Wetland Feature (Linear or Area)

System	Open to Stock Access; Open to Grazing		Open to Stock Access; Closed to Grazing		Closed to Stock Access	
	Linear	Area	Linear	Area	Linear	Area
Lacustrine	43%	16%	0%	6%	57%	77%
Palustrine	30%	45%	5%	6%	66%	49%
Riverine	39%	82%	5%	8%	56%	10%
Total	**35%**	**35%**	**5%**	**6%**	**60%**	**58%**

Although technically open to stock travel and grazing, much of the wetland and meadow area is inaccessible to stock parties, and thus stock use would continue to be concentrated in named forage areas adjacent to maintained trails. Grazing of wetland and meadow vegetation outside of named forage areas would continue to be rare and of light intensity; therefore grazing and trampling impacts to wetland and meadow vegetation outside of named forage areas would be negligible.

Capacities, night and head limits, and other tools described in the Stock Use and Meadow Monitoring and Management Strategy described in appendix D would continue to be used to manage the intensity of grazing impacts.

Grazing capacities would be used to limit the total amount of grazing according to the methods in appendix D. These capacities would be based on meadow size, moisture status, and productivity and adjusted to address site-specific vulnerabilities such as the potential for erosion and the presence of peat-accumulating soils or sensitive species. Utilization limits of 25–45% depending on vegetation zone, moisture level, and logistical value would be used to determine baseline grazing capacities which would be modified where monitoring data provides additional information. These capacities would be applied to all meadows open to grazing. The use of these capacities would reduce grazing and trampling impacts in the most popular destinations. They also would protect areas from increased grazing pressure that might result from displacement of grazing use from nearby meadows that have reached capacity or are otherwise restricted

Administrative use of stock would likely decrease since trail development would be lower than current conditions. Commercial stock use would be expected to decrease in proportion to quota reductions and the amount of trails and areas closed to stock travel and grazing. Depending whether the current trend in private stock use continues, private stock use could continue at current levels or decrease. Total stock use would thus decrease relative to the 10-year average of 6,775 stock nights.

Grazing levels would likely decrease relative to the 10 year average of 6,058 stock nights. If the increasing trend in the use of supplemental feed continued, there could be an additional slight reduction in grazing, and thus in grazing and trampling impacts on meadows and wetlands. Grazing would likely continue to occur in approximately 58% of the meadow area open to grazing.

The intensity of grazing in named forage areas (and therefore the extent and severity of impacts) would be limited by the capacities developed according to the methodology described in appendix D. Table 92 summarizes the number of forage areas and meadow vegetation within them which would be subject to grazing impacts.

Table 92: Number of Forage Areas and Meadow Area Open to Grazing under Alternative 5 by Vegetation Zone and Logistical Value Used to Set Limits on Utilization

Alternative 5	Lower logistical value		Higher logistical value	
Vegetation Zone	**Number of Forage Areas**	**Forage Area Acres**	**Number of Forage Areas**	**Forage Area Acres**
Lower Montane & Woodland	39	200	14	86
Upper Montane & Subalpine	105	4484	41	714
Total	**144**	**4684**	**55**	**800**

In the 14 lower montane forage areas with higher logistical value (totaling 86 acres), utilization would be limited to no more than 45% in moist meadows, and 35% in dry or wet meadows. The amount of foliage left ungrazed at these levels would be approximately equal to the amount of herbage which would be expected to decompose annually; if grazed to capacity regularly, productivity would be expected to remain near current levels which may or may not be similar to comparable ungrazed meadow vegetation.

In the remaining 39 lower montane forage areas open to grazing with lower logistical value (totaling 200 acres), utilization would be limited to no more than 35% in moist meadows, and 25% in dry or wet meadows. The amount of foliage left ungrazed at these levels would be more than the amount of herbage which would be expected to decompose annually; if grazed to capacity regularly, productivity would be expected to trend towards or be similar to comparable ungrazed meadow vegetation.

In the 41 upper montane and subalpine forage areas open to grazing with higher logistical value (totaling 714 acres), utilization would be limited to no more than 35%. If grazed to capacity regularly, this level of utilization in dry *Carex filifolia* vegetation would, on average, reduce productivity by 10% and reduce basal vegetation cover by 16% relative to ungrazed vegetation. In moist to wet *Deschampsia cespitosa* vegetation, this level of utilization would, on average, reduce productivity by 18% relative to ungrazed vegetation. This level of utilization in moist *Calamagrostis muiriana* vegetation would, on average, reduce productivity by 16%, increase basal vegetation cover by 14%, and decrease relative graminoid cover by 12% relative to ungrazed vegetation.

In the remaining 105 upper montane and subalpine forage areas open to grazing with lower logistical value (totaling 4,684 acres), utilization would be limited to no more than 25%. If grazed to capacity regularly, this level of utilization in dry *Carex filifolia* vegetation would, on average, increase productivity by 2% and increase basal vegetation cover by 7% relative to ungrazed vegetation. In moist to wet *Deschampsia cespitosa* vegetation, this level of utilization would, on average, decrease productivity by 11% relative to ungrazed vegetation. This level of utilization in moist *Calamagrostis muiriana* vegetation would, on average, reduce productivity by 10%, increase basal vegetation cover by 41%, and decrease relative graminoid cover by 6% relative to ungrazed vegetation.

Because horses and mules are selective grazers and overall grazing pressure is light, grazing impacts would generally be concentrated in one meadow vegetation type within a forage area. Grazing capacities would be based on the area of this preferred vegetation, which is usually less than the area of the entire meadow. Therefore, the extent of the most severe predicted impacts to meadow and wetland vegetation would be less than the total meadow area summarized above.

The maximum number of stock per party would be reduced to 13 head, resulting in a decrease in the potential for trampling and grazing impacts where stock is allowed. This could be partially offset by the removal or relaxation of some camping and grazing night limits, allowing for greater lengths of stay.

Trampling impacts on meadows would continue to be directly related to grazing, since stock travel through meadows open to access but closed to grazing would be expected to continue to be relatively uncommon and infrequent. Trampling impacts would likely decrease in extent but have the potential for local impacts to increase. The timing of grazing would continue to be controlled by a system of opening dates tied to meadow conditions to reduce stock-related impacts in wetlands such as deep hoofprints, which are more likely to occur early in the season when soils are wet.

Potential nonnative species introductions would be proportional to the meadow area open to both access and grazing, as species deposited along trails and in camps may be propagule sources for wetlands and meadows. Restrictions on the kinds of feed that may be provided to stock would reduce propagule pressure on meadows to the extent that it replaces untreated feed. Surveys to provide for the early

detection of nonnative species would be conducted as part of routine meadow monitoring and wilderness patrol activities.

Grazing pressure would continue to be highest in popular meadows along the JMT corridor, in traditional destinations for visitors traveling with stock (such as Roaring River and Hockett Plateau), and in areas serving as foci for trail maintenance and construction crews. Decreases in trailhead quotas and implementation of the Stock Use and Meadow Monitoring and Management Strategy described in appendix D would continue to be used to manage the intensity of grazing impacts.

Prohibitions on campfires could decrease stock use in some meadows above 10,000 feet. The removal of all food-storage boxes would remove these as factors influencing stock travel.

Off-trail travel zones would be closed to stock access, although there would be little reduction in actual grazing impacts in the off-trail travel areas which are closed to grazing, as current use levels of these meadows are extremely low.

Under this alternative, the Redwood Meadow pasture fence would be removed and the Kern and Hockett Meadow pastures would be reduced in size. This would result in a slight decrease in the extent of trampling and grazing impacts in those areas, but could lead to increased severity of trampling impacts within the remaining fenced area.

All facilities at Mineral King administrative corrals and pack station in east Mineral King Valley would be removed, and the area would be restored to natural conditions. The ranger stations at Bearpaw, Bench Lake, Little Five Lakes, and Monarch would also be removed and the areas restored. These actions would have the potential to result in short-term impacts on the adjacent wetlands. Separate environmental compliance would be conducted.

Under alternative 5, fewer meadows would be open to grazing, resulting in less meadow area subject to grazing impacts. Overall grazing impacts on meadows would be expected to decrease with lower overall stock use and grazing levels. Trampling impacts on meadows would follow grazing impacts; they would be reduced overall. Potential nonnative species impacts would decrease with the closure of more of the parks' meadows to stock access.

High-elevation Long-lived Tree Species: Alternative 5 would limit campfires to below 10,000 feet wilderness-wide. Campfire limitations would remain the same as current limits in the San Joaquin and Kings River drainages, be more restrictive in Kern River drainage, and less restrictive in Kaweah and Tule River drainages than current conditions with the elevation for the restrictions rising by 1,000 feet. Although little whitebark pine and no limber pine habitat exists in Kaweah and Tule River drainages, raising the elevation limit would increase potential impacts from trampling and wood collection on foxtail pine and Sierra juniper, which occur in the higher elevations of these drainages. The Kern River drainage would benefit from the implementation of alternative 5, as additional subalpine vegetation and whitebark pine habitat would be protected by lowering the elevation limit 400 feet. All areas of the parks would be subject to some impacts from trampling and firewood collection at elevations below 10,000 feet under alternative 5.

Under alternative 5, recreational campfires would be restricted in 412,530 total acres of the parks. In wilderness areas of the parks, campfires would be permitted in 37,144 acres (29%) of high-elevation conifer habitat that supports the four subalpine long-lived tree species (whitebark pine, foxtail pine, limber pine, and Sierra juniper). Considering just the three five-needle conifers, which would primarily be whitebark and foxtail pines and to a lesser extent limber pine, this area would be 16,786 acres.

Alternative 5 results in the second greatest acreage of high-elevation areas without campfire restrictions (425,276 acres). The greatest area of impacts from campfires and fuelwood gathering is within 328 feet of campfires and trails. Under alternative 5, these areas would represent approximately 1,426 acres of subalpine or upper montane long-lived tree species habitat that occurs in areas without campfire restrictions; again the second largest area.

The proposed campfire restrictions would also protect the higher-elevation habitat of non-target vegetation classes, which includes portions of the distribution of species such as lodgepole pine and mountain hemlock. In the Kaweah River drainage, with restrictions starting at 9,000 feet, this would include some western white pine and red-fir forest as well. Under this alternative this area would be approximately 28,422 acres.

Alpine Vegetation: Direct removal of alpine vegetation occurs infrequently, and is primarily associated with trail maintenance and construction activities. Under this alternative, impacts resulting from these activities would continue at slightly reduced levels, resulting in localized impacts on alpine plants.

Trampling of alpine vegetation along trail corridors and in high-elevation camp areas by human traffic would continue to occur. Such impacts would be expected to decrease under this alternative relative to current conditions. While these impacts can be locally severe, they are currently insignificant at the ecosystem scale and this would be expected to remain the case.

Most trampling impacts would continue to occur along cross-country routes and in popular destinations where visitor use is concentrated. Areas where such impacts would be expected to continue to be seen would include Dusy Basin, the Mount Whitney area, Upper Darwin Canyon/Lamark Col, Mount Langley, Kearsarge Lakes, and other similar high-elevation basins and routes popular with hikers. However, should other destinations increase in popularity (as periodically occurs in response to news articles, guidebooks, and information shared through social media) local trampling impacts in such areas would be expected to increase. With additional controls on visitor use in the Mount Whitney area, trampling impacts on alpine vegetation would be expected to stabilize along all routes leading into and through the area, especially through Miter Basin, Crabtree Pass, and along the JMT corridor. Increased popularity of Mount Langley, as an easily accessed 14,000+ feet peak, would continue to result in impacts on the sparsely vegetated summit area and along the multiple approach routes; however, these are expected to be mitigated soon by the establishment of a cairned route to the summit. Similarly, the increased popularity of alpine summits along the crest among ‘peak baggers’ would be expected to lead to increased development of informal trails and trampling of alpine vegetation, both on the summits and along approach routes.

Under proposed restrictions on stock access and grazing, 83% of the mapped alpine vegetation in the parks (including alpine meadows) would remain closed to access by stock; 14% would remain open to stock access and grazing, with the remaining 3% open to access but closed to grazing. Trampling impacts on upland alpine vegetation would continue to be largely associated with established trails and routes, since cross-country stock travel through alpine areas is infrequent and this would likely continue to be the case. Restricting stock use to pass through and day use in Dusy Basin, lower Miter Basin, and Upper Blue Canyon would prevent trampling impacts outside of the immediate trail corridor and those associated with holding and feeding animals. Although overnight use by stock in these areas is currently infrequent, these restrictions would ensure protection of the alpine vegetation in these areas should use patterns change. Closure of the Baxter Pass Trail to stock would similarly prevent stock-related impacts on the alpine vegetation along the trail corridor. Trampling of alpine plants by hikers in the Baxter Pass area would continue, as the trail is often indistinguishable and travel over vegetation is unavoidable; under lower use levels, such impacts would remain localized to the primary route corridor.

In the alpine meadows, trampling impacts would continue to be associated with grazing, as cross-country travel in these areas is largely restricted and infrequent. The timing of grazing would continue to be controlled by a system of opening dates tied to meadow conditions to reduce stock-related impacts such as deep hoof prints, which are more likely to occur early in the season when soils are wet.

Grazing of upland alpine vegetation would continue to occur primarily in the drier meadow types such as the Wright Creek Meadow complex along the JMT, in the meadows of the headwaters of the Kern at Sheep Camp Meadows, in the meadows of upper Big Arroyo and Lost Canyon, and in Upper Basin. Grazing of wet alpine meadows would be expected to continue to occur sporadically in individual meadows along the JMT, including in the Twin Lakes and Palisade Lakes basins. The closure of the Upper LeConte Canyon and the Woods Lake Basin to grazing under this alternative would provide additional protection to these alpine meadows. Grazing of other alpine vegetation types, such as fell-fields, would be infrequent and associated with pass-through travel and in areas where stock can be held and fed but not grazed.

Administrative use of stock would likely decrease since trail development would be lower than current conditions. Free-roaming stock used to support trail maintenance activities would continue to graze alpine vegetation in the Lake South America Loop and in Sheep Camp Meadows (north and east of the Tyndall Ranger Station), but not in the meadows. Under lower use levels and patterns, grazing by commercial stock would be expected to continue to occur on a regular basis in the alpine uplands of the lower Wright Creek, in Sheep Camp Meadows, and occasionally in the lower Wallace Creek and Siberian Outpost area. Private grazing of alpine areas would be expected to remain infrequent and at very low intensities.

Grazing of alpine vegetation in the Evolution Lake basin would continue to be restricted to walking parties with burros or llamas. Because these animal have unshod hooves, consume less forage than horses or mules, and are infrequently used as stock in the parks, trampling and grazing impacts on alpine vegetation would continue to be minimal in this area. The Mineral King basin would be closed to grazing, and overnight use of the Mosquito, Eagle, and White Chief basins would continue to be restricted to walking parties with burros or llamas, resulting in only minimal trampling impacts on associated alpine vegetation in those areas.

Under reduced use levels, vegetation in untrailed alpine areas would remain largely undisturbed.

Plants of Conservation Concern (Park Sensitive Plant Species): Direct removal of plants of conservation concern would continue to be expected to occur only under very limited circumstances, such as collections made in the course of research, inventory, or monitoring activities. Collection of voucher specimens is strictly regulated through the research permitting and environmental compliance processes to prevent population level impacts. Because the species of concern are by definition rare, the likelihood that they would be encountered by visitors and illegally collected would remain quite low.

Similarly, trampling of the plants of conservation concern by hikers would be expected to be infrequent under the reduced use levels proposed under this alternative. Although species in the meadows and uplands may suffer incidental trampling by visitors traveling through meadows or on cross-country routes, this would not be expected to result in population level impacts. The closure of the Baxter Pass Trail to stock would lead to increased protection of populations of *Astragalus ravenii* and *Streptanthus gracilis* in that area. Thus, impacts on the seven vascular plant species of conservation concern known or suspected to occur in alpine upland areas frequented by cross-country hikers and used occasionally by stock, listed under alternative 1, would be expected to remain infrequent and insignificant at the population level.

If recreational rock climbing on the walls of the South Fork Kings River were to increase with the opening of the North Dome area to overnight camping, incidental impacts on individuals of marble rockmat, which grows in crevices and on ledges in the canyon, could be expected to increase. An increase in the use of existing routes and the development of additional new routes could lead to locally significant trampling impacts which could have measurable impacts on local populations. As the species is also found in remote, off-trail areas not favored by climbers, such impacts would not be expected to result in large-scale losses or declines that could lead to the listing of the species.

Impacts on the seven vascular plant species of conservation concern known or suspected to inhabit areas that are open to cross-country travel by stock, listed under alternative 1, would be further protected with the elimination of cross-country travel by stock proposed under this alternative. Exceptions to this would continue to be found along the floor of the lower Kern Canyon (where administrative grazing of the area known as the 'maze' coincides with the habitat of Kern River daisy), and on the Hockett Plateau (where administrative stock tend to roam off trail and can potentially encounter populations of Tulare County bleeding heart, field ivesia, Hockett Meadows lupine, and purple mountain-parsley).

The proposed change in access to these areas would likely not result in a significant change in these use patterns, as the areas frequented by stock largely fall within 0.5 mile of the trail corridor and within designated forage areas. Based on recent surveys, current use levels and patterns do not appear to be resulting in population level impacts on these species. As administrative stock use and grazing would be expected to decrease under this alternative, the potential for impacts to these species would decrease and no large-scale losses or declines that could lead to their listing would be expected.

The 18 vascular plant species of conservation concern either known, or having the potential, to grow in or adjacent to meadows open to grazing by stock are listed under alternative 1. With an overall decrease in use, impacts on these species would continue to be expected to be localized and would not be expected to result in large-scale losses or declines that could lead to the listing of any of the species.

The mosses of concern considered in this analysis (*Bruchia bolanderi*, *Helodium blandowii*, *Meesia triquetra*, *Meesia uliginosa*, and *Pohlia tundrae*) all grow in meadow environments. Specific actions proposed under this alternative that would lead to greater protection of these species from trampling and grazing impacts include the closure of the four off-trail areas and Guyot Creek east of the JMT, which would protect the peat-accumulating wetlands and their associated moss flora from impacts. The implementation of grazing capacities for park meadows would also afford greater protection to the moss communities found in peat-accumulating wetlands as the capacities are based on the size of the area suitable for grazing; at relatively low levels of use, stock tend to avoid the wettest areas which support bryophytes.

Expanding the portion of the Miter Basin area open only to pass through and day rides by stock, coupled with the adoption of smaller party sizes for off-trail hikers and riders, would potentially provide additional protection to the habitat of tundra thread moss.

Overall, the restriction of off-trail travel by stock, and reduction in overall use levels proposed under this alternative would be expected to lead to a decrease in potential impacts on the plants of conservation concern.

Nonnative Plant Species: Alternative 5 would not allow off-trail stock travel and would reduce off-trail grazing in meadows, substantially lowering the potential for introducing nonnative plants in areas where early detection would be difficult and costly. Total stock use would decrease relative to current levels. Overall disturbance related to visitor use (lower trailhead quotas and group size) and facility maintenance (trail construction and maintenance, ranger station maintenance) would be lower than current conditions.

Due to the implementation of stock-feed restrictions and improved prevention mitigations, plus decreased propagule pressure from fewer visitors and lower levels of administrative operations (zero long-term established trail crew camps and four fewer ranger stations and patrol cabins), overall propagule pressure would be substantially lower than current conditions. No pack stations would be permitted at Mineral King or Wolverton, reducing the frontcountry sources for invasive plant transport to wilderness. Probability of introductions to high-value habitats (wetlands) would be lower, since 14% less meadow area could be grazed than current conditions. The spatial distribution of impacts and difficulty of detection would be much lower, since off-trail stock travel would be prohibited and grazed meadow area would be reduced. Alternative 5 would result in substantial beneficial effects on native plant communities from reduced disturbance and reduced nonnative plant propagule pressure.

Cumulative Effects: Alternative 5 calls for a decrease in the number of visitors and stock wilderness-wide, reduces development, but allows for continued grazing. Fewer visitors would result in a reduction of adverse impacts wilderness-wide; however, the net benefit would be minimal. This alternative would reduce the percentage of meadow area that is open to stock travel from 64% to 43% and reduce the percentage of the parks' meadows open to grazing from 51% to 37%. With the decrease in access, the potential for invasive species spread in meadows would be reduced. Alternative 5 would alter campfire restrictions from current conditions, which would result in beneficial effects on subalpine trees in the Kern River drainage when compared to current conditions, and negative effects on subalpine trees in the Kaweah and Tule drainages.

The projects that may affect vegetation that are separate from projects proposed by this WSP/FEIS include the high-elevation forest monitoring program, the wetlands monitoring program, the Halstead and Cahoon meadow restorations, the ecological restoration program, invasive species management plan and activities, and permitted research activities. The majority of other past, present, and future foreseeable projects in wilderness have no potential for effects on vegetation. The impacts from these seven projects, and of the Fire and Fuels Management Program, are described for alternative 1. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under alternative 5 that would constitute a significant cumulative effect.

CONCLUSION

Wetlands and Meadows: Under all alternatives, continuation of current wilderness management policies, including protection of cultural resources, natural processes, visitor education, and restrictions on amounts and locations of overnight use, would continue to protect wetlands and meadows in the wilderness of Sequoia and Kings Canyon National Parks.

Trampling of wetland and meadow vegetation by human traffic would continue to occur along trails that pass through meadows, along riparian corridors and lakeshores where campers pass through to collect water or to fish, and where visitors set up camps on or adjacent to meadow or riparian vegetation. While these impacts can be locally severe, they are currently insignificant at the landscape scale and this would be expected to remain the case.

Under all alternatives, wetland and meadow vegetation would be affected by visitor activities. The use of administrative and recreational stock would continue to be the source of most impacts on these communities. The amount of wetland and meadow area subject to these impacts would vary by alternative (tables 93 and 94, figures 32 and 33). Alternatives 1, 2, 3, and 5 would allow some level of grazing in 35–52% of the wetlands and 37–51% of the meadows in the parks' wilderness. Under alternatives 1, 2, 3, and 5, grazing of wetland and meadow vegetation outside of named forage areas would continue to be rare and of light intensity; therefore grazing and trampling impacts to wetland and meadow vegetation outside of named forage areas would be negligible. Under existing use levels and patterns, less than half of the

area open to stock use would continue to be grazed by stock; any increase in use or shift in those patterns would have the potential to cause an increase in the number of areas subject to grazing.

Under alternative 1, meadows in popular areas and of high strategic value for those travelling with stock would continue to be grazed at higher intensities and could show impacts such as increases in bare ground and reductions in productivity. These meadows would be subject to regular monitoring and assessment, and impacts would be addressed using the management tools described in the 1986 SUMMP and BMP. Under alternatives 2, 3 and 5, grazing would be managed according to the Stock Use and Meadow Monitoring and Management Strategy described in appendix D, which would include the application of site-specific grazing capacities to all meadows open to grazing. The use of these capacities would reduce grazing and trampling impacts in the most heavily grazed forage areas. It would also provide protection to those areas which otherwise may be subject to increased grazing pressure in response to the implementation of temporary restrictions nearby or other changes in use patterns. Under anticipated use levels and patterns, impacts would continue to be most detectable in popular meadows along the JMT, in those areas serving as foci for trail crews and mounted rangers, and in the Roaring River and Hockett areas.

Under each of the alternatives where grazing would continue, any shifts in use to currently ungrazed meadows would have the potential to result in local increases in bare ground, decreases in production, and changes in vegetation composition associated with the introduction of grazing to areas currently not being used by stock. While there is good information available to predict the average magnitude of these changes, there is considerable and important variability in the response of individual sites to grazing (Cole et al. 2004). Nonetheless, these changes would not be expected to contribute to changes considered ecologically significant at the landscape scale. These potential impacts would be mitigated through the continued monitoring and management of stock use and grazing.

Although alternative 3 would decrease the acreage of wetland and meadow vegetation open to grazing, increased use levels could lead to an increase in severity of localized impacts associated with stock use in those areas that would remain open. The proposed increase in party size from 20 to 25 animals under this alternative would also have the potential to increase trampling impacts in wetlands associated with trails and camps. Under each of the action alternatives, implementation of new restrictions on commercial outfitters may result in the displacement of stock use to other areas of the park, which could cause new impacts in meadows that are currently infrequently used. These potential impacts would be mitigated through the implementation of the Stock Use and Meadow Monitoring and Management Strategy described in appendix D.

The elimination of all grazing as proposed under alternative 4 would have a beneficial effect on wetland areas that are currently open to grazing. Alternative 4 would thus have the most beneficial effect on wetland and meadow vegetation.

Under all alternatives, impacts on wetlands and meadows would be measurable on a local scale, but in most cases would not be expected to result in significant, long-term changes in function or composition. Alternatives 2 and 5 would result in decreased impacts on meadows from trampling and grazing over those occurring under current conditions; alternative 3 could produce slightly elevated impacts over current conditions. Alternative 4 would eliminate effects from trampling and grazing in meadows throughout the parks' wilderness, resulting in a significant beneficial effect to wetland and meadow vegetation. All action alternatives would have a beneficial effect on peat-accumulating meadows, ranging from a minor decrease in potential impacts under alternative 2 to a significant decrease in potential impacts under alternative 4. The elimination of grazing, such as proposed under alternative 4, may alleviate effects on wetlands and meadows wilderness-wide, but would likely lead to increased localized impacts by shifting and concentrating use in upland areas where stock would be held and fed.

Continuation of current wilderness management policies, including protection of natural processes, visitor education, and restrictions on amounts and locations of overnight use, would continue to protect wetlands and meadows throughout wilderness. Wetlands and meadows would remain generally undisturbed, with localized exceptions associated with foot traffic and stock use along trail corridors and in those areas used for grazing. Although grazed meadows would be expected to exhibit some differences in productivity, cover, and composition relative to ungrazed meadows, these differences would not be expected to lead to significant long-term changes in productivity, structure or wetland function. Grazing would continue to be routinely monitored to ensure that impacts to vegetation were kept within acceptable levels, impacts to soils remained localized and would not lead to accelerated rates of erosion, and that new introductions of nonnative species were detected and responded to appropriately.

Table 93: Percentage of Wetland Areas Open to Stock Grazing, Open to Stock Access, and Closed to Stock Access for All Wetland Types*

Alternative	Open to Stock Access; Open to Grazing	Open to Stock Access; Closed to Grazing	Closed to Stock Access
Alternative 1	52% (high)	12%	36%
Alternative 2	49%	6%	45%
Alternative 3	36%	20%	44%
Alternative 4	0% (low)	47%	53%
Alternative 5	35%	6%	58%

*Types of wetlands include lacustrine, palustrine, and riverine wetlands

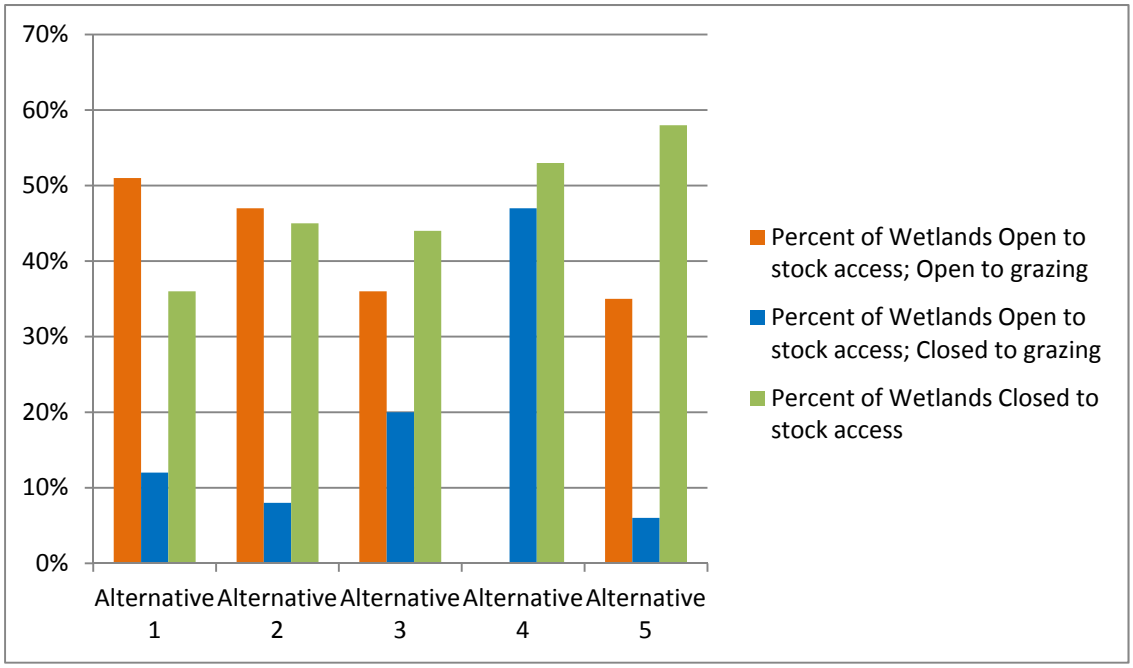


Figure 32: Percentage of Wetland Areas Open to Stock Grazing, Open to Stock Access, and Closed to Stock Access for each Alternative

Table 94: All Types of Meadows either Open or Closed to Stock Access

Alternative	Open to Stock Access; Open to Grazing	Open to Stock Access; Closed to Grazing	Closed to Stock Access
Alternative 1	51%	13%	36%
Alternative 2	48%	6%	46%
Alternative 3	37%	18%	45%
Alternative 4	0%	44%	56%
Alternative 5	37%	6%	57%

*Types of meadows include fens, fen/wet meadows, wet meadows, moist meadows, and dry meadows

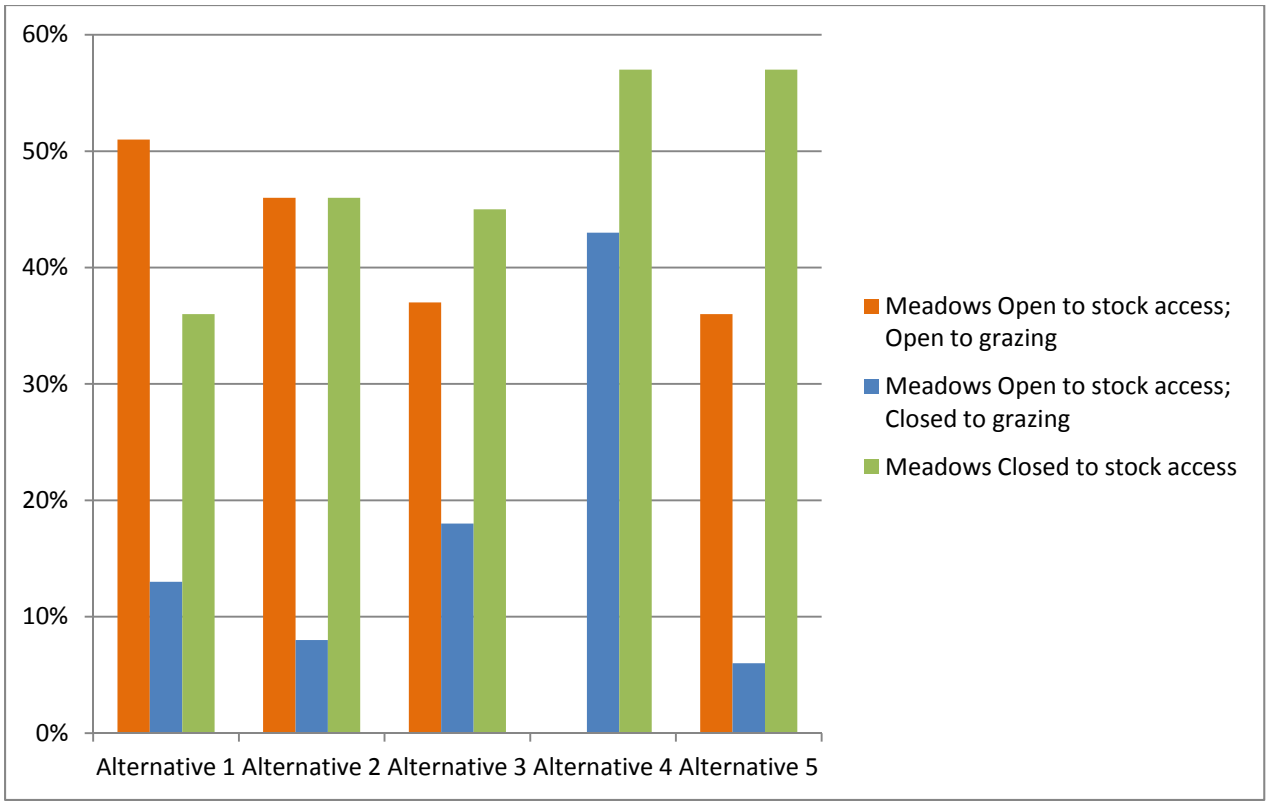
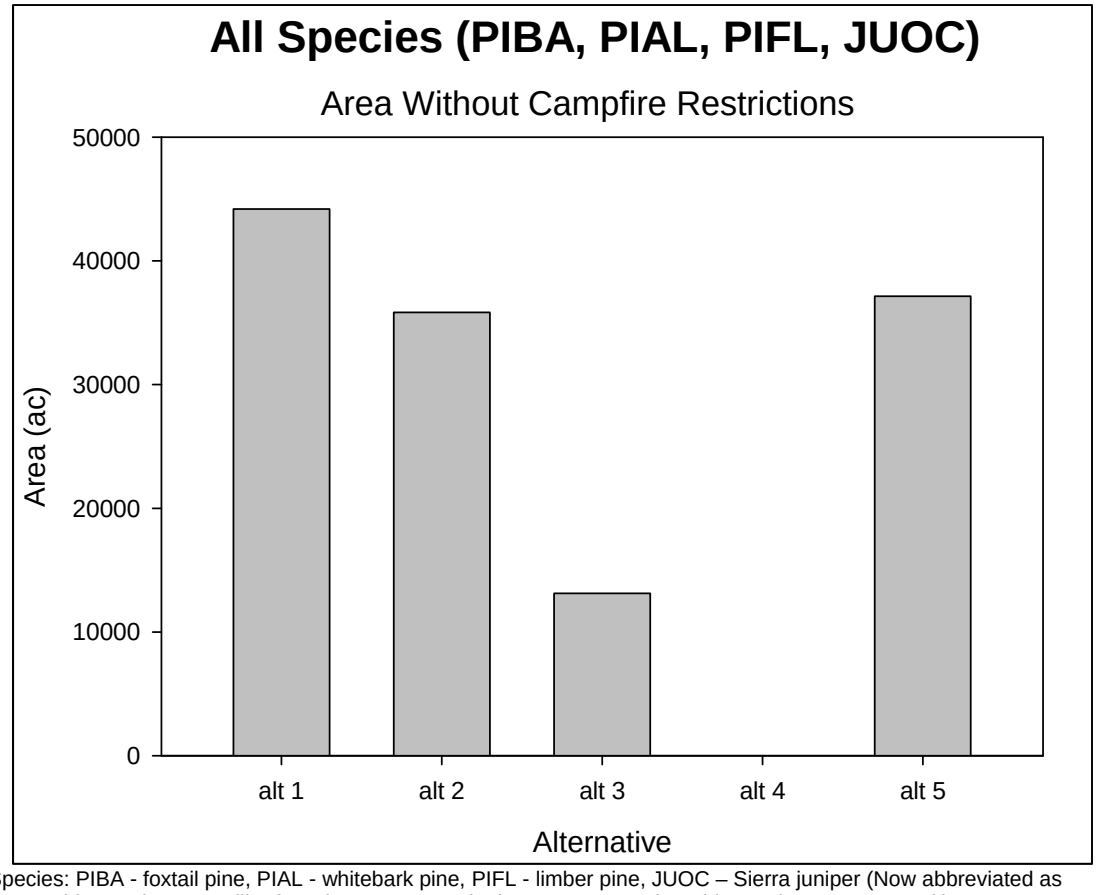


Figure 33: Percentage of Meadow Areas Open to Stock Grazing, Open to Stock Access, and Closed to Stock Access for Each Alternative

High-elevation Long-lived Tree Species: Impacts on high-elevation long-lived tree species were analyzed relative to the elevation restrictions for campfires with affects varying among alternatives. Alternative 1 has the least area with campfire restrictions, while alternative 4 prohibits campfires in the habitats of all four high-elevation conifers (figure 34). Alternative 2 (no campfires above 9,000 feet in Kaweah, Tule, and Soda Springs drainages or above 10,000 feet in Kern, San Joaquin and Kings river drainages) and alternative 5 (restrictions above 10,000 feet) were nearly equivalent for the high-elevation conifer species, with about 2,965 acres more with campfire restrictions under alternative 2 compared to alternative 5. Alternative 3 (restrictions above 9,000 feet wilderness-wide) was intermediate between

alternative 4 and alternatives 2 and 5. The differences between the alternatives are presented in table 95 on page 496. The alternatives range from protecting 65–100% of the high-elevation habitat in the parks from impacts due to campfires. All of the action alternatives would reduce impacts on high-elevation long-lived trees, and the reduced impacts under alternative 4 would be significant.



Species: PIBA - foxtail pine, PIAL - whitebark pine, PIFL - limber pine, JUOC – Sierra juniper (Now abbreviated as JUGR, this species was still referred to as western juniper, or JUOC, when this graph was generated.)

Figure 34: Combined Acreage Where the Four High-elevation Long-lived Tree Species Grow Where There Are Not Campfire Restrictions (Alternatives 1 through 5)

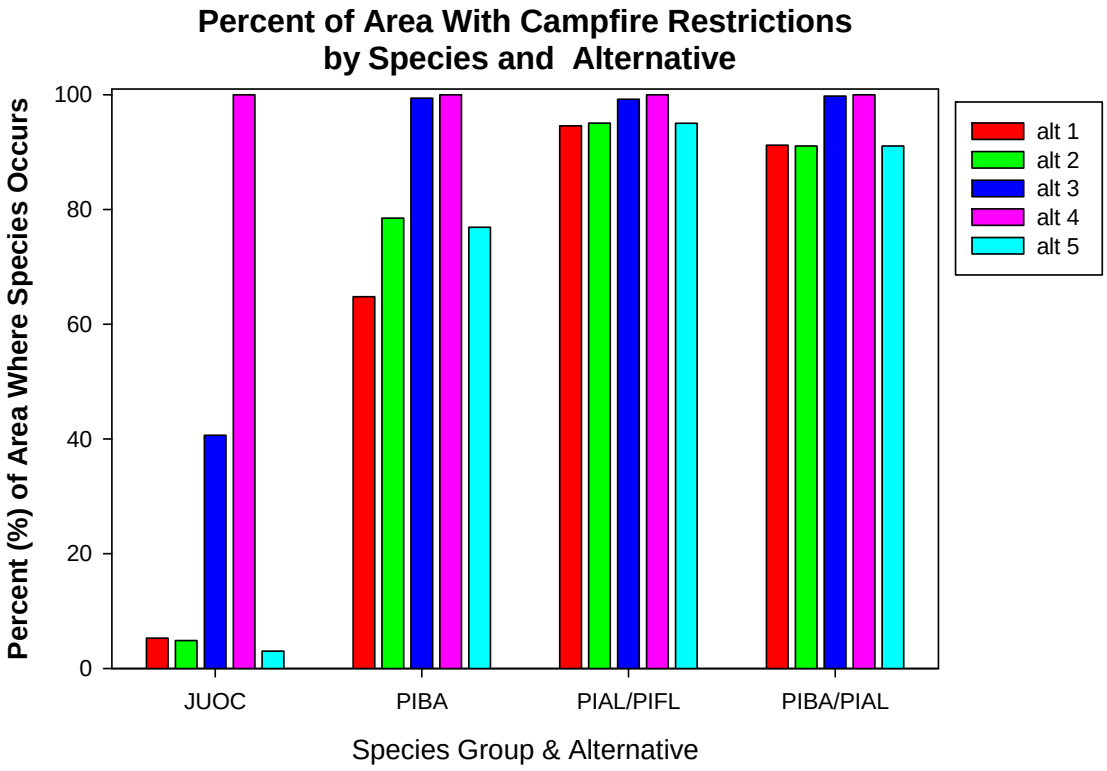
The different alternatives will result in differing campfire restriction coverage among the four targeted long-lived tree species. The differences among the alternatives are greatest for Sierra juniper and smallest for the species groups of whitebark/limber pines and foxtail/whitebark pines. This is a result of the campfire restrictions covering all high-elevation areas across all alternatives, whereas large portions of the mapped distributional range of the largely upper montane Sierra juniper only falls within two of the alternatives; alternative 3 and 4 (figure 35). If only the five-needle species are considered, campfire restriction coverage for alternative 2 and alternative 5 are similar, as are alternative 3 and alternative 5. Area of greatest potential affects from campfires and fuelwood gathering at campsites and along trails (within 328 feet), in areas not having campfire restrictions varied by alternative, with the largest area in alternative 1 (1,893 acres) and smallest in alternative 4 (0 acres) where all campfires are restricted within wilderness. The other alternatives were intermediate with some variation by alternative. The elevational designations specified in the five alternatives will also result in the inclusion of some other, non-target vegetation classes that fall within the elevational limits. This would include higher-elevation portions of

the distribution of species such as lodgepole pine and mountain hemlock. The area of non-target vegetation where restrictions would be placed varies by alternative (figure 36). It would be greatest under alternative 4 and smallest under alternative 5.

Table 95: Area of Subalpine Vegetation with Campfire Restrictions, by Alternative

Alternative	Acres of Subalpine Vegetation* without Campfire Restrictions (Not Protected)	Percent of Total Subalpine Habitat with Campfire Restrictions (Protected)
Alternative 1	44,212	65
Alternative 2	35,857	72
Alternative 3	13,126	90
Alternative 4	0	100
Alternative 5	37,144	71

*includes the four long-lived tree species: foxtail pine, whitebark pine, limber pine, and Sierra juniper (formally classified as western juniper)



Species: JUOC – Sierra juniper (previously classified as western juniper); PIBA - foxtail pine; PIAL - whitebark pine; PIFL - limber pine

Figure 35: Comparison of Percent Area Having Campfire Restrictions for Specific Vegetation Classes (as classed by Sequoia and Kings Canyon National Parks Vegetation Map)

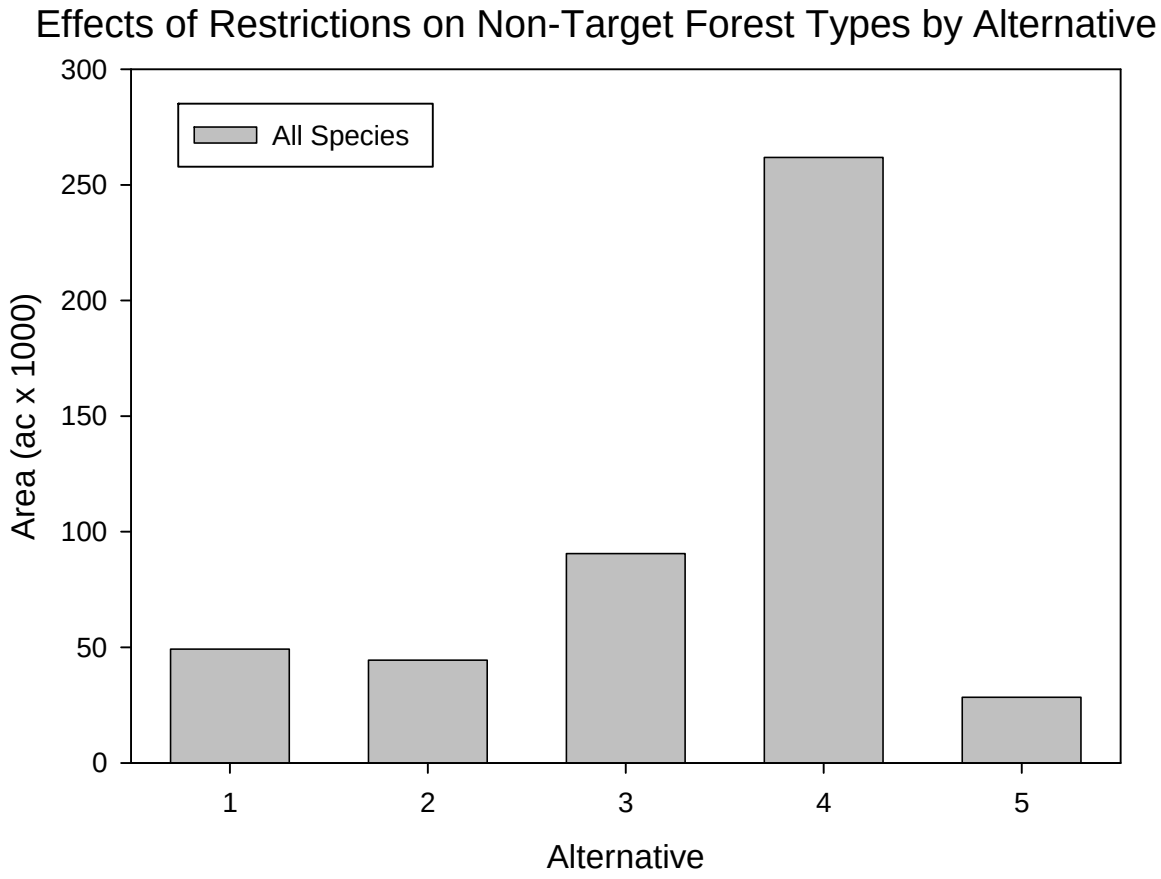


Figure 36: Area of Non-target Vegetation Classes that Occur within the Elevational Limits for the Campfire Restrictions for Each of the Five Alternatives

Alpine vegetation: Most of the alpine vegetation in the parks—found in some of the most remote and inaccessible portions of wilderness—is thought to be intact and relatively free from human disturbance. Where visitor use is concentrated, however, the slow-growing, perennial dominated communities that make up the alpine vegetation can show signs of impact. Due to the short growing season and harsh conditions that characterize the high-elevation environment, recovery from even minor disturbances can take a very long time and impacts can thus persist.

Direct removal of alpine vegetation occurs infrequently, and is primarily associated with trail maintenance and construction activities. Under alternatives 1, 2 and 3, impacts resulting from these activities would continue at existing levels, resulting in localized impacts on alpine plants. Reflecting the proposed changes in trail classification and lower use levels anticipated under alternatives 4 and 5, there may be a modest decrease in impacts associated with trail work under those alternatives.

Trampling of alpine vegetation along trail corridors and in high-elevation camp areas by human traffic would continue to occur. While these impacts can be locally severe, they are currently insignificant at the landscape scale and this would be expected to remain the case. The severity and extent of impacts on alpine vegetation would be expected to correlate with the use levels anticipated under each alternative; thus alternatives 1, 2 and 3 would have the potential to result in continued or slightly increased impacts on alpine vegetation, and such impacts would be expected to decrease under alternatives 4 and 5. Most trampling impacts would continue to occur along cross-country routes and in popular destinations where

visitor use is concentrated. Areas where such impacts would be expected to continue to be seen under all alternatives would include Dusy Basin, the Mount Whitney area, Upper Darwin Canyon/Lamark Col, Mount Langley, Kearsarge Lakes, and other similar high-elevation basins and routes popular with hikers. Should additional destinations increase in popularity (as periodically occurs in response to news articles, guidebooks, and information shared through social media) localized trampling impacts in such areas would be expected to increase.

Under alternative 1, with the anticipated increase in visitation to the Mount Whitney area, trampling impacts on alpine vegetation would be expected to increase along all routes leading into and through the area, especially through Miter Basin, Crabtree Pass, and along the JMT corridor. Increased popularity of Mount Langley, as an easily accessed 14,000+ feet peak, would continue to result in impacts on the sparsely vegetated summit area and along the multiple approach routes; however, these are expected to be mitigated by the establishment of a cairned route to the summit in 2014. Similarly, the increased popularity of alpine summits along the crest among 'peak baggers' would be expected to lead to increased development of informal trails and trampling of alpine vegetation, both on the summits and along approach routes. With additional controls on visitor use in the Mount Whitney area under the action alternatives, trampling impacts on alpine vegetation would be expected to stabilize in these areas, although the increased use levels anticipated under alternative 3 could lead to an increase in these impacts.

Under all alternatives alpine vegetation would continue to be affected to some extent by visitor activities. The use of administrative and recreational stock would continue to have potential for impact on those alpine meadows open to stock access and/or grazing. Grazing of other alpine vegetation types, such as fell-fields, would be infrequent and associated with pass-through travel and in areas where stock can be held and fed but not grazed. Alternatives 1, 2, 3, and 5 would allow some level of grazing in 14–30% of the mapped alpine vegetation in the parks' wilderness. Each of these alternatives would prohibit stock access in a portion of the parks' alpine, ranging from 64% under alternative 1, 69% under alternative 3, 70–76% of the mapped acreage under alternatives 2 and 4, and up to 83% under alternative 5. Grazing of alpine vegetation in the Evolution Lake basin would continue to be restricted to walking parties with burros or llamas. Because these animals have unshod hooves, consume less forage than horses or mules, and are infrequently used as stock in the parks, trampling and grazing impacts on alpine vegetation would continue to be minimal in this area. Trampling impacts on upland alpine vegetation would continue to be largely associated with established trails and routes, since cross-country stock travel through alpine areas is infrequent, and this would not be expected to change significantly under any of the alternatives.

Under alternatives 2, 3 and 5, grazing would be managed according to the Stock Use and Meadow Monitoring and Management Strategy described in appendix D. This would include the application of site-specific grazing capacities to all alpine meadows open to grazing. The use of these capacities would reduce grazing and trampling impacts in the most popular destinations while also providing protection to those areas which otherwise may be subject to increased grazing pressure in response to the implementation of temporary restrictions nearby. Under current use levels and patterns, grazing impacts would continue to be most detectable in popular meadows along the JMT, and in those areas serving as foci for trail crews.

Under alternative 4, grazing would be prohibited and trampling of alpine meadows currently open to grazing would largely cease, although low levels of trespass grazing and trampling would be expected. The removal of all drift fences and gates would mean that animals who became untethered would likely roam farther afield than under current conditions, with a possible increase in off-trail trampling impacts as a result. These would be expected to be infrequent. Stock access would be prohibited in 76% of the mapped alpine vegetation, the second-highest level of protection afforded by any of the alternatives.

Under current (alternatives 1 and 2) or reduced (alternatives 4 and 5) use levels and patterns, vegetation in untrailed alpine areas would remain largely undisturbed. Any significant increase in levels of use or change in patterns of visitor use, as that anticipated under alternative 3, would be expected to result in increased trampling and/or grazing impacts on alpine vegetation. The implementation of campsite condition standards and visitor encounter standards under the action alternatives would serve for the detection and management of such impacts, allowing for the continued protection of alpine vegetation throughout the parks' wilderness.

Table 96: Summary Values for Alpine Vegetation by Alternative Related to Stock Access

Alternative	Open to Stock Access and Grazing	Open to Stock Access, Closed to Grazing	Closed to Stock Access
Alternative 1	30%	6%	64%
Alternative 2	27%	3%	70%
Alternative 3	15%	16%	69%
Alternative 4	0%	24%	76%
Alternative 5	14%	3%	83%

Continuation of current wilderness management policies, including protection of natural processes, visitor education, and restrictions on amounts and locations of overnight use, would continue to protect alpine vegetation throughout the wilderness. Alpine vegetation would remain generally undisturbed, with localized exceptions associated with foot traffic and stock use along trail corridors, in high elevation camps, and in alpine areas used for grazing. Although grazed meadows would be expected to exhibit some differences in productivity, cover, and composition relative to ungrazed meadows, these differences would not be expected to lead to significant long-term changes in the productivity, structure or function of alpine systems. Grazing would continue to be routinely monitored to ensure that impacts to vegetation were kept within acceptable levels, impacts to soils remained localized and would not lead to accelerated rates of erosion, and that new introductions of nonnative species were detected and responded to appropriately.

Plants of Conservation Concern (Park Sensitive Plant Species): Under all of the alternatives, direct removal of plants of conservation concern would be expected to occur only under very limited circumstances, such as collections made in the course of research, inventory, or monitoring activities. Collection of voucher specimens is strictly regulated through the research permitting and environmental compliance processes to prevent population level impacts. Because the species of concern are by definition rare, the likelihood that they would be encountered by visitors and illegally collected is considered quite low.

Similarly, trampling of the plants of conservation concern by hikers would be expected to be infrequent under the patterns of use anticipated under alternatives 1, 2, 4 and 5. Although species in the meadows and uplands may continue to suffer incidental trampling by visitors traveling through meadows or on cross-country routes, this would not be expected to result in population level impacts.

The potential for trampling of the plants of conservation concern by hikers could rise with the increased levels and patterns of use anticipated under alternative 3. Species in the meadows and uplands may be subject to incidental trampling by visitors traveling through meadows or on cross-country routes. Although this would not be expected to result in population-level impacts, the likelihood of local impacts would increase commensurate with increasing use levels. The closure of the Baxter Pass Trail to stock would lead to increased protection of populations of *Astragalus ravenii* and *Streptanthus gracilis* in that

area. Thus potential for impacts on the seven vascular plant species of conservation concern known or suspected to occur in alpine upland areas frequented by cross-country hikers and used occasionally by stock, would be expected to increase.

If recreational rock climbing on the walls of the South Fork Kings River were to increase with the proposed opening of the North Dome area to overnight camping under alternatives 2, 3, 4 and 5, incidental impacts on individuals of marble rockmat, which grows in crevices and on ledges in the canyon, could be expected to increase. An increase in the use of existing routes and the development of additional new routes could lead to locally significant trampling impacts which could have measurable impacts on local populations. As the species is also found in remote, off-trail areas not favored by climbers, such impacts would not be expected to result in large-scale losses or declines that could lead to the listing of the species.

Impacts on the seven vascular plant species of conservation concern known or suspected to inhabit areas that would remain open to cross-country travel by stock under alternatives 1, 2, 3 and 4 would be expected to remain localized and insignificant at the population level. Exceptions to this are found along the floor of the lower Kern Canyon (where administrative grazing of the area known as the 'maze' coincides with the habitat of Kern River daisy), and on the Hockett Plateau (where administrative stock tend to roam off trail and can potentially encounter populations of Tulare County bleeding heart, field ivesia, Hockett Meadows lupine, and purple mountain-parsley). Continued administrative grazing in these areas would not be expected to result in population-level impacts, large-scale losses, or declines that could lead to the listing of these species.

Under alternatives 1, 2, 3, and 5 the 18 vascular plant species of conservation concern either known, or having the potential, to grow in or adjacent to meadows that would remain open to grazing by stock would continue to be exposed to potential impact from grazing. Under alternatives 2, 3 and 5 grazing intensity in meadows would be managed through the implementation of site-specific grazing capacities, and thus impacts on these species would continue to be localized and would not be expected to result in large-scale losses or declines that could lead to the listing of any of the species.

The potential for such localized impacts would be expected to increase in frequency and extent with the increase in use anticipated under alternative 3, while the holding and feeding of animals in camps adjacent to meadows that would occur under alternative 4 also has the potential to result in increased localized impacts on plants of conservation concern. With continued monitoring and management of visitor and administrative use, such impacts would not be expected to result in large-scale losses or declines that could lead to the listing of the species.

The mosses of concern considered in this analysis (*Bruchia bolanderi*, *Helodium blandowii*, *Meesia triquetra*, *Meesia uliginosa*, and *Pohlia tundrae*) all grow in meadow environments. Specific actions proposed under all of the action alternatives that would lead to greater protection of these species from trampling and grazing impacts include the closure of Guyot Creek east of the JMT, which would protect the peat-accumulating wetlands there and the associated moss flora from impacts. Expanding the portion of the Miter Basin area open only to pass through and day rides by stock, coupled with the adoption of smaller party sizes for off-trail hikers and riders, would potentially provide additional protection to the habitat of tundra thread moss. The implementation of grazing capacities for all the parks' meadows under alternatives 2, 3, and 5 would also afford greater protection to the moss communities found in peat-accumulating wetlands. The parks-wide grazing prohibition proposed under alternative 4 would afford the greatest level of protection to mosses found in meadows.

Under each of the alternatives considered under this plan, impacts on plants of conservation concern would be expect to remain localized and insignificant at the population level with proper monitoring and

mitigation efforts. None of the actions considered would be expected to lead to large-scale losses or declines that could lead to the listing of these species.

Nonnative plant species: Alternative 1 allows the most extensive off-trail stock travel and grazing, producing the highest probability of introducing nonnative plants in areas where early detection would be difficult and costly. Stock use and disturbance severity under alternative 1 is slightly higher than alternatives 2 and 3, and much higher than alternatives 4 and 5. Disturbance related to visitor use (trail use quotas and group size) and facility maintenance (trail construction and maintenance, ranger station maintenance) would produce similar nonnative plant impacts as alternatives 2 and 3, but higher impacts than alternatives 4 and 5. Due to the continued allowance of unprocessed stock feeds (hay and hay cubes) into the wilderness, overall propagule pressure would continue to produce a substantial risk of introducing new invasive plant species and populations. Alternative 1 would have the highest probability of introductions to high-value habitats (wetlands) among all of the alternatives. Spatial distribution of impacts would be wide, and difficulty of detection would be highest among all the alternatives.

The probability of successful nonnative plant introduction and establishment can be predicted by estimates of propagule pressure and disturbance, which can be measured by levels of stock access, visitor use, and facility maintenance. Alternatives 1, 2, and 3 have overall similar levels of stock access, visitor use, and facility maintenance, so the probability of successful nonnative plant introductions and establishment by these measures are not expected to differ greatly. However, implementation of stock-feed restrictions and improved prevention mitigations would reduce, but not eliminate, propagule introductions associated with stock use for all alternatives. In addition, alternatives 4 and 5 have reduced levels of stock access, visitor use, and facility maintenance, so the probability of successful nonnative plant introductions and establishment would be substantially reduced, resulting in substantial beneficial effects on native plant communities. Alternative 4 would additionally eliminate grazing in meadows, substantially reducing the risk of nonnative plant introductions and establishment in mid-elevation meadows, which are trending toward increased incidence of invasive perennial grasses such as velvet grass, orchard grass, smooth brome, and reed canarygrass. By reducing or eliminating stock access outside trail corridors, alternatives 4 and 5 would reduce the total area requiring early detection surveys and allow early detection resources to be used more effectively, so the probability of detecting new introductions early would be higher. In summary, none of the alternatives would result in additional negative impacts from nonnative plant species. Alternative 2 would have slight beneficial effects, and alternatives 4 and 5 would have substantial beneficial effects by reducing nonnative-plant introductions and establishment; with alternative 4 offering the most improvement.

WILDLIFE

METHODOLOGY FOR ANALYZING IMPACTS

The NPS Organic Act, which directs parks to conserve “wild life” unimpaired for future generations, is interpreted to mean that native animal life should be protected and perpetuated as part of the parks’ natural ecosystems. Natural processes are relied on for the maintenance of populations of native species to the greatest extent possible, and these species are protected from harvesting, harassment, or harm by human activities. According to NPS *Management Policies 2006*, the restoration of native species is a high priority (section 4.1). Management goals for wildlife include maintaining components and processes of naturally evolving park ecosystems, such as natural abundance, diversity, and the ecological integrity of plants and animals.

Impacts to wildlife were assessed by reviewing existing literature and characterizing the effects based on the types of impacts that could occur, and the analyzing factors that could contribute to wildlife impacts under each alternative. The types of impacts associated with wildlife that relate to visitor use and

administrative activities in wilderness include wildlife behavior modification and habitat modification. These are described in the following paragraphs.

TYPES OF IMPACTS ON WILDLIFE

Knight and Cole (1991) describe four ways that recreational activities impact wildlife: harvesting, habitat modification, pollution, and disturbance. Because harvest is not allowed in the parks, with the exception of recreational angling and highly regulated collections for research purposes, it is unimportant in the context of this WSP/FEIS and will not be discussed further. Habitat modification and pollution are similar enough to each other that they will be discussed collectively under "Habitat Modification." Because the primary impact of disturbance is that it causes changes in wildlife behavior, disturbance will be discussed under "Behavior Modification." Thus, there are essentially two general forms of wildlife impacts caused by human activities in the parks' wilderness: impacts on wildlife behavior and impacts on wildlife habitat.

Behavior Modification: Wildlife respond to encounters with visitors in one of three ways: avoidance, attraction, and habituation (Knight and Cole 1991). Avoidance is often a short-term response to disturbance, such as individuals exhibiting flight responses after encounters with recreationists and then resuming their prior activities soon thereafter. Avoidance can also be a long-term response to disturbance, such as individuals permanently avoiding otherwise suitable habitat in favor of undisturbed sites. Attraction develops over time when wildlife seeks out humans because of positive reinforcement, such as food rewards. Habituation (i.e., bears foraging for natural foods in close proximity to people after learning that people are non-threatening) develops over time after frequent benign encounters with humans, in which there is no positive or negative reinforcement; animals ignore humans to avoid energetically costly irrelevant behavior. Responses to the same disturbance may vary between species, between individuals within a species, or even between the same individual across different encounters. It is important to recognize that while these three types of behavioral responses may be adaptive and "natural," they may not necessarily be desired. For example, habituation of bighorn sheep to humans may be desirable to facilitate co-existence of the two species, while habituation of bears to humans may be undesirable because it often leads to bears obtaining human food and becoming threats to public safety.

Bears that become habituated to humans would be more likely to become food-conditioned (i.e., bears would directly seek out humans as a source of food), either through intentional (e.g., visitors purposely feeding bears) or unintentional means (e.g., visitors accidently leaving food unsecured) (Herrero 1985). Habituation and food-conditioning would be most pronounced in areas where quality bear habitat and relatively high levels of human use overlap (e.g., Paradise Valley) and as a result, human/bear conflicts would tend to be most pronounced in these areas.

Habitat Modification: Habitat modification describes changes to vegetation, soils, and topography as well as pollution that occur as a result of human activities. Habitat modifications are generally considered adverse for most species, but they can also cause simultaneous beneficial effects on other species. For example, facilitation or development of stock facilities and stock grazing may be beneficial to brown-headed cowbirds but adverse to the host species that would be parasitized by brown-headed cowbirds (Rothstein et al. 1980). There is some disagreement in the literature regarding the severity of impacts of brown-headed cowbird parasitism to host species in the Sierra Nevada. Rothstein et al. (1980) found high levels of brown-headed cowbird parasitism in developed areas of the Sierra Nevada and suggested that parasitism rates were high enough to threaten the continued survival of some species. However, Verner and Ritter (1983) concluded that brown-headed cowbirds were largely absent in natural areas of the Sierra Nevada and doubted that brown-headed cowbird parasitism was a substantial threat. Purcell and Verner (1999) arrived at a similar conclusion. Additional evidence for the latter hypothesis is that Siegel and Wilkerson (2005) found little evidence of cowbird presence within the parks' wilderness specifically, with most detections occurring near developed areas. Halterman et al. (1999) examined brown-headed

cowbird parasitism rates in eight western national parks, including Sequoia and Kings Canyon National Parks, and considered the overall parasitism rate of 6.6% to be low. The observed rate in the parks was 2.9%. These lines of evidence suggest that brown headed-cowbird impacts on host species in the parks would be unlikely to threaten the continued survival of any species, although the situation may be substantially different outside of the parks.

On the other hand, the study by Halterman et al. (1999) is now 15 years old and despite showing declines in abundance Sierra-wide, there is a trend (although not statistically significant) indicating that brown-headed cowbird abundance has increased in the parks over the past several decades (Steel et al. 2012). Thus, while impacts on bird species parasitized by brown-headed cowbirds would be adverse, there is insufficient information available to determine impact intensity with complete certainty. The best available evidence suggests that brown-headed cowbird impacts are unimportant in influencing native bird population dynamics within the wilderness of the parks, but may be important in frontcountry areas for species restricted to lower elevations, where brown-headed cowbirds are more abundant.

Light to moderate stock grazing may decrease habitat quality for some invertebrate species but increase habitat quality for others (Gonzáles-Megías et al. 2004). The impacts would generally be more pronounced in (1) meadows that receive higher levels of grazing compared to meadows that are rarely or lightly grazed and (2) wetter sedge habitats than in drier reed habitats (Holmquist et al. 2013a). Stock generally do not graze an entire meadow evenly because of variation in forage quality throughout a meadow. In patches that are heavily grazed, most (if not all) invertebrate species would be adversely impacted, but some invertebrate species may experience beneficial effects in areas that are lightly grazed, perhaps because of (1) an increase in the diversity of available habitats, (2) provision of supplemental food (i.e., manure), or (3) damage to plants making them more susceptible to insect herbivory (Holmquist et al. in press). Within the growing season, impacts would be minimal, characterized by Holmquist et al. (2013b) as "neither completely benign nor vastly destructive."

The minimal impacts from a previous year would be unlikely to persist into the following year (i.e., annual cycles of invertebrate community disturbance followed by reorganization would likely occur). For example, Holmquist et al. (2010) found that within the parks, at the beginning of the growing season and prior to stock arrival, there were few differences in invertebrate diversity and abundance between meadows with a long history of stock use and meadows with a long history of minimal use. Thus, there would be few, if any, long-term impacts (beneficial or adverse) to invertebrates due to stock grazing.

Impact intensity would be scale dependent. At the scale of the overall wilderness, stock grazing impacts on invertebrates would be undetectable because of the small area impacted. On a localized scale, measurable impacts would occur.

FACTORS THAT CONTRIBUTE TO WILDLIFE IMPACTS

The primary factors that contribute to wildlife behavior modification include encounters between wildlife and hikers and stock (from either recreational or administrative sources) because these are the types of disturbances that occur most frequently. Secondarily, wildlife behavior could be modified by infrequent administrative activities such as helicopter flights. The primary factors that contribute to wildlife habitat modification include grazing by stock, trampling by humans and stock, nutrient loading from human and stock waste, and creation or maintenance of infrastructure that supports visitor recreation (e.g., trails, campsites, ranger stations, food-storage boxes, etc.).

IMPACTS OF ALTERNATIVE 1: NO-ACTION / STATUS QUO

Black Bears: Under alternative 1, bears would continue to have benign encounters with people throughout wilderness, which would lead to habituation. Incident rates would likely continue to remain near their current level, which is substantially lower than neighboring Yosemite National Park (NPS n.d. b). There would likely be periodic fluctuations because of variation in natural food supplies (e.g., incidents would likely be higher in years of poor natural food availability), but as a rule, incidents would continue to remain relatively rare, and bear population dynamics in wilderness would be dominated by natural processes.

Cumulative Effects: Past, present, and reasonably foreseeable actions occurring within the parks and the surrounding area that would be expected to contribute to cumulative impacts to bears include implementation of the parks' Bear Management Plan and Fire and Fuels Management Plan; land management plans for the adjacent USFS lands; and bear hunting on both public and private land adjacent to the parks. Bear management activities under the Bear Management Plan generally occur in the frontcountry, but may affect bears that use wilderness areas. Some of these activities (e.g., hazing, capturing and tagging, and euthanasia) would adversely impact individual animals in the short-term but would not likely have population-level effects. Other bear management activities (e.g., visitor education, food-storage regulation, law enforcement, etc.) would beneficially impact individuals as well as provide a population-level benefit, both in the short and long-term if these activities led to decreased encounters. The parks' Fire and Fuels Management Plan and land management plans for the adjacent USFS lands would impact bears primarily through modifications of habitat (e.g., prescribed fires, silvicultural treatments, etc.) which could be beneficial or adverse, depending on the specific situation. These impacts would be both short and long term. Bear hunting would adversely impact individual bears that are harvested but there would be no long-term population-level impacts, because harvest rates are maintained at a conservative level. Since alternative 1 proposes no changes to the management of black bears in wilderness, there would be no significant cumulative effects associated with the alternative.

Birds: Brown-headed cowbirds would continue to parasitize the nests of dozens of host species, particularly flycatchers, vireos and warblers (Steel et al. 2012). Brown-headed cowbird abundance and parasitism rates could be relatively high near frontcountry developments (e.g., campgrounds, picnic areas, administrative and stock facilities, etc.). These areas are prime foraging areas for brown-headed cowbirds because of access to supplemental food associated with human occupancy (Rothstein et al. 1980, Verner and Ritter 1983). Most native bird species have widespread distributions and would not experience effects substantial enough to alter their population dynamics, but impacts on species with distributions limited to the lower elevations of the parks, such as the yellow warbler, could limit population growth (Rodney Siegel, pers. comm., 2014). In wilderness, brown-headed cowbird abundance and parasitism would be uncommon, and impacts on native bird species would be minimal because of the lack of development, although there could be potential for localized problematic areas near ranger stations or other highly visited sites (see for example, Wright 1999).

Cumulative Effects: Past, present, and reasonably foreseeable actions occurring within the parks and the surrounding area that would be expected to contribute to cumulative impacts to brown-headed cowbirds, and therefore, native birds, include implementation of land management plans for the adjacent USFS lands and development on adjacent private lands. In both cases, should habitat fragmentation and human development increase, brown-headed cowbirds would benefit, which may result in an increase in nest parasitism on native birds. The parks' projects that may affect native birds that are separate from projects proposed by this WSP/FEIS include the restoration of Halstead and Cahoon Meadows, the ecological restoration program, and permitted research projects. Several native bird species that use meadow habitats are known to inhabit the parks, including orange-crowned warbler (*Vermivora celata*), yellow warbler (*Dendroica petechia*), Nashville warbler (*Vermivora ruficapilla*), and Wilson's warbler (*Wilsonia pusilla*)

(Wilkerson and Siegel 2002); yellow warbler are common host species of the brown-headed cowbirds (Heath 2008). The meadow restorations would recreate natural habitat that would benefit birds that use the habitat. The resources management and science program would restore natural conditions to human-disturbed areas; this program would benefit wildlife throughout the parks, including birds. Permitted research activities throughout wilderness cover a variety of resources, including wildlife, and specifically birds. Research projects may temporarily disturb birds, but overall the knowledge gained would be beneficial and could be applied to wildlife management plans.

Brown-headed cowbirds would continue to produce adverse impacts on native bird species under alternative 1. However, because this alternative proposed no changes to the management of brown-headed cowbirds in wilderness, there would be no significant cumulative effects associated with the alternative.

Invertebrates: Terrestrial invertebrates would continue to be adversely affected by human and stock trampling, particularly along trails, by stock grazing within meadows, and at stream fording sites.

Trampling –Terrestrial invertebrate diversity and abundance would be reduced in trampled areas relative to the immediate surrounding areas, due to invertebrate behavioral avoidance of "edge" habitat in favor of core habitat (Holmquist 2004). These adverse impacts would be more pronounced in heavily trampled areas (e.g., maintained trails, campsites, etc.) compared to lightly trampled areas (e.g., informal trails). In heavily trampled areas, impacts would be likely to persist from year to year, and in lightly trampled areas, annual cycles of invertebrate community disturbance followed by reorganization would likely occur. Assuming that a 16.4 feet “zone of influence” around trampled areas is representative (Holmquist 2004), a rough estimation of the area that would be considered heavily trampled is 2,578 acres (0.31% of the area of the parks; based on 650 miles of maintained trails). Impact intensity would be scale dependent. At the scale of the overall wilderness, trampling impacts would be undetectable because of the small area impacted; on a localized scale, measurable impacts would occur.

Stock grazing –Stock grazing in meadows would continue to impact invertebrates by causing changes to plant species composition or through changes in habitat structure (Gibson et al. 1992).

Stock fording of streams –Stock activity at fording sites would continue to cause soil erosion, sedimentation, and urine and manure deposition (McClaran and Cole 1993), which would likely adversely impact aquatic invertebrates downstream from these sites. It is currently unknown what extent these impacts would be and how long they would persist, but research to address these questions in the Sierra Nevada is ongoing. Extrapolation to the parks’ wilderness from similar studies evaluating cattle impacts on aquatic invertebrates [for example, Herbst et al. 2012] is of limited value because stock use of the parks’ wilderness streams would be orders of magnitude lower than what occurs on cattle grazing allotments. With the noted caveat of an absence of supporting data, a "best guess" estimation of stock impacts at fording sites to aquatic invertebrates is that they would be similar to grazing impacts: (1) impacts from a previous year would be unlikely to persist into the following year (i.e., annual cycles of invertebrate community disturbance followed by reorganization would likely occur) and (2) impact intensity would be scale dependent—at the scale of the overall wilderness, impacts would be undetectable because of the small area impacted; on a localized scale, measurable impacts would occur. Additionally, measurable impacts would likely only occur at a few fording sites that receive relatively heavy use; no measurable effects would be expected at the more numerous light to moderately used sites.

Cumulative Effects: Past, present, and reasonably foreseeable actions occurring within the parks and the surrounding area that would be expected to contribute to cumulative impacts to invertebrates include implementation of the parks’ Fire and Fuels Management Plan and various restoration programs (e.g., Aquatic Restoration Plan, Halstead and Cahoon Meadow restorations, etc.). The implementation of the parks’ Fire and Fuels Management Plan would impact invertebrates primarily through modifications of

habitat (e.g., prescribed fire), which could be beneficial or adverse depending on the specific situation. These impacts would generally be short-term. Restoration programs would provide long-term beneficial impacts to invertebrates. For example, the meadow restoration program would recreate natural conditions including water flow and native plants, creating suitable conditions for native invertebrates. Permitted research activities throughout wilderness cover a variety of resources, including wildlife. Invertebrate studies are one of the most frequent topics for research projects in the parks in the last three years. Research projects may temporarily disturb invertebrates depending on the methods of tracking and collecting data, but overall, the knowledge gained would be beneficial and could be applied to wildlife management plans.

Because this alternative proposed no changes to hiker and stock use in wilderness, there would be no significant cumulative effects associated with the alternative.

IMPACTS OF ALTERNATIVE 2: PROTECT WILDERNESS CHARACTER BY IMPLEMENTING SITE-SPECIFIC ACTIONS (NPS PREFERRED ALTERNATIVE)

Black Bears: In popular use areas visitor use levels would be similar to present levels. Keay and van Wagtendonk (1983) found that human/bear conflicts and visitor density (measured as visitors present per night in each management zone) in wilderness areas of Yosemite National Park were correlated with each other, whereas other measures of visitor use (e.g., the distance and number of days hiked from trailhead to trail zone; the number of trail segments in a zone; the length of trails in a zone; and the number of camp areas per zone) did not correlate with human/bear conflicts. Because the visitor use levels would be similar to present levels, there would be little change in undesirable bear behavior as a result of this action.

On the other hand, the removal of 25 food-storage boxes, as well as potentially an additional 13 over time may result in an increase in food-conditioning and resultant human/bear conflicts near these sites relative to alternative 1, especially if visitors do not properly use alternative approved food-storage measures. However, because the food-storage boxes selected for removal would be in areas without a history of bear issues; where a nearby food-storage box would be sufficient for storage needs; where container requirements would likely be successful; or where there would be opportunities for counter-balancing, increases in human/bear conflicts as a result of this action would be expected to be minimal. The establishment of additional designated campsites in bear habitat, assuming that this action results in an increased concentration of visitor use, could also result in an increase in food-conditioning and human/bear conflicts near these sites. This would occur due to increased human/bear encounter rates that foster bear habituation to people which, as discussed previously, could be a precursor to behavior and food-conditioning. Increased density of human food in these locations could also result in increased human/bear conflicts. If proper food storage is regularly practiced, increases in human/bear conflicts as a result of this action would be expected to be minimal.

It is likely that any change (positive or negative) in human/bear conflict rates under alternative 2 would be minimal.

Cumulative Effects: Other than those ongoing projects and activities associated with the administration of wilderness (i.e., facility and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on black bears. The impacts from the implementation of the parks' Bear Management Plan and Fire and Fuels Management Plan, land management on adjacent USFS lands, and bear hunting actions outside the parks would be the same as previously described for alternative 1. This alternative would result in impacts that are not substantially different from the status quo (alternative 1), with some localized adverse impacts where designated campsites would be established. Considered together, there would be no meaningful additive or

interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

Birds: The closure of additional meadows to grazing could contribute to reduced habitat quality for brown-headed cowbirds, and thus could also result in a decrease in parasitism to host species near these sites, relative to alternative 1. At other sites, the establishment of designated stock camps (assuming that this action results in an increased concentration of stock use) could result in increased habitat quality for brown-headed cowbirds, and therefore, increases in parasitism to host species near these sites. However, as discussed previously, because existing parasitism rates, based on the best available evidence, are thought to be unimportant in influencing native bird population dynamics in wilderness, impacts on native birds by these actions (adverse or beneficial) would likely be minimal. Also at the park-wide scale, the requirement that stock feed carried into wilderness be limited to processed pellets or rolled grains could result in increases in brown-headed cowbird abundance and parasitism rates because it is likely that processed pellets and rolled grains that are not completely consumed by stock would be used as a supplemental food source by brown-headed cowbirds. Again however, this conclusion is speculative.

Because frontcountry areas are already developed, it is unlikely there would be measurable increases in brown-headed cowbird abundance associated with the modification of any of the frontcountry developments of stock camping sites in Cedar Grove, possible modification of stock facilities in Wolverton, modification of the Atwell Mill Campground for stock camping, possible modification of stock facilities at the Mineral King pack station, and modification of the South Fork Campground for stock camping. Discussing the relationship between development and brown-headed cowbirds, Verner and Ritter (1983) stated, "*Unless future developments are confined to areas already developed* [emphasis added], they will no doubt increase the abundance and distribution of cowbirds in the mountains." Based on this rationale, while brown-headed cowbird abundance may increase slightly at these sites, particularly because they would be closer to source populations than wilderness sites, it seems reasonable to assume that significant adverse impact on host species through parasitism, relative to alternative 1, would not be expected.

Cumulative Effects: Cumulative effects would be similar to those described under alternative 1. This alternative would result in impacts that are not substantially different from the alternative 1 with localized adverse impacts where new campgrounds would be established and development of stock-related features at Cedar Grove, Wolverton, Atwell Mill, and Mineral King. There are both adverse and beneficial effects as a result of ongoing and future potential projects. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect on native birds.

Invertebrates:

Trampling – Similar visitor use levels would result in similar trampling impacts on invertebrates as alternative 1.

Stock grazing –The closure of additional meadows to grazing could provide beneficial effects on invertebrates at these sites relative to alternative 1, but because Holmquist et al. (2010) found that within the parks' wilderness, at the beginning of the growing season and prior to stock arrival, there were few differences in invertebrate diversity and abundance between meadows with a long history of stock use and meadows with a long history of minimal use, beneficial effects would likely be minimal. Beneficial effects would be most pronounced in the newly closed meadows that previously experienced higher levels of grazing.

Stock fording of streams – Impacts on aquatic invertebrates downstream from fording sites would be similar to those described under alternative 1. There would be no actions under alternative 2 that would measurably modify the frequency that streams would be forded by stock.

Cumulative Effects: Cumulative effects would be similar to those described under alternative 1. This alternative would result in impacts that are not measurably different from the status quo (alternative 1). Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect on invertebrates.

IMPACTS OF ALTERNATIVE 3: PROVIDE MORE OPPORTUNITIES FOR PRIMITIVE RECREATION

Black Bears: In popular use areas for which visitor use levels could increase, bears may have more frequent benign encounters with people, which may lead to an increased frequency of habituation and food-conditioning relative to alternative 1. The establishment of additional designated campsites in bear habitat, assuming that this action results in an increased concentration of visitor use, could also result in an increase in food-conditioning and resultant human/bear conflicts near these sites.

On the other hand, these adverse consequences would be at least partially, perhaps completely mitigated by the addition of up to 35 new food-storage boxes, shifting locations of existing food-storage boxes to key areas, and modifying food-storage requirements, including adding portable container requirements in selected areas.

Cumulative Effects: The majority of other past, present, and future foreseeable projects in wilderness have little potential for effects on black bears. The impacts from the implementation of the parks' Bear Management Plan and Fire and Fuels Management Plan, land management on adjacent USFS lands, and bear hunting actions outside the parks would be the same as previously described for alternative 1. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

Birds: The closure of the meadows to grazing in the off-trail areas could contribute to reduced habitat quality for brown-headed cowbirds, and thus could result in a decrease in parasitism to host species near these sites, relative to alternative 1. Actions that could benefit brown-headed cowbird include establishment of designated stock camps, frontcountry development, and the requirement of using processed pellets, rolled grains, or fermented hay as stock feed. Impacts within both the wilderness and the frontcountry would be similar to alternative 2, as the relevant actions proposed are nearly identical. Based on the rationale detailed in alternatives 1 and 2, that brown-headed cowbird parasitism is unimportant in influencing native bird populations, adverse impacts on native bird populations from alternative 3 would likely be minimal.

Cumulative Effects: This alternative would result in impacts that are not substantially different from alternative 1, with localized adverse effects from additional frontcountry stock facilities. Cumulative impacts would be similar to those described under alternative 1. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect on native birds.

Invertebrates:

Trampling – Increases in visitor use may provide additional adverse trampling impacts on invertebrates relative to alternative 1, but the difference would likely be slight because existing trampled areas (e.g.,

maintained trails, campsites, etc.) would remain in that state regardless of the frequency of visitor use. Invertebrates in lightly trampled areas (e.g., informal trails) may experience additional adverse consequences as a result of increased visitor use, but impacts would be unlikely to persist from year to year; annual cycles of invertebrate community disturbance followed by reorganization would likely occur.

Stock grazing –The closure of additional meadows in off-trail areas to grazing could provide beneficial effects on invertebrates at these sites relative to alternative 1. However, because Holmquist et al. (2010) found that there were few differences in invertebrate diversity and abundance between meadows with a long history of stock use and meadows with a long history of minimal use, beneficial effects would likely be minimal. Beneficial effects would likely be most pronounced in the newly closed meadows that previously experienced relatively higher levels of grazing.

Stock fording of streams – Impacts on aquatic invertebrates downstream from fording sites would be similar to alternative 1. Alternative 3 would increase the frequency of fording stock slightly throughout the wilderness and would slightly increase the currently low likelihood of impact to aquatic invertebrates, as discussed in alternative 1.

Cumulative Effects: Cumulative effects would be similar to those described under alternative 1. This alternative would result in impacts that are not substantially different from alternative 1. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect on invertebrates.

IMPACTS OF ALTERNATIVE 4: EMPHASIZE UNDEVELOPED QUALITY AND NON-COMMERCIAL RECREATION

Black Bears: In popular use areas for which visitor use would be slightly reduced, bears may have less frequent benign encounters with people, which may lead to a reduced frequency of habituation and food-conditioning relative to alternative 1. Because the reductions in visitor use would be slight, reductions in undesirable bear behavior as a result of this action would likely be slight as well. The removal of all existing designated campsites, assuming that this action results in a reduced concentration of visitor use, could result in a decrease in food-conditioning and resultant human/bear conflicts near these sites.

The beneficial effects would likely be offset by the removal of all food-storage boxes and the requirement for visitors to use portable food-storage containers. This could result in a net increase in food-conditioned behavior in bears if visitors do not properly store their food. The requirement for portable bear-resistant container use for all overnight users would not be expected to mitigate the loss of the food-storage boxes for the following reasons:

Many users on long backpacking trips (i.e., > 7 days) carry more food with them than will fit in portable containers (McCurdy and Martin 2007, Mazur 2008). Without food-storage boxes available to store food in until the volume is reduced to a level that will fit in the portable containers (e.g., during the first day or so of a trip), any improperly stored food would be available to bears.

An unknown percentage of users will refuse to carry portable containers, but would otherwise use food-storage boxes if they were available (McCurdy and Martin 2007, Mazur 2008). While such users could be violating regulations, the violations would occur nonetheless, and such improperly stored food would be available to bears.

Overall, two actions in this alternative could contribute to decreases in human/bear conflicts (reduced visitor use, removal of designated campsites), and one action could contribute to increases in human/bear

conflicts (removal of all food-storage boxes) relative to alternative 1. It is likely that there would be a measurable increase in human/bear conflict rates from alternative 1.

Cumulative Effects: Cumulative effects would be similar to those described under alternative 1. The majority of other past, present, and future foreseeable projects in wilderness have little potential for effects on black bears. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under alternative 4 that would constitute a significant cumulative effect.

Birds: The closure of all meadows to grazing could contribute to reduced habitat quality for brown-headed cowbirds and could result in a decrease in parasitism to host species near these sites, relative to alternative 1. It is likely that there would be reduced stock use wilderness-wide under this alternative as a result of the closure of all meadows to grazing. This could result in reduced habitat quality for brown-headed cowbirds, and therefore, reductions in parasitism to host species near these sites. It is also possible that the complete replacement of stock grazing with the requirement that stock feed be carried into wilderness would have confounding effects. Increases in brown-headed cowbird abundance and parasitism rates could occur because it is likely that processed pellets and rolled grains that are not completely consumed by stock could be used as a supplemental food source by brown-headed cowbirds; however, this conclusion is speculative.

As with alternatives 2 and 3, because existing parasitism rates, based on the best available evidence, are thought to be unimportant in influencing native bird population dynamics in wilderness, impacts on native birds by these actions (adverse or beneficial) would likely be minimal. At the park-wide scale, decreases in stock-party sizes could potentially result in decreased habitat quality for brown-headed cowbirds, and therefore, decreases in parasitism to host species as well.

Impacts within the frontcountry would be similar to alternatives 2 and 3, as the relevant actions proposed are nearly identical, except for the modifications at the Atwell Mill Campground.

Cumulative Effects: Cumulative effects would be similar to those described under alternative 1. There are both adverse and beneficial effects as a result of ongoing and future potential actions outside the park, and internal projects in the parks. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect on native birds.

Invertebrates

Trampling – Trampling impacts would be similar to alternative 2, as the relevant actions proposed are nearly identical.

Stock grazing –Stock grazing impacts would be eliminated under this alternative, which would result in beneficial effects on invertebrates. Holmquist et al. (2010) found that within the parks' wilderness, at the beginning of the growing season and prior to stock arrival, there were few differences in invertebrate diversity and abundance between meadows with a long history of stock use and meadows with a long history of minimal use, therefore the beneficial effects would likely be minimal. Beneficial effects, if any, would likely be most pronounced in the closed meadows that previously experienced higher levels of grazing.

Stock fording of streams –Impacts on aquatic invertebrates downstream from fording sites would be similar to alternative 1. Alternative 4 would reduce the frequency of fording stock modestly throughout

the wilderness and would further decrease the already low likelihood of impact to aquatic invertebrates, as discussed in alternative 1.

Cumulative Effects: Cumulative effects would be similar to those described under alternative 1. This alternative would result in impacts that are not measurably different from the status quo (alternative 1). Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect on invertebrates.

IMPACTS OF ALTERNATIVE 5: EMPHASIZE OPPORTUNITIES FOR SOLITUDE

Black Bears: With wilderness visitor use levels notably reduced, bears may have fewer encounters with people, which may lead to a reduced frequency of habituation and food-conditioning relative to alternative 1. Because visitor use would be substantially reduced, decreases in undesirable bear behavior as a result of this action could be substantial as well. As with alternative 4, the removal of all existing designated campsites, assuming that this action results in a reduced concentration of visitor use, could also result in a decrease in food-conditioning and resultant human/bear conflicts near these sites.

The beneficial effects would likely be offset by the removal of all food-storage boxes and reliance on self-determined food-storage methods wilderness wide, resulting in a net increase in food-conditioned behavior in bears. Mazur (2008) found that 9% of backpacking parties surveyed in the parks used food hanging (a method historically overcome by bears in the parks) where portable container use was voluntary. While counterbalancing, or food-hanging, would not be a violation of the parks' regulations, food stored in this manner would often become available to bears.

Overall, two actions in this alternative could contribute to decreases in human/bear conflicts (reduced visitor use; removal of designated campsites), and two actions could contribute to increases in human/bear conflicts (removal of all food-storage boxes; reliance on self-determined food-storage methods) relative to alternative 1. It is likely that there would be a measurable increase in human/bear conflicts from alternative 1.

Cumulative Effects: As described under alternative 1, the majority of other past, present, and future foreseeable projects in wilderness have little potential for effects on black bears. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under alternative 5 that would constitute a significant cumulative effect.

Birds: Alternative 5 could potentially reduce habitat quality and quantity for brown-headed cowbirds by reducing stock-party sizes, and reducing the number of meadows open to stock grazing. Additionally, frontcountry development of stock facilities would be limited to Cedar Grove, Wolverton, and South Fork. These actions could limit brown-headed cowbird abundance, and therefore, reduce parasitism on native bird species. However, the use of processed pellets or rolled grains as stock feed could provide a food source for brown-headed cowbirds and increase abundance slightly. Based on the rationale described previously, that brown-headed cowbird parasitism is unimportant in influencing native bird populations, beneficial effects on native bird populations from alternative 5 would likely be minimal.

Cumulative Effects: The projects that may affect brown-headed cowbirds, and therefore, affect native birds are described under alternative 1. There are both adverse and beneficial effects as a result of ongoing and future potential projects. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect on native birds.

Invertebrates

Trampling – The substantial reduction of visitor use levels may reduce trampling impacts on invertebrates relative to alternative 1, but the difference would be slight because heavily trampled areas (e.g., maintained trails, campsites, etc.) would remain in that state regardless of the frequency of visitor use. Invertebrates in lightly trampled areas (e.g., informal trails) may experience additional benefits, but they would be slight.

Stock grazing – The closure of additional meadows to grazing could provide beneficial effects on invertebrates at these sites relative to alternative 1. In addition, there would be an elimination of grazing in areas closed to off-trail stock travel. However, as previously discussed, the beneficial effects would likely be minimal except in those areas that previously experienced higher levels of grazing.

Stock fording of streams – Impacts on aquatic invertebrates downstream from fording sites would be similar to alternative 1. Alternative 5 would reduce the frequency of fording stock slightly throughout the wilderness and would slightly decrease the already low likelihood of impact to aquatic invertebrates, as discussed in alternative 1.

Cumulative Effects: Cumulative effects would be similar to those described under alternative 1. This alternative would result in impacts that are not measurably different than the status quo. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect on invertebrates.

CONCLUSION

Black Bears: Management under alternative 1 would result in adverse effects on bears; mitigation measures to avoid and minimize impacts, such as the placement and use of food-storage boxes, the use of portable bear-resistant containers, and visitor education, would be extensive. All action alternatives have the potential to modify habituation and food conditioning in bears; however, due to the removal of all food-storage boxes under alternatives 4 and 5, these alternatives could have a greater adverse impact on black bears if visitors do not store food properly. Alternatives 1, 2, and 3 would not have significant beneficial or adverse impacts on black bears in the parks.

Birds: Management under alternative 1 would result in long-term adverse impacts on bird species parasitized by brown-headed cowbirds, with impacts most pronounced in the frontcountry areas, but virtually absent throughout wilderness. Across all alternatives, modifications to grazing restrictions, establishment or removal of stock camps, and modifications to frontcountry developments, may impact brown-headed cowbird populations and rates of parasitism to host species; but these impacts (adverse or beneficial) would likely be minimal because existing parasitism rates, based on the best available evidence, are thought to be unimportant in influencing native bird population dynamics in wilderness. Halterman et al. (1999), Verner and Ritter (1983) and Siegel and Wilkerson (2005) all concluded that brown-headed cowbirds were largely absent in natural areas of the Sierra Nevada and most of the parks' wilderness. Neither adverse nor beneficial significant impacts are anticipated from any of the plan alternatives on birds.

Invertebrates: Management under the no-action alternative would continue to result in long-term adverse impacts on invertebrates in heavily trampled areas (e.g., maintained trails, campsites, etc.). Additionally, there would be seasonal adverse impacts (for many species) and seasonal beneficial effects (for a few species) as a result of changes to stock grazing. Impacts on aquatic species from stock fording of streams would occur at a few fording sites that receive relatively heavy use; no measurable effects would be

expected at the more numerous light to moderately used sites. Impacts on invertebrates would be measurable at a localized level and undetectable at the overall scale of wilderness. It is anticipated that invertebrate population dynamics would remain dominated by natural processes. Neither adverse nor beneficial significant impacts are anticipated from any of the plan alternatives on the invertebrate fauna.

SPECIAL-STATUS SPECIES

This section provides an analysis of federally and state-listed threatened and endangered species, as well as candidate species, that are present within the Sequoia and Kings Canyon National Parks wilderness and have the potential to be affected by components of the alternatives. The effects of the alternatives on critical habitat are also evaluated.

METHODOLOGY FOR ANALYZING IMPACTS

Section 7 of the Endangered Species Act (ESA) mandates all federal agencies to determine how to use their existing authorities to further the purposes of the act to aid in recovering listed species, and to address existing and potential conservation issues. Section 7(a)(2) states that each federal agency shall, in consultation with the Secretary of the Interior, ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. NPS *Management Policies 2006* (NPS 2006) states that potential effects of agency actions should also be considered for state- or locally listed species. In this analysis, special-status species include wildlife that are federally or state listed, proposed, or candidates for listing (appendix L). Plant species of conservation concern are discussed under the "Vegetation" section.

Four federally listed or special-status species, the Yosemite toad, the Sierra Nevada yellow-legged frog, the northern distinct population segment of the mountain yellow-legged frog, and the Sierra Nevada bighorn sheep, have the potential to be affected by management actions within the WSP/FEIS alternatives. Within the boundaries of the parks, critical habitat has been designated for the bighorn sheep and proposed for the Yosemite toad, the Sierra Nevada yellow-legged frog and the northern distinct population segment of the mountain yellow-legged frog. Thus, the effect on critical habitat of these species is also analyzed.

This analysis was conducted using information obtained through best professional judgment of the parks' staff, experts in the field, recovery plans and actions for listed species, ongoing data collection for other projects, and other supporting literature (as cited in the text). NPS observations and anecdotal evidence are included and described, when available. Impacts on special-status species were assessed in terms of changes in the amount and connectivity of special-status species habitat or critical habitat, integrity of the habitat (including past disturbance) and populations, and the potential for increased/decreased disturbance and number of individuals. The parks would adhere to additional measures required by a biological opinion issued by the USFWS (if applicable and in accordance with Section 7 of the ESA) beyond those described in this document. Mitigation measures and best management practices would be implemented to reduce, minimize, or eliminate the impacts on the parks' natural resources (see the "Mitigation Common to All Alternatives" section of chapter 2).

USFWS DETERMINATION OF IMPACTS

The following impact determinations, as defined by the USFWS, were used to characterize impacts on special-status species:

No effect: The effects of the proposed action and its interrelated and interdependent actions will not directly or indirectly affect special-status species or destroy/adversely modify designated or proposed critical habitat.

May affect, not likely to adversely affect: The effects of the proposed action and its interrelated and interdependent actions on special-status species, or designated or proposed critical habitat, are expected to be beneficial, discountable, or insignificant. Beneficial effects are contemporaneous positive effects without any adverse effects on the species or habitat. Insignificant effects relate to the size of the impact (and should never reach the scale where take occurs). Discountable effects are those that are extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur.

May affect, likely to adversely affect: The effects of the proposed action and its interrelated and interdependent actions on special-status species or designated critical or proposed habitat are expected to be adverse. In the event that the overall effect of the proposed action is beneficial to the listed species or critical habitat, but may also cause some adverse effect on individuals of the listed species or segments of the critical habitat, then the determination "is likely to adversely affect."

YOSEMITE TOAD

The Yosemite toad is listed as a federally threatened species. Critical habitat is proposed within the northwest area of Kings Canyon National Park, including portions of the South Fork of the San Joaquin River and Middle Fork of the Kings River watersheds (USFWS 2013) (figure 25 on page 335). This is the only area of the parks where Yosemite toads are found.

Types of Impacts on Yosemite Toad: Visitor use, including its amount, concentration, timing, and mode of travel all influence the potential for adverse impacts on Yosemite toads. The impacts associated with the plan alternatives differ only slightly, although alternatives that support higher use levels, particularly stock use in Yosemite toad habitat, would be expected to have a slightly greater potential for adverse impacts on Yosemite toads.

In the context of the alternatives, there are three primary means by which Yosemite toads could be adversely affected, all of which are related to recreational activities: (1) disturbance during encounters with hikers and stock, (2) injury or mortality due to trampling by hikers and stock, and (3) degradation of habitat due to trails and/or stock use. There is some overlap between injury or mortality due to trampling, and potential degradation of habitat due to trampling.

Disturbance – Hiker and stock presence could cause Yosemite toads to move away and/or flee. Flight responses would be expected to be temporary in nature, and individuals that flee would typically be expected to resume their prior behaviors within a short amount of time. Therefore, this impact is discountable and insignificant.

Injury and Mortality Due to Trampling **–** Yosemite toads can suffer injury or death from trampling by hikers and stock. Although there is no documentation of Yosemite toads being trampled at the parks, it is possible that it could occur. Also, in wet habitats, stock hoofprints can create deep impressions from which tadpoles cannot escape, leading to their death.

Some evidence suggests that adverse effects from increased interactions of Yosemite toads with people and/or stock would remain at a low level of biological significance: First, adult toads breed in standing

water, typically in meadows, during early summer right after the snowpack melts. After one to two weeks of breeding, adults leave the water and migrate upslope for the rest of summer, foraging in mesic meadow habitat and using features such as rodent burrows for cover (Kagarise Sherman 1980; Kagarise Sherman and Morton 1984; Jennings and Hayes 1994). The early summer breeding window is when hiker/stock access is naturally limited due to lingering snow cover and wet ground conditions; thus potential effects from trampling and/or disturbance on breeding adult toads would be slight. Second, although adult toads are exposed for much of the summer in mesic meadow habitat, individuals are scattered, not congregated in large groups as when breeding. This helps reduce potential effects of trampling on the population. Third, foraging adults have access to cover habitat that may provide protection if they are deep enough to withstand caving under heavy loads. Toads in shallow burrows have occasionally been crushed by livestock (Jennings 1996, USFWS 2002). Fourth, toad eggs and tadpoles remain in water until shortly after metamorphosis, a period comprising approximately 6 to 10 weeks (Jennings and Hayes 1994, USFS et al. 2009) rather than 2 to 3 years as in mountain yellow-legged frogs. The comparatively short window when eggs and tadpoles are exposed reduces their overall vulnerability to trampling. In addition, Yosemite toad breeding involves large numbers of eggs/tadpoles, of which a small percentage are thought to survive to adulthood, meaning that mortality as a result of trampling is likely unimportant to Yosemite toad population dynamics. Finally, although there is potential for Yosemite toad individuals to be inadvertently trampled by people on foot, given the few locations where Yosemite toads are known to live near trails (3 out of approximately 15 populations in the parks, according to surveys conducted in 1997, 2001, 2002, 2004, and 2010–2013), trampling of Yosemite toads is expected to be rare. Therefore, while it is possible that individuals could be affected, it is highly unlikely that trampling would have a significant effect on Yosemite toad populations.

Degradation of Habitat – Actions associated with recreational use may have the greatest potential to impact Yosemite toad habitat in the parks. Foot and stock traffic within or adjacent to meadows can compact soil, displace vegetation, and increase erosion, particularly around streambanks. In extreme cases, soil compacted by high use traffic can cause lowered water tables, leading to a change in hydrology and ultimately in habitat for the Yosemite toad.

Human access to Yosemite toad habitat could also create impacts under each of the alternatives, though the severity from foot traffic would likely be less than that produced by stock. Stock can alter meadow habitat by removing vegetation during grazing. Grazing typically occurs in meadows, which is a primary toad habitat. Recreation of other types has overlap potential with all segments of toad habitat (NPS 2013d). Visitors are not confined to trails and could, therefore, access toad habitat in areas where stock would be restricted. Visitors generally camp close to water sources and could affect toad habitat by trampling, especially during repeated trips to water sources. Surveys from 1997 to 2012 have detected Yosemite toads in approximately 42 contiguous meadows in the parks. The populations of Yosemite toads are small and isolated, and therefore, adverse impacts on toad habitat could result in a measurable loss at the population level.

The effects of grazing plus recreation, in general, can be widespread, frequent, and persistent, and can be locally intense across the species range. Alteration of Yosemite toad habitat may result in changes in distribution and reduced abundance, potentially affecting populations. The parks contain relatively few Yosemite toad populations, and substantial adverse effects on even one population would make successful conservation more challenging. For example, one of the three populations near trails appears to currently be the largest Yosemite toad population in the parks. If effects on this population due to habitat degradation are severe, it could make it substantially more challenging to conserve Yosemite toads in the parks. Therefore, the impacts on Yosemite toads across the alternatives are related to the amount of hiker and stock access and grazing that is allowed in Yosemite toad habitat.

IMPACTS OF ALTERNATIVE 1: NO-ACTION / STATUS QUO

Under alternative 1, Yosemite toad populations near trails in the South Fork San Joaquin, Blue Canyon, and Evolution watersheds would continue to be occasionally disturbed during summer, resulting in flight response behavior due to encounters with hikers and stock. While individuals could be temporarily affected, there would be no effect on toad populations.

Encounters between Yosemite toads and hikers and/or stock have the potential to trample individual toads. Although individuals could be injured or die, given the few locations where Yosemite toads live near trails (including South Fork San Joaquin, Evolution, and the upper and lower Blue Canyon area) trampling events are expected to be rare. For example, the Yosemite toad population in the South Fork San Joaquin watershed appears to be stable over the past approximately 15 years, even though there is a trail nearby that brings people and stock in close proximity to toads on an annual basis. The small amount of potential trampling that may affect Yosemite toads under this alternative would be expected to result in no effect on their populations.

Degradation of toad habitat due to trails and/or stock grazing has the potential to adversely affect Yosemite toad habitat. There are few locations where Yosemite toad populations are known to inhabit areas near trails; therefore, the overall potential for degradation under this alternative from foot and stock traffic would be small. Grazing in Yosemite toad habitat would continue in limited locations in Kings Canyon National Park, such as in the upper and lower Blue Canyon area. As stated previously, grazing can alter Yosemite toad habitat and affect individual toads by trampling. Due to the small number and size of Yosemite toad populations in the parks, if the effects on any of the populations due to habitat degradation are severe, it would be substantially more challenging to conserve Yosemite toads in the parks. However, under this alternative, stock use and grazing would continue to be managed to prevent severe habitat degradation; therefore, there may be adverse impacts on individual toads, but the potential for population-wide effects is small.

Cumulative Effects: Other than those ongoing projects and activities associated with the administration of wilderness (i.e., facility and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on Yosemite toad.

The projects that may affect Yosemite toads that are separate from projects proposed by this WSP/FEIS include activities related to Yosemite toad, the aquatics restoration plan, and permitted research projects. Several past and ongoing activities include observation and analysis of data collected. These would not directly impact Yosemite toads, but would provide information for management of the species and related visitor activities. Two additional studies require direct handling of toads to collect genetic information and skin swabs for analysis of the effects of chytrid fungus. This would impact the toads temporarily, but would not create a measurable impact on their populations. The aquatics restoration plan is working to remove nonnative fish from waterbodies within the parks. This project could have short- to long-term adverse impacts on two Yosemite toad populations during removal actions, depending on methods used to remove the fish. Over the long-term, this project will have a beneficial effect on Yosemite toads, as it removes one threat to the species. Permitted research activities throughout wilderness cover a variety of resources, including herpetology (one of the most frequent topics for research in wilderness in the past three years in the parks) and sensitive species. Research projects may temporarily disturb Yosemite toads, depending on methods used to track and to collect data, but overall, the knowledge gained would be beneficial and could be applied to wildlife management plans.

Since alternative 1 proposed no changes to the management of Yosemite toads in wilderness, there would be no significant cumulative impacts associated with the alternative.

Impacts of Alternative 2: Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)

There would be reduced potential for visitors to interact with Yosemite toads and alter toad habitat under alternative 2. Several informal or abandoned trails in the South Fork San Joaquin, Evolution and Blue Canyon areas would be converted to maintained trails, which could reroute the trail further away from toad breeding habitat. In addition, a smaller party-size restriction would be implemented for stock groups in the upper South Fork San Joaquin area. Alternative 2 would impose additional restrictions in Yosemite toad habitat that would reduce the potential for direct impacts to toads and indirect effects due to habitat modification. Grazing would be prohibited in portions of the Blue Canyon area. Stock parties would be limited to day-use in Upper Blue Canyon. Stock travel in day-use only areas (Upper South Fork San Joaquin, Lake 11,106 feet, and Upper Blue Canyon) would be limited to within 100 yards of trails. Stock party size in Upper South Fork San Joaquin would be limited to no more than 12 stock. All stock travel would be prohibited on the unmaintained trail in McGee Canyon. This would reduce the potential for disturbance and trampling of Yosemite toads, which could result in beneficial effects on toads and their habitat in the South Fork San Joaquin, Evolution, and Blue Canyon areas.

There would still be grazing allowed in some meadows within the South Fork San Joaquin and Evolution areas, but new limitations on the amount of grazing allowed would provide greater habitat protection. Yosemite toads would continue to benefit from the limitation which allows grazing only for walking parties with burros and llamas from Evolution Lake to Muir Pass. As stated under alternative 1, the Yosemite toad population in the upper South Fork San Joaquin appears to be stable; stock use and grazing under alternative 2 would be expected to result in a minimal overall adverse effect on Yosemite toad populations at the scale of the parks.

Cumulative Effects: Other than those ongoing projects and activities associated with the administration of wilderness (i.e., facility and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on Yosemite toads. The impacts would be the same as described for alternative 1. This alternative would result in impacts that are slightly less than the no-action alternative (alternative 1). Further restrictions for access by stock, and grazing closures, could result in beneficial effects on Yosemite toads. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

Impacts of Alternative 3: Provide More Opportunities for Primitive Recreation

Under alternative 3, there would be increased opportunities for visitors to interact with Yosemite toads and to recreate in toad habitat. Visitor use levels would be allowed to increase, including in popular areas near toad populations. Several informal or abandoned trails in the South Fork San Joaquin, Evolution and Blue Canyon areas would be converted to maintained trails, which could reroute the trail further away from toad breeding habitat. There would be no additional party-size restrictions implemented for stock groups in the upper South Fork San Joaquin area.

Alternative 3 would allow greater numbers of stock for day and on-trail use, which could lead to a greater chance of trampling and habitat degradation in areas where stock are permitted. However, as with all alternatives, there are a limited number of sites at which Yosemite toads are known to overlap with hiker and/or stock use, so the adverse effects would be expected to be minimal. In addition, the seven-night consecutive limit at any one place proposed under this alternative would reduce the amount of time a group of visitors would be allowed to camp at one location in wilderness. Visitors tend to camp near water sources; allowing longer stays in a single campsite generally results in greater impacts due to the

tendency of people to spread into larger areas and create informal trails. By reducing the consecutive-night stay under alternative 3, potential impacts on Yosemite toad habitat from longer stays would be reduced.

Alternative 3 would impose additional restrictions in Yosemite toad habitat that would reduce the potential for direct impacts to toads and indirect effects due to habitat modification. Grazing would be prohibited in portions of the Blue Canyon area. Stock parties would be limited to day-use in Upper Blue Canyon. Stock travel in day-use only areas (Upper South Fork San Joaquin, Lake 11,106 feet, and Upper Blue Canyon) would be limited to within 100 yards of trails. All stock travel would be prohibited in McGee Canyon. There would still be grazing allowed in some meadows within the South Fork San Joaquin and Evolution areas, but new limitations on the amount of grazing allowed would provide greater habitat protection. Yosemite toads would continue to benefit from the limitation which allows grazing only for walking parties with burros and llamas from Evolution Lake to Muir Pass. As stated under alternative 1, the Yosemite toad population in the upper South Fork San Joaquin appears to be stable; so continuing the current grazing management program would be expected to result in a minimal overall adverse effect on Yosemite toad populations at the scale of the parks.

Cumulative Effects: Other than those ongoing projects and activities associated with the administration of wilderness (i.e., facility and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on Yosemite toads. The impacts from these projects are the same as described for alternative 1. This alternative would result in little change from current conditions. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

Impacts of Alternative 4: Emphasize Undeveloped Quality and Non Commercial Recreation

There would be reduced potential for visitors to interact with Yosemite toads and alter habitat under alternative 4. Several informal or abandoned trails in the South Fork San Joaquin, Evolution and Blue Canyon areas would be converted to maintained trails, which could reroute the trail further away from toad breeding habitat. Alternative 4 would also decrease visitor use slightly, and limit where stock travel is allowed on- and off-trail, decreasing impacts from potential trampling and habitat degradation. Under this alternative, the entire Upper South Fork San Joaquin and Hell-for-Sure Trails (approximately 11.6 miles of trail) would be closed to commercial stock use. No stock would be allowed above Franklin-Montgomery Meadow (approximately 9.7 miles of the trail). Additionally, the entire Blue Canyon Trail would be abandoned and therefore closed to stock access. These actions would reduce the potential for stock to impact toads and toad habitat in these areas.

Alternative 4 would prohibit grazing wilderness-wide, eliminating the potential for future impacts from habitat degradation related to vegetation removal and trampling from stock grazing. Under alternative 4, Yosemite toads would continue to be periodically exposed to the potential for trampling and/or disturbance from hikers and stock as described for the other alternatives. However, these impacts would be less than those under the no-action alternative (alternative 1). In addition, these effects would be minimal and would be expected to have little overall adverse effect on Yosemite toad populations at the scale of the parks.

Cumulative Effects: As described under alternative 1, there are few past, present, or future foreseeable projects that would result in a detectable effect on Yosemite toads. The establishment of additional protective measures for meadows in Yosemite toad habitat would benefit individual toads but is not likely to have an effect on toad populations at the scale of the parks. Considered together, there would be no

meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

Impacts of Alternative 5: Emphasize Opportunities for Solitude

There would be reduced potential for visitors to interact with Yosemite toads and alter toad habitat under alternative 5, primarily from the overall reduction in visitor use levels wilderness wide. Several informal or abandoned trails in the South Fork San Joaquin, Evolution and Blue Canyon areas would be converted to maintained trails, which could reroute the trail further away from toad breeding habitat. Alternative 5 would impose additional restrictions in Yosemite toad habitat that would reduce the potential for direct impacts to toads and indirect effects due to habitat modification. Grazing would be prohibited in portions of the Blue Canyon area. Stock parties would be limited to day-use in Upper Blue Canyon. Stock travel in day-use only areas (Upper South Fork San Joaquin, Lake 11,106 feet, and Upper Blue Canyon) would be limited to within 100 yards of trails. Stock party size in Upper South Fork San Joaquin would be limited to no more than 12 stock. All stock travel would be prohibited in McGee Canyon. There would still be grazing allowed in some meadows within the South Fork San Joaquin and Evolution areas, but new limitations on the amount of grazing allowed would provide greater habitat protection. Yosemite toads would continue to benefit from the limitation which allows grazing only for walking parties with burros and llamas from Evolution Lake to Muir Pass. While grazing activities in toad habitat still could result in adverse effects on individual toads and their habitat, the toad population in the upper South Fork San Joaquin appears to be stable. This alternative would result in impacts that are less than those under the no-action alternative (alternative 1). Adverse effects under this alternative would likely be minimal and would be expected to have little overall adverse effect on Yosemite toad populations at the scale of the parks.

Cumulative Effects: The projects that may affect Yosemite toads that are separate from projects proposed by this WSP/FEIS include Yosemite toad activities, the aquatics restoration plan, and permitted research projects as described under alternative 1. The majority of other past, present, and future foreseeable projects in wilderness have little potential for measurable effects on Yosemite toads. This alternative would result in reduced visitor use in the wilderness, but little change to Yosemite toads or their habitat from current conditions. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

MOUNTAIN YELLOW-LEGGED FROGS

This section evaluates impacts on mountain yellow-legged frogs that may result from implementation of the alternatives. Mountain yellow-legged frogs are a native amphibian species complex within the parks that includes two species: the Sierra Nevada yellow-legged frog (found within the South Fork San Joaquin and Middle Fork Kings River watersheds in the parks) and the northern distinct population segment (DPS) of the mountain yellow legged-frog, which inhabits the South Fork Kings River and Kern River watersheds (Vredenburg et al. 2007) (figure 25 on page 335).

Types of Impacts on Mountain Yellow-legged Frogs: In the context of the alternatives, there are three primary means by which mountain yellow-legged frogs could be adversely affected, all of which are related to recreational activities: disturbance during encounters with hikers and stock, injury or mortality due to trampling by hikers and stock, and degradation of habitat due to trails and/or stock use. The amount of visitor use, its concentration, its timing, and the visitor's mode of travel all influence the potential for adverse impacts on mountain yellow-legged frogs. However, the potential for impacts from visitor use can be reduced or eliminated through the appropriate trail design, education and monitoring efforts, discussed in "Mitigation Common to All Alternatives" section. For this reason, the impacts

associated with the plan alternatives differ only slightly, although alternatives that support higher use levels, particularly stock use, would be expected to have a greater potential for impacts on mountain yellow-legged frogs.

Disturbance – Hiker and stock presence in mountain yellow-legged frog habitat could result in disturbance. Adverse impacts on the frogs would include movement away from the disturbance and/or flight responses (i.e., temporary displacement). Flight responses would be expected to be temporary in nature, and individuals that flee would typically be expected to resume their prior behaviors within a short amount of time. Therefore, this impact is discountable and insignificant.

Injury and Mortality due to Trampling – Recreation activities and administrative activities may threaten all life stages of the frogs through direct disturbance resulting from trampling. Use of stock adds to the effects of trampling, which can cause direct mortality to mountain yellow-legged frogs. The frogs use a variety of aquatic habitats, and are known to lay eggs in shallow areas where humans and stock could step on them. In the parks, mountain yellow-legged frog deaths from trampling have been recorded in a meadow in Sixty Lake Basin (USFS et al. 2014). Although individuals could be injured or perish, given the relatively few locations where mountain yellow-legged frogs inhabit areas near trails (seven out of a few dozen populations in the parks), trampling events on mountain yellow-legged frogs are expected to be rare.

Mountain yellow-legged frogs have behaviors that could both mitigate and contribute to the potential for adverse effects from increased interactions of hikers and/or stock. Behaviors that mitigate exposure include the following. Adult mountain yellow-legged frogs breed in standing water during early summer right after the snowpack melts (Stebbins and McGinnis 2012). The early summer breeding window is when hiker/stock access is naturally limited due to lingering snow cover and wet ground conditions, and thus potential effects from trampling and/or disturbance on egg masses would be minimal. Second, mountain yellow-legged frogs employ a breeding strategy common among amphibians in which large numbers of eggs/tadpoles are produced, of which a small percentage survive to metamorphosis and then to adulthood (Pough et al. 2001). Injury or mortality to tadpoles or recently metamorphosed frogs would therefore be a similar fate as the majority of juvenile animals in the population. Third, adult mountain yellow-legged frogs do not leave the water after breeding since they are highly aquatic throughout the year (Stebbins and McGinnis 2012); however, they often migrate away from breeding waters and forage at separate nearby waters (Lannoo 2005). Frogs on shorelines or in shallow water zones would therefore be at risk of being trampled, but they can escape to protective aspects of deep water if they move quickly.

In contrast, there are frog behaviors that contribute to exposure and potential impacts. First, mountain yellow-legged frogs often congregate in large groups during the day, including tadpoles in warm, shallow water and basking frogs on emergent shoreline vegetation, rocks, and logs (Rachowicz and Vredenburg 2004). Second, after mountain yellow-legged frog eggs hatch during mid-summer, tadpoles remain in the water for 2 to 3 years, until metamorphosis is achieved (Lannoo 2005). The long window of tadpole exposure increases their overall vulnerability to trampling.

The potential for injury or mortality to mountain yellow-legged frog individuals from trampling exists. However, given the relatively small number of mountain yellow-legged frog populations near trails and the behaviors that may mitigate the potential for adverse effects, effects from trampling are unlikely to result in substantial adverse effects at the population level. For example, the mountain yellow-legged frog population in the upper Evolution watershed appears to be stable over the past approximately 15 years, even though there is a high-use trail nearby that brings numerous hikers and stock in close proximity to mountain yellow-legged frogs on an annual basis. Therefore, while it is possible that individual frogs could be affected, it is highly unlikely that trampling would have an adverse effect on frog populations.

Degradation of Habitat – Visitors and stock can affect mountain yellow-legged frog habitat from direct use of their habitat or use of trails adjacent to streams and meadows. Through grazing and trampling, stock can alter habitats by removal of vegetation, soil compaction, erosion, and sloughing of streambanks. Degradation of mountain yellow-legged frog habitat due to trails and/or stock use has the potential to adversely affect mountain yellow-legged frog populations. Trails get used by foot and stock traffic that can compact soil, displace vegetation, and increase erosion. When trails are located in or near meadows, soil compaction can result and this type of habitat alteration has the potential to eventually lower the water table (Kondolf et al. 1996). Four of the seven populations near trails are currently among the largest populations in the parks. If effects on these populations due to habitat degradation are severe, it could make it more challenging to conserve mountain yellow-legged frogs in the parks. When meadows degraded by trails are occupied by mountain yellow-legged frogs, the altered hydrology may result in reductions in distribution and abundance (USFWS 2013). If the loss of water is severe enough, effects originally derived from trails could indirectly result in the loss of mountain yellow-legged frog populations.

Impacts of Alternative 1: No-action / Status Quo

Under alternative 1, mountain yellow-legged frog populations immediately adjacent or close to trails in the upper Funston, Bubbs, South Fork Woods, Dusy, Middle Fork Kings, and Evolution watersheds would continue to be occasionally disturbed during encounters with hikers and stock during the summer months. Adverse impacts would include movement away from the disturbance, and/or flight responses (i.e., temporary displacement). Flight responses would be expected to be temporary in nature, and individuals that flee would typically be expected to resume their prior behaviors within a short amount of time.

As discussed, there could be individual frogs affected from trampling by hikers and stock. Given the relatively small number of mountain yellow-legged frog populations near trails and the behaviors that may mitigate the potential for adverse effects, effects from trampling may affect some individual frogs, but are unlikely to result in adverse effects at the population level.

Degradation of mountain yellow-legged frog habitat due to trails and/or stock use has the potential to adversely affect mountain yellow-legged frogs. Seven populations of mountain yellow-legged frogs are located near trails where the greatest impacts from recreation activities occur; therefore, the potential for overall habitat degradation would be expected to be slight. Given the few locations where mountain yellow-legged frog populations inhabit areas near trails, the overall potential for habitat degradation under this alternative would be expected to be small.

Cumulative Effects: Other than those ongoing projects and activities associated with the administration of wilderness (i.e., facility and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on mountain yellow-legged frog or their habitat.

The projects that may affect mountain yellow-legged frogs that are separate from projects proposed by this WSP/FEIS include the aquatics restoration plan, related studies on frogs, and permitted research projects. The aquatics restoration plan is working to remove nonnative fish from selected high-elevation waterbodies within the parks. This project could have short- to long-term adverse impacts on mountain yellow-legged frogs during removal actions, depending on the methods used to remove the fish. Over the long-term, this project will have a beneficial effect on mountain yellow-legged frogs, as it removes one of the largest threats to the species. Studies on frogs include invasive actions such as marking animals for tracking purposes, removal of individuals for disease studies, and treating individuals with antifungal cleansers and probiotics. These actions are adverse in the short-term, as members of the population could

be removed; however, the research could result in information that could help conservation of the species. Additionally, other frog studies involve reintroduction attempts on NPS and USFS lands. Where the attempts were successful, these actions produced beneficial effects on mountain yellow-legged frogs. Permitted research activities throughout wilderness cover a variety of resources including herpetology, one of the most frequent topics for research in wilderness in the past three years in the parks, and sensitive species. Research projects may temporarily disturb mountain yellow-legged frogs, depending on the methods of tracking and collecting data, but overall, the knowledge gained would be beneficial and could be applied to wildlife management plans.

Since alternative 1 proposed no changes to the management of mountain yellow-legged frogs in wilderness, there would be no significant cumulative impacts associated with the alternative.

Impacts of Alternative 2: Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)

The potential for hikers and stock to interact with mountain yellow-legged frogs would remain similar to those described under alternative 1. Slight beneficial effects on mountain yellow-legged frogs and/or frog habitat could occur under alternative 2 due to the elimination of stock travel or restriction of stock travel to within 100 yards of the trail in 10 areas, as well as the elimination of grazing in 4 areas. In areas that remain open to grazing, implementation of additional controls on grazing could also provide slight benefits. The potential for injury or mortality to mountain yellow-legged frog individuals from trampling exists under alternative 2; however, effects from trampling are unlikely to result in impacts at the population level.

Cumulative Effects: Other than those ongoing projects and activities associated with the administration of wilderness (i.e., facility and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that would have a detectable effect on mountain yellow-legged frogs. The impacts from these projects are described for alternative 1. This alternative would result in impacts that are not substantially different from alternative 1 with some localized beneficial effects in areas closed to stock or grazing. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

Impacts of Alternative 3: Provide More Opportunities for Primitive Recreation

There would be increased potential for hikers and stock to interact with mountain yellow-legged frogs under alternative 3, especially if increased visitor use occurs near frog populations. Alternative 3 would allow greater numbers of stock on-trail use, which could lead to an increased chance of trampling and habitat degradation in areas where stock are permitted. However, there would be a relatively small number of sites at which mountain yellow-legged frogs would overlap with hikers and/or stock. Slight beneficial effects on mountain yellow-legged frogs and/or frog habitat could occur under alternative 3 due to the elimination of stock travel or restriction of stock travel to within 100 yards of the trail in 6 areas, as well as the elimination of grazing in 3 areas. In areas that remain open to grazing, implementation of additional controls on grazing could also provide slight benefits.

Under alternative 3, the consecutive night stay would be limited to 7 days, half of that allowed under alternatives 1 and 2. Visitors tend to camp near water sources, and allowing longer stays in a single campsite generally would result in increased impacts due to the tendency of people to spread into larger areas. By reducing the consecutive night stay under alternative 3, potential impacts on mountain yellow-legged frog habitat that tends to occur with longer stays would be reduced.

Similar to alternative 2, injury or mortality to individuals from trampling would be unlikely to result in adverse effects at the population level under this alternative; however, periodic threats from trampling and/or disturbance from hikers and stock would continue to be possible.

Cumulative Effects: The projects that may affect mountain yellow-legged frogs that are separate from projects proposed by this WSP/FEIS include the aquatics restoration plan, related studies on frogs, and permitted research projects. The majority of other past, present, and future foreseeable projects in wilderness have no potential for measurable effects on mountain yellow-legged frogs. The impacts from these projects are described under alternative 1. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

Impacts of Alternative 4: Emphasize Undeveloped Quality and Non Commercial Recreation

Alternative 4 would be the most protective of resources in that no grazing would be permitted wilderness-wide, reducing potential impacts from habitat degradation related to vegetation removal from stock grazing. Under this alternative, restrictions on off-trail travel by stock would also lead to increased habitat protection. Disturbance from hikers and stock as described for the other alternatives could occur under alternative 4. However, mountain yellow-legged frogs could experience slightly increased beneficial effects from reduced trailhead quotas, further restricted stock use in mountain yellow-legged frog habitat (primarily restrictions regarding commercial stock), and the elimination of stock grazing.

Cumulative Effects: The projects that may affect mountain yellow-legged frogs that are separate from projects proposed by this WSP/FEIS include the aquatics restoration plan, related studies on frogs, and permitted research projects. The majority of other past, present, and future foreseeable projects in wilderness have no potential for measurable effects on mountain yellow-legged frogs. The impacts from these projects are described under alternative 1. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

Impacts of Alternative 5: Emphasize Opportunities for Solitude

Slight beneficial effects on mountain yellow-legged frogs and/or frog habitat could occur under alternative 5 due to the elimination of stock travel or restriction of stock travel to within 100 yards of the trail in 10 areas, as well as the elimination of grazing in 2 areas. In areas that remain open to grazing, implementation of additional controls on grazing could also provide slight benefits. Even with the protective measures in place, mountain yellow-legged frogs would be periodically exposed to trampling impacts and/or disturbance from hikers and stock as described for the other alternatives.

Cumulative Effects: The projects that may affect mountain yellow-legged frogs that are separate from projects proposed by this WSP/FEIS include the aquatics restoration plan, related studies on frogs, and permitted research projects. The majority of other past, present, and future foreseeable projects in wilderness have no potential for measurable effects on mountain yellow-legged frogs. The impacts from these projects are described for alternative 1. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

SIERRA NEVADA BIGHORN SHEEP

This section evaluates impacts on Sierra Nevada bighorn sheep (bighorn sheep) and designated critical habitat that may result from implementation of the WSP/FEIS alternatives. The bighorn sheep is listed as a federal and state endangered species. In Sequoia and Kings Canyon National Parks, bighorn sheep primarily occur along the eastern boundaries within wilderness in alpine and subalpine habitats. There are 93,174 acres of designated critical habitat for the bighorn sheep located within the parks, which represents 22% of the total for this species. The USFWS (2007) divided potential bighorn sheep habitat into 16 herd units in the *Recovery Plan*, 10 of which are located wholly or partially within the parks. Of these 16 herd units, 12 have been identified as essential to recovery of the species because of habitat characteristics that make them the most likely areas where recovery will occur. Eight of the 12 essential herd units are located wholly or partially within the parks: Wheeler Ridge, Taboose Creek, Sawmill Canyon, Mount Baxter, Mount Langley, Mount Williamson, Big Arroyo, and Laurel Creek (figure 26 on page 338). Ten ewes and four rams were reintroduced into the Big Arroyo herd unit in March 2014, which was previously vacant. The Laurel Creek herd unit currently does not contain bighorn sheep but future reintroductions are planned (NPS 2011b).

Types of Impacts on Sierra Nevada Bighorn Sheep: In the context of the alternatives, there are two primary means by which bighorn sheep could be adversely impacted, both of which are related to recreational activities: disturbance during encounters with hikers, backpackers, stock and interactions with stock at foraging sites. The amount of recreational and administrative use, its concentration, its timing, and the mode of travel all influence the potential for adverse impacts on bighorn sheep. However, the potential for impacts from visitor use can be reduced or eliminated through the appropriate design, education and monitoring efforts, discussed in detail in the "Mitigation Common to All Alternatives" section of chapter 2. For this reason, the impacts associated with the plan alternatives differ only slightly, although alternatives that support higher use levels, particularly higher levels of stock use, would be expected to have a slightly greater potential for impacts on bighorn sheep.

Disturbance **–** Adverse impacts on bighorn sheep would include movement away from the disturbance (i.e., temporary displacement) and likely stress–related responses such as elevated heart rates (MacArthur et al. 1979, MacArthur et al. 1982) or increased vigilance, resulting in reduced foraging efficiency (Pelletier 2006). Stress had been documented to cause compromised immune systems in some bighorn populations (Spraker et al. 1984), but it is unlikely that stress-related disease would occur in bighorn sheep because it has not been documented previously during routine disease testing of radio-collared animals [Sierra Nevada Bighorn Sheep Recovery Program (2004)].

There are two lines of evidence that suggest adverse impacts of increased bighorn sheep / human interactions would continue to remain below the level of biological significance. First, bighorn sheep have habituated to human activity in many places (Stanger et al. 1986, Papouchis et al. 2001, Jansen et al. 2007), including within the parks. Two studies from the 1970s that took place at Mount Baxter (when visitor-use levels were approximately double what they are today) indicate that bighorn sheep activity patterns were influenced by frequent encounters with visitors but no permanent displacement occurred (Wehausen et al. 1977), and that bighorn sheep became conditioned to hikers and continued to return to their habitat despite repeated encounters with visitors (Hicks and Elder 1979). There is no evidence that the situation at Mount Baxter has changed since the 1970s, and it appears to exist in other herds. For example, bighorn sheep in the Mount Langley herd tolerate people at close distances in the Upper Soldier Lake area. It appears likely that, as long as disturbance is predictable and non-threatening, bighorn sheep can adapt to human activity (Papouchis et al. 2001).

Second, Hicks and Elder (1979) found that because people preferred to camp near water and trails and bighorn sheep preferred to inhabit areas where these features do not exist, there was limited opportunity

for human/bighorn sheep interactions around Mount Baxter. Presumably, this situation continues to exist throughout bighorn sheep habitat in the parks and as long as it does, increased human activity is likely to have little impact on bighorn sheep because there will still remain substantial spatial segregation.

Stock Interaction – There appear to be few adverse impacts on bighorn due to stock interactions and this would be expected to continue. Disease transmission between stock and bighorn sheep would be unlikely because experimental studies indicate that llamas and horses (these two species, along with burros and mules, are the only animals allowed for use as stock in the parks) can be safely co-pastured with bighorn sheep without incident (Foreyt and Lagerquist 1996). There are a variety of other potential impacts that include bighorn sheep avoidance of important habitat (i.e., meadows) in which stock occur (Ostermann et al. 2008); increased vigilance and reduced foraging efficiency in the presence of stock (Brown et al. 2010); stock trampling of meadow vegetation important to bighorn sheep (Cole and Spildie 1998); and, competition between stock and bighorn sheep for forage (Krausman et al. 1999). If such adverse impacts occur, based on the indicators described below, there is no evidence to suggest that they would occur at a level of biological significance.

In 2007, the *Recovery Plan for the Sierra Nevada Bighorn Sheep* stated "there is no evidence that commercial, recreational, scientific, or educational activities currently are significant threats" and "…at present there appear to be few locations where recreational disturbance has the potential to significantly affect bighorn sheep" (USFWS 2007). In addition, the following indicators are inconsistent with hypotheses regarding substantial adverse impacts from disturbance or interactions with stock at foraging sites.

Since 1999 there has been substantial population growth in the four herds using the parks that are annually monitored (Wheeler Ridge, Sawmill, Mount Baxter, and Mount Langley) (Stephenson et al. 2012). In recent years, growth has slowed or even declined in these herds, apparently due to emigration to vacant habitats or density-dependent mechanisms (i.e., herds may be approaching carrying capacity) (Stephenson et al. 2012). However, these are natural phenomenon and not likely related to the parks' management.

Body condition data for the Wheeler Ridge and Mount Langley herds (the only herds for which data are available) suggest that adult ewes are not nutritionally limited (Stephenson et al. 2012).

There is no evidence that bighorn sheep have abandoned suitable habitat. To the contrary, within the last decade, natural range expansions have occurred into previously unoccupied areas. The Bubbs Creek herd was founded (likely from individuals dispersing from Mount Baxter herd), the Taboose Creek herd unit has been explored by an unknown number of individual ewes from the Sawmill Canyon herd, and the Convict Creek herd unit has recently been colonized by both ewes and rams, likely from the Wheeler Ridge herd (Stephenson et al. 2012).

Disease prevalence in the parks is quite low in bighorn sheep, especially compared to populations elsewhere (Sierra Nevada Bighorn Sheep Recovery Program 2004).

Evidence from recent ongoing research examining bighorn-stock interactions indicates that (1) there is little overlap in space use of meadows used by bighorn sheep and stock (i.e., most meadows open to stock grazing are not within bighorn sheep habitat) and (2) vegetation structure and species composition in meadows does not vary between meadows used by stock only, bighorn sheep only, both species, or neither species in a direction that suggests a significant negative impact to bighorn habitat from stock grazing (Klinger et al. 2015).

Impacts of Alternative 1: No-action / Status Quo

Under alternative 1, bighorn sheep in the Wheeler Ridge, Sawmill, Mount Baxter, and Mount Langley herds would continue to be occasionally disturbed during encounters with hikers and stock during the summer months, which is when the bighorn sheep generally occupy the parks (the Bubbs Creek herd inhabits the parks year-round and the newly created Big Arroyo herd is anticipated to as well). There appears to be few adverse impacts on bighorn sheep from hikers and stock use (as described above) under current conditions; therefore, these disturbances would be of no biological importance.

Cumulative Effects: Other than those ongoing projects and activities associated with the administration of wilderness (i.e., facility and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on bighorn sheep.

Past, present, and reasonably foreseeable actions occurring within the parks and the surrounding area that would be expected to contribute to cumulative impacts on bighorn sheep include recovery and reintroduction activities. These activities are conducted by the California Department of Fish and Wildlife, both within the parks and adjacent to them, and have been ongoing since 1999 when the species was first listed under the ESA. Activities include capturing and monitoring sheep, reintroductions to formerly occupied habitats, translocations between herd units, and predator management. These activities would have short-term adverse effects and long-term beneficial effects on Sierra Nevada bighorn sheep. Since alternative 1 proposed no changes to the management of bighorn sheep in wilderness, there would be no significant cumulative impacts associated with the alternative.

Impacts of Alternative 2: Protect Wilderness Character by Implementing Site-specific Actions (NPS Preferred Alternative)

There could be an increased frequency of bighorn sheep / human encounters under alternative 2 if new Class 1 trails are established in bighorn sheep habitat. However, new Class 1 trails, such as one proposed to replace the numerous informal trails on Mount Langley, could actually concentrate use which would benefit bighorn sheep by making human activity more predictable. Also, as the informal trails are restored, habitat would be restored in this area, resulting in beneficial effects on bighorn habitat.

Interactions could decrease if visitor use levels are reduced in the most popular areas (e.g., Mount Whitney Management Area). Smaller stock- party sizes could decrease the severity of bighorn sheep stress-related responses during interactions. Bighorn sheep could benefit (from the perspective of forage competition with stock) from prohibiting stock in portions of the Rae Lakes and Dusy Basin watersheds, and with additional meadows closed to stock grazing under this alternative. These beneficial effects are anticipated to be minimal.

There could be disturbance impacts on bighorn sheep during the relocation of the Bench Lake tent platform, but these would be localized and temporary. Site selection would consider bighorn habitat and use patterns to limit the modification of habitat and reduce long-term effects associated with disturbance.

Cumulative Effects: Other than those ongoing projects and activities associated with the administration of wilderness (i.e., facility and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on bighorn sheep. The projects that may affect bighorn sheep that are separate from projects proposed by this WSP/FEIS include research and recovery actions previously described under alternative 1.

The cumulative effects would be similar to those described under alternative 1. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

Impacts of Alternative 3: Provide More Opportunities for Primitive Recreation

Under alternative 3, visitor use levels could increase on trails that intersect bighorn sheep habitat and new Class 1 trails could be established in bighorn sheep habitat; these actions could result in an increase in bighorn sheep / human encounters. However, establishing Class 1 trails could also result in beneficial effects on bighorn sheep as described under alternative 2. Alternative 3 would allow for a greater number of stock per party, potentially increasing stress-related responses in bighorn sheep. It is unclear how higher contact rates would impact bighorn relative to current conditions because while there is certainly a threshold level at which disturbance becomes adverse at a biologically significant level (e.g., reproduction or survival declines due to reduced foraging efficiency), tolerance levels and dependable criteria have not been established (Krausman et al. 1999). For the reasons described above under "Types of Impacts on Sierra Nevada Bighorn Sheep," it is probable that the impacts related to increased bighorn-human interactions would continue to remain below the level of biological significance.

The restriction on grazing in off-trail areas would benefit newly reintroduced bighorn sheep in portions of the Big Arroyo herd unit, and in portions of the Laurel Creek herd unit, if bighorn sheep are eventually reintroduced there. Bighorn sheep could also benefit (from the perspective of forage competition with stock) from the disallowance of stock in portions of the Rae Lakes watershed, and with additional meadows closed to stock grazing under this alternative. These beneficial effects are anticipated to be minimal.

There could be short-term impacts on bighorn sheep during relocation of the Charlotte Lake Ranger Station and from project work related to the removal of the Little Five Lakes Ranger Station. Bighorn could be temporarily disturbed by the sights and sounds of project activity, especially if helicopter operations are required.

Cumulative Effects: The projects that may affect bighorn sheep that are separate from projects proposed by this WSP/FEIS include research and recovery actions previously described under alternative 1. The cumulative effects would be similar to those described under alternative 1. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

Impacts of Alternative 4: Emphasize Undeveloped Quality and Non-commercial Recreation

Under alternative 4, there would be beneficial effects on bighorn sheep because visitor use levels would be reduced, stock would be allowed to travel on fewer trails, and party size would be reduced. Stock would be restricted in portions of the Rae Lakes and Dusy Basin watersheds. Off-trail stock use would be slightly reduced from current use from the disallowance of off-trail commercial stock travel. Thus, there would be reduced levels of disturbance, and reduced competition for forage. Overall the effects would be beneficial and long-term; however, the beneficial effects are anticipated to be minimal. For the reasons described previously under "Types of Impacts on Sierra Nevada Bighorn Sheep," it is probable that beneficial effects would remain below the level of biological significance.

There could be adverse impacts on bighorn sheep during removal of the Charlotte Lake Ranger Station and Bench Lake tent platform. Bighorn sheep could be temporarily disturbed by the sights and sounds of project activity, especially if helicopter operations are required. Impacts would occur from work done at

Little Five Lakes Ranger Station within the Big Arroyo herd unit, but it is unlikely that these two activities would be scheduled together.

Cumulative Effects: The projects that may affect bighorn sheep that are separate from projects proposed by this WSP/FEIS include research and recovery actions previously described under alternative 1. The cumulative effects would be similar to those described under alternative 1. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under alternative 4 that would constitute a significant cumulative effect.

Impacts of Alternative 5: Emphasize Opportunities for Solitude

Under alternative 5, there would be decreased use overall. Visitor use levels would be reduced. On-trail stock use would be similar to alternatives 2 and 3; however, stock would not be allowed off-trail except to access overnight camp areas. The reduction in visitor use and the closures of areas to stock would reduce the potential for interactions between humans/stock and bighorn sheep. Under this alternative, bighorn sheep would benefit from reduced forage competition with stock from the closures. The restriction on grazing in off-trail areas would benefit newly reintroduced bighorn sheep in the Big Arroyo herd unit, and in the Laurel Creek herd unit, if bighorn sheep are eventually reintroduced there. These beneficial effects are anticipated to be minimal.

There could be impacts on bighorn sheep during removal of the Bench Lake tent platform and the removal of the Little Five Lakes Ranger Station. Bighorn sheep could be temporarily disturbed by the sights and sounds of project activity, especially if helicopter operations are required.

Cumulative Effects: The projects that may affect bighorn sheep that are separate from projects proposed by this WSP/FEIS include research and recovery actions previously described under alternative 1. The cumulative effects would be similar to those described under alternative 1. Considered together, there would be no meaningful additive or interactive effects among these projects and the proposed actions under alternative 5 that would constitute a significant cumulative effect.

CONCLUSIONS

Yosemite toad: Under alternatives 1, 2, 3, and 5, individual Yosemite toads would continue to be at risk from trampling by visitors and stock. Recreation activities and grazing would continue to cause a slight degradation of Yosemite toad habitat. Current management techniques successfully minimize these impacts. The action alternatives limit stock access in some areas that contain Yosemite toad habitat, lowering the chance of trampling and habitat degradation. Impacts of alternatives 2, 3, and 5 would be similar; alternative 4 would result in the lowest risk to Yosemite toad because all meadows would be closed to grazing. The action alternatives would incorporate mitigation measures designed to minimize impacts.

Frequent impacts on Yosemite toad are not expected under any of the alternatives; however, Yosemite toad populations are generally small and isolated, and thus injury, direct death, or stranding of individual animals has the potential to result in a slight change in the overall population. Because of the potential for mortality, the alternatives would result in a USFWS determination of *may affect, likely to adversely affect* for the Yosemite toad. When considering the intensity of impacts with respect to the laws and policies designed to protect special-status species, impacts on Yosemite toad from the alternatives are not expected to be significant, and thus are not likely to result in jeopardy for the species.

Mountain yellow-legged frogs: Under alternative 1, mountain yellow-legged frogs would continue to be at risk from disturbance, trampling, and habitat degradation. All of the action alternatives reduce this risk

by restricting stock access and grazing, and reducing the potential for impact from disturbance, trampling, and habitat degradation. Alternative 3 would allow larger party size, potentially increasing the potential for human-frog interactions, while alternative 4 has the most restrictions that reduce impacts on mountain yellow-legged frogs, resulting in the fewest impacts on the mountain yellow-legged frogs. Based on the USFWS determination of impact, all alternatives would result in a *may affect, likely to adversely affect* determination for mountain yellow-legged frogs. While the potential for mortality by trampling exists, the probability is very low and mortality would be highly unlikely to result in population-level risks. This low risk combined with the mitigation measures would make mortality unlikely. In the context of laws and policies that protect special-status species, the impacts of the alternatives would not be significantly adverse or beneficial, and they would not result in population-level impacts, and thus would be highly unlikely to result in jeopardy for the two species.

Sierra Nevada bighorn sheep: Bighorn sheep would continue to be disturbed during hiker and stock interactions but there would be no measurable difference in impacts associated with disturbance across the alternatives. There are few adverse effects on bighorn sheep due to stock interactions at foraging areas; this would be expected to continue across alternatives. All alternatives limit stock access and grazing, with alternative 5 being the most protective of bighorn sheep habitat because of restrictions in off-trail travel by stock. Overall the effects would be beneficial and long term, but for the reason described above under "Types of Impacts on Sierra Nevada Bighorn Sheep," it is probable that beneficial impacts would remain below the level of biological significance. Based on the information gathered about the effects of hiker and stock use on bighorn sheep, and the actions proposed under the alternatives which may temporarily disturb bighorn sheep, the implementation of the WSP/FEIS would result in a USFWS determination of *may affect, but not likely to adversely affect* for bighorn sheep and could result in a slight modification of critical habitat. In the context of laws and policies that protect special-status species, the impacts of the alternatives would not be significantly adverse or beneficial, and they would not result in population-level impacts, and thus would not result in jeopardy for the Sierra Nevada bighorn sheep.

CULTURAL RESOURCES

METHODOLOGY FOR ANALYZING IMPACTS

The following discussion includes analyses of potential impacts from the alternatives in the WSP/FEIS to the four types of cultural resources in Sequoia and Kings Canyon National Parks: archeological resources, historic structures, cultural landscapes, and ethnographic resources. These physical components of the parks' cultural resources were described separately in chapter 3; however, they are reiterated together here because the distinctions between these four types are not always clear. For example, historic structures and the natural landscape features within which they sit all contribute to those areas defined as cultural landscapes. In addition, the full extent of the archeological and ethnographic resources, many of which also contribute to the cultural landscape, may not be known. Cultural resources in many areas of the parks are composed of all of these types, which may also contribute to those areas defined as cultural landscapes. In addition, many management actions proposed in the alternatives affect a combination of two and sometimes all of these resources. Therefore, the effects of each alternative on all types of cultural resources are discussed below. Information used in this assessment was obtained from available relevant literature and documentation, maps, and consultation with cultural-resource experts, as well as from interdisciplinary team meetings, field trips, and site visits.

Section 106 of NHPA requires that federal agencies take into account the effect of any proposed undertakings on properties that are listed, or eligible for listing, in the National Register. The process begins with identification and evaluation of cultural resources for national-register eligibility, followed by an assessment of effects on eligible resources. This process includes consultation with the California State Historic Preservation Office (CA SHPO) and affiliated American Indian Tribes. If an action could change

in any way the characteristics that qualify the resource for inclusion in the National Register, it is considered to have an effect. *No adverse effect* means there could be an effect, but the effect would not be harmful to the characteristics that qualify the resource for inclusion in the National Register. *Adverse effect* means the action could diminish the integrity of the characteristics that qualify the resource for the National Register.

Section 110 of the NHPA requires that federal land managers establish programs in consultation with the respective SHPO to identify, evaluate, and nominate properties to the National Register. This act applies to all federal undertakings or projects requiring federal funds or permits.

The method for assessing effects on cultural resources complies with the requirements of both NEPA and section 106 of NHPA, and with implementing regulations 40 CFR 1500 and 36 CFR 800). The analysis also takes into account that there are differences between NEPA and NHPA. Therefore, the assessment of effects discusses the following characteristics of effects to ensure NEPA compliance:

- Type (beneficial or adverse)
- Duration (short-term, long-term)
- Context of the effect (localized, parks-wide, regional)
- Cumulative nature of the effect

To ensure compliance with section 106 of NHPA, the following considerations were incorporated into the analysis of impacts:

- Determination of the Area of Potential Effect, or APE (800.4[a])
- Identification of historic properties in the APE that are listed or eligible for listing on the National Register (NRHP 800.4[b]-[c])
- Application of the criteria of adverse effect on affected historic properties in the APE (800.5[a][1])

All proposed actions in the plan would be performed in accordance with *NPS-28 Cultural Resource Management Guideline 1998*. Consultation with interested parties would occur in accordance with the 2008 document *Nationwide Programmatic Agreement Among the National Park Service (U.S. Department of the Interior) Nationwide the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers for Compliance with Section 106 of the National Historic Preservation Act*, or as otherwise agreed to in consultation with the CA SHPO. Measures to mitigate any adverse effects of proposed actions would be implemented in consultation with the CA SHPO and would be documented in a memorandum of agreement or the NEPA decision document for this plan. If the NPS, CA SHPO, affected American Indian Tribes and groups (if appropriate), and the Advisory Council on Historic Preservation (ACHP) could not agree on measures to avoid or minimize adverse effects and were unable to negotiate and execute an alternate memorandum of agreement in accordance with 36 CFR 800.6(b), the effect would remain adverse. A summary of effects under NHPA section 106 is included in the impacts analysis of each alternative.

The cultural resources impact analysis is wholly focused on the manner in which the various WSP alternatives would affect archeological resources, historic structures, cultural landscapes, and to the extent possible, ethnographic resources.

Archeological Resources: Archeological resources are the remains of past human activity and the records documenting the analysis of such remains (*NPS-28: Cultural Resource Management Guideline 1998*).

Potential impacts on archeological resources are assessed based on the amount of disturbance to an archeological resource and the degree to which the integrity remains or is otherwise lost without recordation of the remains. When appropriate, potential impacts on archeological resources are to be assessed per appendix C of NPS-28: *Cultural Resource Management Guideline 1998; Secretary of the Interior's Standards for Archeological Documentation* (NPS 1998b).

Historic Structures: An historic structure is "a constructed work … consciously created to serve some human activity" (*NPS-28 Cultural Resource Management Guideline 1998*). Of the structures in wilderness, 22 are currently on the List of Classified Structures, and 17 are listed on the National Register. Of these, only three structures listed or eligible for listing in the National Register would potentially be affected by the alternatives: the Pear Lake Ski Hut, Redwood Meadow Ranger Station, and the Tyndall Ranger Station, thus the effects on these structures will be further evaluated in this section. Stock-related structures (e.g., drift fences and gates) could also be historic although they have not been evaluated.

One of the historic cabins, photographed in the early 1990s, left behind by the trapper Shorty Lovelace

Adverse effects on historic properties occur when irreparable alterations of features or patterns, including demolition, diminish the overall integrity of the resource so that it no longer qualifies for the National Register. Adverse effects on built-environment historic properties (aboveground buildings and structures) under NHPA section 106 can be addressed with a good-faith effort to consider whether and how to avoid, minimize, or mitigate the effect. This may involve modifying the undertaking, imposing certain

mitigation conditions, or other measures negotiated in consultation with the CA SHPO, the ACHP, culturally associated American Indian Tribes and groups, and the public.

This approach is derived from both the Secretary of the Interior's Standards for the Treatment of Historic Properties as well as the regulations of the ACHP implementing the provisions of section 106 of the National Historic Preservation Act.

Cultural Landscapes: According to the *NPS-28 Cultural Resource Management Guideline 1998*, cultural landscapes are "…complex resources that range from large rural tracts covering several thousand acres to formal gardens of less than an acre. Natural features such as landforms, soils, and vegetation are not only part of the cultural landscape; they provide the framework within which it evolves…."

Potential impacts on cultural landscapes, topography, landforms, and vegetation are evaluated in terms of past, present, and future change resulting from implementation of the alternatives. The cultural-landscapes evaluation addresses anticipated changes to land use, vegetation patterns, circulation systems, locations of structures, topographic features and relief, site elevation, slope orientation, rock exposure, and modification of soil types. Of the seven cultural landscapes described in chapter 3 of this document, six would continue to be protected under all alternatives: the Kern Canyon Ranger Station / Lewis Camp Area, the Barton Lackey Complex, Colony Mill Road, the John Muir Trail, the HST and the "Early Trail System" of Sequoia and Kings Canyon National Parks. Therefore, there would be no impacts on these identified cultural resources.

Adverse effects on cultural landscapes occur when irreparable alterations of features or patterns, including demolition of contributing structures, diminish the overall integrity of the landscape so that it no longer qualifies for the National Register. As stated previously, adverse effects on historic properties under NHPA section 106 can be addressed with a good-faith effort to consider whether and how to avoid, minimize, or mitigate the effect. This may involve modifying the undertaking, imposing certain mitigation conditions, or other measures negotiated in consultation with the CA SHPO, the ACHP, culturally associated American Indian Tribes and groups, and the public.

This approach is derived from both the *Secretary of the Interior's Standards for the Treatment of Historic Properties* as well as the regulations of the ACHP implementing the provisions of section 106 of the NHPA.

Ethnographic Resources: Ethnographic resources are expressions of human culture and the basis of continuity of cultural systems (*NPS-28 Cultural Resource Management Guideline* 1998). Ethnographic resources can include sites, structures, objects, traditional landscapes, or a natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a traditionally associated group. An ethnographic overview and assessment is lacking at Sequoia and Kings Canyon National Parks; therefore, information collected as part of the Multipark Ethnographic Overview for Sequoia and Kings Canyon National Parks, Yosemite National Park, and Devils Postpile National Monument, underway in 2014, will be considered as the planning process continues. This information will enhance formal consultation with American Indian Tribes and organizations and will better inform management priorities and resource decisions.

TYPES OF IMPACTS ON CULTURAL RESOURCES

Visitors can intentionally or inadvertently affect cultural resources by trampling, vandalizing, or removing them. Park staff can also unintentionally affect cultural resources by trampling resources, as can stock. The intentional removal of historic structures would have a direct and long-term adverse impact on the structure and potentially alter the cultural landscape. Installing equipment or new structures or re-

routing/upgrading trails would require surveys so that resources can be avoided or impacts can be minimized. These types of actions are considered in the assessment of impacts on cultural resources.

IMPACTS COMMON TO ALL ALTERNATIVES

Archeological resources, historic structures, cultural landscapes, and known ethnographic resources would be managed in accordance with the NHPA and other laws, regulations, and directives that direct the NPS to protect cultural resources and make reasonable efforts to minimize any damage that may occur to the resources. This would result in long-term beneficial effects on cultural resources throughout the parks' wilderness.

The parks would continue the practice of research, survey, and consultation to determine the location, integrity, and national-register eligibility of historic structures, cultural landscapes, and archeological and ethnographic sites. Newly located national-register-eligible resources would be managed to protect their integrity and minimize damage. Overall, this would result in a beneficial long-term impact on cultural resources.

Trailhead and stock-use quotas are considered in all alternatives. Regardless of whether the alternative proposes an increase or reduction in trail use, the impacts on archeological resources would be negligible because the trails are located in previously disturbed areas. There would be minimal-to-no impact on historic structures, cultural landscapes, or ethnographic resources from changes in trail quotas.

Under all alternatives, trails would be classified and maintained to Class 1, 2, or 3 standards, as described by the U.S. Forest Service's *Trail Classification System.*

> Establishing a trail management and classification system in itself would not have any impacts on cultural resources, but upgrading or downgrading trails among the classes would potentially affect cultural resources. Upgrading and constructing new trails would likely require excavation, which could expose undiscovered archeological resources. Impacts would be minimized due to the fact that the trails would be surveyed for resources before construction begins and cultural resources would be avoided to the greatest extent possible. Any adverse impacts on newly located resources would be mitigated in consultation with the CA SHPO. Overall, the impacts on archeological resources from trail construction would be permanent, localized, and adverse.

Maintenance of trails would be based upon the class of trail and level of use. Regular trail maintenance, including removal of hazard trees, downed wood, and rocks; erosion control; trail reconstruction; and clearing of brush would occur under all alternatives. These actions would have no adverse impacts on cultural resources. The trails are in previously disturbed areas so it is unlikely that maintenance operations would disturb archeological resources. The process of assessing the eligibility of trails for listing on the National Register has yet to be comprehensively addressed. However, the majority of trails are proposed to be formally assessed as cultural landscapes. Regular maintenance would result in beneficial effects on the integrity of the trails because they would be reasonably protected from degradation.

Trail maintenance also involves the repair and reconstruction of trail structures, such as bridges, and minor realignments. As previously mentioned above, few of the trails in wilderness have been formally evaluated for national register eligibility; however, the parks consider several trails potentially significant, both nationally and locally. Any realignments or structure reconstruction on trails would have the potential to result in adverse impacts on historic structures and features, but any work with the potential to affect the resources would be conducted so as to minimize impacts. Any adverse impacts on historic structures and features from trail maintenance would be localized, and long-term.

Cultural resources at the parks would be impacted by some general actions. Hiking, stock use, grazing, and camping activities (on- and off-trail), whether for recreational or administrative purposes, have the potential to inadvertently affect cultural resources. Moreover, resources in remote areas are subject to vandalism and degradation. These activities result in adverse impacts and would continue under all alternatives. Overall, the intensity of the impacts would be long-term and park-wide.

Any changes to frontcountry facilities would require separate design and compliance. Any adverse impacts on located cultural resources would be mitigated in consultation with the CA SHPO. Resulting adverse impacts on historic structures, cultural landscapes, archeological and ethnographic resources from construction would be localized and long-term.

IMPACTS OF ALTERNATIVE 1: NO-ACTION / STATUS QUO

The discussion that follows provides an analysis of impacts on cultural resources as a result of alternative 1. The analysis details specific impacts that are not described in the common-to-all section, and the detailed discussion is provided by element.

Wilderness, in the no-action alternative, would be managed under the guidelines of the parks' GMP, BMP, and SUMMP. The use of established areas and infrastructure, such as trails, designated campsites, food-storage boxes, privies, administrative structures, camps, and pastures would continue as appropriate. Cultural resources in wilderness would continue to be protected, monitored, and maintained to ensure their stability and integrity. These actions would continue to provide a parks-wide, long-term, beneficial effect on cultural resources. Impacts on archeological sites, historic structures, cultural landscapes, and known ethnographic resources would continue to be assessed prior to development, and any adverse impacts would be avoided or minimized in consultation with the CA SHPO. Any adverse impacts would be long-term, and localized or park-wide.

Cumulative Effects: Other than those ongoing projects and activities associated with the administration of wilderness (i.e., trail maintenance and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on cultural resources.

Past, present, and future projects that involve the installation of equipment or structures, or result in ground disturbance in wilderness, have the potential to inadvertently impact archeological and/or ethnographic resources. Resources management and science projects may include research activities, rehabilitation projects, and invasive-species management. All projects that involve ground disturbance, such as the Natural Resources Conservation Service soils mapping project, the Halstead Meadow Restoration (ongoing), and the Cahoon Meadow restoration project (future), require site-specific identification of cultural resources and consultation with the CA SHPO to minimize adverse impacts.

One plan in particular has the potential to inadvertently impact cultural resources, the Sequoia and Kings Canyon National Parks Fire and Fuels Management Plan (2003). Under this plan, some fires are suppressed and others (natural fires) are allowed to burn. Fire suppression can have a localized, adverse impact on cultural resources due to inadequate time to conduct surveys and to identify and plan for avoiding resources. Allowing fire to burn could result in localized, adverse impacts on archeological and ethnographic resources, structures, and cultural landscapes. For all cultural resource types these effects would be long-term; however, the natural environment component of a cultural landscape would recover with time.

On a regional scale, it is important to consider the effects of past, present, and future foreseeable actions that may affect cultural resources in adjacent USFS lands, and in Yosemite National Park. One element that may affect resources on a regional scale is the potential removal or reduction of High Sierra Camps at

Yosemite National Park. As Yosemite National Park develops their wilderness stewardship plan, there may be alternatives that consider changes in the management of the five High Sierra Camps, or the reduction in the size, or the removal of these camps. Under the no-action alternative, the High Sierra Camp at Bearpaw Meadow would remain and continue to be operated. Considered together there would be no meaningful additive or interactive effects among these projects and the continued actions under this alternative that would constitute a significant cumulative effect.

Section 106 Summary: Assessments for proposed projects would occur on a site-specific and case-by-case basis prior to implementation. Much of the work conducted in wilderness is accomplished under the Nationwide Programmatic Agreement (NPS 2008b). Additional consultations with the CA SHPO will take place on a case-by-case basis for those projects that fall outside the scope of the Nationwide Programmatic Agreement. The NPS would alter projects and work with the CA SHPO to avoid adverse impacts to cultural resources whenever possible. In accordance with the regulations of the ACHP (36 CFR 800.5) that address the criteria of effect and adverse effect, the determination of effects under this alternative would result in *no adverse effect.*

IMPACTS OF ALTERNATIVE 2: PROTECT WILDERNESS CHARACTER BY IMPLEMENTING SITE-SPECIFIC ACTIONS (NPS PREFERRED ALTERNATIVE)

The discussion that follows provides an analysis of impacts on cultural resources as a result of alternative 2. The analysis describes specific impacts associated with this alternative that are not included in the "Impacts Common to All Alternatives" section.

There could be new construction associated with this alternative; trails could be constructed or upgraded. New campsites or camp areas could be established. Stock camps could be designated in selected areas. Privies could be constructed at popular areas. These actions could impact cultural resources, especially archeological and ethnographic resources. Any construction, however, would require a cultural resources survey and if National Register-eligible resources are identified, the construction would be sited to avoid the resources. Therefore, any impacts on National Register-eligible cultural resources would be avoided.

Some privies and food-storage boxes could be removed. There would be no impacts on archeological resources from these actions because the boxes and privies are in previously disturbed areas. None of the structures considered for removal are eligible for the National Register. Therefore, there would be no impact on historic structures. The removal of any contributing element to a cultural landscape would require consultation with the CA SHPO and adverse impacts would be avoided.

The Mission 66-era ranger station at Bearpaw Meadow would be removed. A new station would be reconstructed to better meet the area's historic character. The ranger station may be a contributing element to the National Register-eligible cultural landscape, therefore its removal may result in a long-term adverse impact on the cultural landscape. The adverse effect may be mitigated through documentation strategies and other measures developed in consultation with the CA SHPO and the ACHP.

The historic ranger stations and patrol cabins at Redwood Meadow, Simpson Meadow, and Tyndall would be retained under this alternative. The Pear Lake Ski Hut would continue to be operated in the winter. This alternative continues current types and levels of use and would, therefore, result in no impact on these historic structures.

Cumulative Effects: Other than those ongoing projects and activities associated with the administration of wilderness (i.e., trail maintenance and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on cultural resources. As stated

previously, research and resource management projects may affect cultural resources. There are two meadow restoration projects that include ground disturbance, along with the soils mapping project. In addition, the fire management program may affect cultural resources. This alternative would result in impacts that are not substantially different from the status quo (alternative 1) with some widespread beneficial effects on cultural resources from increased knowledge, which allows for increased protection. There would be a localized adverse effect on the cultural landscape at the Bearpaw Meadow High Sierra Camp. Considered together there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

Section 106 Summary: Assessments for proposed projects would occur on a site-specific and case-by-case basis prior to implementation. Much of the work conducted in wilderness is accomplished under the Nationwide Programmatic Agreement (2008). Additional consultations with the CA SHPO will take place on a case-by-case basis for those projects that fall outside the scope of the Nationwide Programmatic Agreement. The NPS would alter projects and work with the CA SHPO to avoid adverse impacts to cultural resources whenever possible.

In accordance with the regulations of the ACHP (36 CFR 800.5) that address the criteria of effect and adverse effect, the determination of effects under the proposed action may result in adverse effect on the Bearpaw Meadow High Sierra Camp cultural landscape, depending on the outcome of the Section 110 effort that has been initiated for the Bearpaw Meadow High Sierra Camp (submitted in January 2015).

IMPACTS OF ALTERNATIVE 3: PROVIDE MORE OPPORTUNITIES FOR PRIMITIVE RECREATION

The discussion that follows provides an analysis of impacts on cultural resources as a result of alternative 3. The analysis describes specific impacts associated with this alternative that are not included in the "Impacts Common to All Alternatives" section.

There would be new construction associated with this alternative. Some existing food-storage boxes would be relocated to protect resources and additional boxes may be added in popular areas. Existing privies would be retained and additional privies could be constructed in popular areas. New campsites could be established. These actions could impact cultural resources, especially archeological resources or cultural landscapes. Any construction, however, would require a cultural resources survey and if National Register-eligible resources are identified, the construction would be sited to avoid the resources or so as to be sensitive to an existing cultural landscape. Therefore, any impacts on National Register-eligible cultural resources would be avoided.

The alternative proposes a range of management prescriptions for Bearpaw Meadow High Sierra Camp. The Mission 66-era ranger station at Bearpaw Meadow would be removed; a new station would be constructed outside the historic district. However, since the ranger station may be determined to be a contributing element to the National Register-eligible cultural landscape, its removal may result in an adverse impact on the cultural landscape. The adverse effect may be mitigated through documentation strategies and other measures developed in consultation with the CA SHPO and the ACHP. The Bearpaw Meadow High Sierra Camp would be retained and the expansion of facilities would be considered. The expansion has the potential to adversely impact the cultural landscape. Any changes to the camp would be planned in consultation with the CA SHPO, and the level of impact could be somewhat mitigated through documentation strategies developed in consultation. Nonetheless, the level of impact from development within the cultural landscape would be localized, long-term, and adverse depending on the nature of the modifications.

There would be no impacts on the Pear Lake Ski Hut; even with increased use levels. There would be no change to the management of the historic ranger stations at Tyndall, Redwood Meadow and Simpson Meadow under alternative 3.

Cumulative Effects: Other than those ongoing projects and activities associated with the administration of wilderness (i.e., trail maintenance and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on cultural resources. These effects are described under alternative 1. This alternative would result in impacts that are not substantially different from the status quo (alternative 1) with some widespread beneficial effects on cultural resources from increased knowledge, which allows for increased protection. There would be a localized adverse effect on the cultural landscape at the Bearpaw Meadow High Sierra Camp. Considered together there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

Section 106 Summary: Assessments for proposed projects would occur on a site-specific and case-by-case basis prior to implementation. Much of the work conducted in wilderness is accomplished under the Nationwide Programmatic Agreement (2008). Additional consultations with the CA SHPO will take place on a case-by-case basis for those projects that fall outside the scope of the Nationwide Programmatic Agreement. The NPS would alter projects and work with the CA SHPO to avoid adverse impacts to cultural resources whenever possible.

In accordance with the regulations of the ACHP (36 CFR 800.5) that address the criteria of effect and adverse effect, the determination of effects under the proposed action may result in *adverse effect* on the Bearpaw Meadow High Sierra Camp cultural landscape, depending on the outcome of the Section 110 effort that has been initiated for the Bearpaw Meadow High Sierra Camp (submitted in January 2015).

IMPACTS OF ALTERNATIVE 4: EMPHASIZE UNDEVELOPED QUALITY AND NON-COMMERCIAL RECREATION

The discussion that follows provides an analysis of impacts on cultural resources as a result of alternative 4. The analysis describes specific impacts associated with this alternative that are not included in the "Impacts Common to All Alternatives" section.

All grazing would be discontinued under this alternative. This would result in a beneficial effect on unrecorded cultural resources in meadows because they would be less vulnerable to inadvertent damage. However, new areas would be used for holding and feeding stock, thus could result in new areas of disturbance, resulting in inadvertent damage to cultural resources.

Most existing privies and food-storage boxes would be removed. There would be no impacts on archeological resources from these actions because the boxes and privies are in previously disturbed areas. None of the structures considered for removal are National Register-eligible; therefore, there would be no impact on historic structures.

All designated campsites would be removed from Emerald and Pear lakes, Lower Paradise Valley, and at Bearpaw Meadow. No other sites would be designated. There would be no impacts on archeological resources from these actions because the campsites and privies are in previously disturbed areas. None of the structures considered for removal are eligible for the National Register. Therefore, there would be no impact on historic structures.

The alternative proposes the complete removal of the Bearpaw Meadow High Sierra Camp. The Mission 66-era Ranger Station at Bearpaw Meadow would also be removed. This area comprises a National

Register-eligible cultural landscape. The removal of the facilities may result in an adverse impact on the cultural landscape. The adverse effect may be mitigated through documentation strategies and other measures developed in consultation with the CA SHPO and the ACHP.

There would be localized, long-term, adverse impacts on those ranger stations to be removed that are listed or eligible for listing on the National Register – the Redwood Meadow Ranger Station, Simpson Meadow patrol cabin, and the Tyndall Ranger Station. The level of impact could be somewhat mitigated through documentation strategies developed in consultation with the CA SHPO.

The winter commercial services at the Pear Lake Ski Hut would be discontinued, but the ranger station would continue to be maintained as a cultural resource. Therefore, there would be no effect on this historic structure.

Cumulative Effects: Other than those ongoing projects and activities associated with the administration of wilderness (i.e., trail maintenance and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on cultural resources. The impacts would be the same as described under alternative 1. This alternative would result in an adverse effect by removing one cultural landscape (Bearpaw Meadow High Sierra Camp), and removing three historic structures. If the High Sierra camps are reduced in size or removed elsewhere in the region, this alternative combined with the regional effects, could constitute a significant adverse effect on those resources.

Section 106 Summary: Assessments for proposed projects would occur on a site-specific and case-by-case basis prior to implementation. Much of the work conducted in wilderness is accomplished under the Nationwide Programmatic Agreement (2008). Additional consultations with the CA SHPO will take place on a case-by-case basis for those projects that fall outside the scope of the Nationwide Programmatic Agreement. The NPS would alter projects and work with the CA SHPO to avoid adverse impacts to cultural resources whenever possible.

In accordance with the regulations of the ACHP (36 CFR 800.5) that address the criteria of effect and adverse effect, the determination of effects under this alternative would result in an *adverse effect* on the Bearpaw Meadow High Sierra Camp cultural landscape and the ranger stations (patrol cabins) at Redwood Meadow, Simpson Meadow, and Tyndall. There would be *no adverse effect* on any other cultural resources.

IMPACTS OF ALTERNATIVE 5: EMPHASIZE OPPORTUNITIES FOR SOLITUDE

The discussion that follows provides an analysis of impacts on cultural resources as a result of alternative 5. The analysis describes specific impacts associated with this alternative that are not included in the "Impacts Common to All Alternatives" section.

There would be no new construction in wilderness associated with this alternative. Therefore, there would be no construction-related impacts on National Register-eligible cultural resources under alternative 5.

All existing privies and food-storage boxes would be removed. There would be no impacts on archeological resources from these actions because the boxes and privies are in previously disturbed areas. None of the structures considered for removal are National Register-eligible; therefore, there would be no impact on historic structures.

All designated campsites would be removed from Emerald and Pear lakes, Lower Paradise Valley, and at Bearpaw Meadow. No other sites would be designated. There would be no impacts on archeological

resources from these actions because the campsites and privies are in previously disturbed areas. None of the structures considered for removal are National Register-eligible; therefore, there would be no impact on historic structures.

The alternative proposes the removal the Mission 66-era Ranger Station at Bearpaw Meadow. However, since the ranger station may be determined to be a contributing element to the National Register-eligible cultural landscape, its removal may result in an adverse impact on the cultural landscape. The adverse effect may be mitigated through documentation strategies and other measures developed in consultation with the CA SHPO and the ACHP.

The winter commercial services at the Pear Lake Ski Hut would be discontinued; winter use of the facility as a warming hut would be managed by the NPS. The ranger station would continue to be maintained as a cultural resource. Therefore, there would be no effect on this historic structure.

Cumulative Effects: Other than those ongoing projects and activities associated with the administration of wilderness (i.e., trail maintenance and visitor-use management), there are few past, present, or future foreseeable projects in the parks' wilderness that have a detectable effect on cultural resources. These effects are described under alternative 1. This alternative would result in an adverse effect by modifying one cultural landscape. Considered together there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect.

Section 106 Summary: Assessments for proposed projects would occur on a site-specific and case-by-case basis prior to implementation. Much of the work conducted in wilderness is accomplished under the Nationwide Programmatic Agreement (2008). Additional consultations with the CA SHPO will take place on a case-by-case basis for those projects that fall outside the scope of the Nationwide Programmatic Agreement. The NPS would alter projects and work with the CA SHPO to avoid adverse impacts to cultural resources whenever possible.

In accordance with the regulations of the ACHP (36 CFR 800.5) that address the criteria of effect and adverse effect, the determination of effects under the proposed action may result in adverse effect on the Bearpaw Meadow High Sierra Camp cultural landscape, depending on the outcome of the Section 110 effort that has been initiated for the Bearpaw Meadow High Sierra Camp (submitted in January 2015).

CONCLUSION

All of the alternatives protect cultural resources to a varying degree. The adverse effects from the action alternatives relate to the removal of historic structures. The historic ranger stations are best preserved in alternatives 1, 2, 3, and 5. Alternative 4 would result in an adverse effect on three historic ranger stations.

Alternative 1 would provide the most protection to the Bearpaw Meadow High Sierra Camp. Under alternatives 2, 3, and 5, the Bearpaw Meadow High Sierra Camp would be adversely affected by the removal of a contributing feature, the Bearpaw Meadow Ranger Station. In addition, under alternative 3, the development could be slightly expanded, which could also result in an adverse effect on this resource. Alternative 4 would result in the complete removal of the Bearpaw Meadow High Sierra Camp, which would result in a permanent adverse effect on this cultural resource. In addition, if Yosemite National Park, through its planning process, decides to remove High Sierra camps, this would result in a region-wide adverse cumulative effect on these historic resources.

Any changes to cultural resources would be planned in consultation with the CA SHPO, and the level of impact could be somewhat mitigated through documentation strategies developed in consultation.

Nonetheless, the level of impact from modifications or the removal of cultural properties would be localized, long-term, and adverse. CEQ suggests that adverse effects on a cultural district or landscape that is eligible for listing on the National Register of Historic Places is a consideration when determining the level of significance. The removal of the entire Bearpaw Meadow High Sierra Camp, thus, could be deemed significant; this would depend upon the results of consultations with SHPO.

SOCIOECONOMICS

NPS Director's Order 12: *Environmental Impact Analysis* requires units of the NPS to consider social and economic impacts of a planning action as directed by CEQ regulations. CEQ defines the human environment as the natural and physical environment, and the relationship of people with that environment (1508.14). Socioeconomic impacts include those to minority and low-income communities as specified in Executive Order 12898, "Environmental Justice" (Feb. 11, 1994); however, this topic area was dismissed from detailed consideration (see chapter 1).

METHODOLOGY FOR ANALYZING IMPACTS

Potential economic and social implications of the Sequoia and Kings Canyon National Parks WSP/FEIS alternatives were identified as a topic of public interest. Economic effects are commonly expressed in terms of the number and types of jobs supported directly and indirectly by the parks, changes in income, and changes in visitor spending resulting from changes in visitor use. Examples of social impacts include effects on local and regional population growth, housing, and community facilities and services.

The current assessment focuses on the two primary factors most likely to vary among the alternatives and have socioeconomic consequences in the region:

1) Changes in the levels of wilderness visitor use and spending at the parks and in the surrounding region, including changes in the commercial services offered within the parks.
2) Future NPS expenditures for rehabilitation, restoration, and maintenance of wilderness-related recreation and administrative facilities.

Management actions to implement the alternatives would likely be achieved through reprioritization and reallocation of available funding. Future expenditures would reflect NPS policies, actual on-the-ground conditions, unforeseen events and opportunities, and budgets approved by Congress for the NPS in general, and for Sequoia and Kings Canyon National Parks specifically.

Management guidance and restrictions established through the WSP/FEIS would be expected to have limited effects on the overall wilderness use under any of the action alternatives. Current use is estimated at approximately 111,000 visitor use days per year (see the "Visitor Use and Experience" section in chapter 3). Expected changes in future visitor use are not quantitative but rather reflective of the relative order in visitation changes expected under each alternative (alternative 5 allowing the least use among the alternatives and alternative 3 allowing the highest annual use). Actual visitor use over time will exhibit temporary and multi-year variations due to factors such as weather and regional or national economic fluctuations.

IMPACT CHARACTERIZATION AND SIGNIFICANCE FOR SOCIOECONOMICS

Economic and social impact significance associated with the WSP/FEIS alternatives are assessed in terms of scale/intensity, duration, and type/character. These parameters are defined as follows.

Scale/Intensity: In addition to the relative magnitude of changes, factors considered in assessing scale and intensity of impacts associated with the WSP/FEIS alternatives include the likelihood of the public awareness of the effects of the changes, the ability to measure the effects, and the number of people or extent of the geographic region that would be affected.

Duration: Social and economic changes associated with management actions under an alternative may be temporary or persist for an extended time. Temporary impacts may be noticeable locally but not result in long-term changes of underlying economic and social conditions. Long-term impacts, on the other hand, may lead to changes in the economic base, trigger construction or closure of public facilities and changes in service levels, affect local real estate markets and how individuals and groups relate to one another, and other changes in established social interactions. The distinguishing characteristics associated with duration are described below.

> **Short-term:** Short-term effects typically occur during and in response to planning, design, construction and major maintenance of buildings, trails, parking lots and other facilities. The effects commonly diminish or disappear after the activity is completed. Multiple "short-term" periods could occur within an extended time horizon, such as the life of the WSP, as distinct actions implemented over time, could each trigger short-term effects.
>
> **Long-term:** Long-term effects, which may not begin until after completion of direct activities associated with the initial changes in management, generally last many years, and may extend indefinitely into the future. Such effects may include changes in the base budget for park operations and maintenance and effects related to changes in visitation over time.

Type/Character: Social and economic consequences may be beneficial, adverse or indeterminate. The key characteristics of effects that determine the type/character of effects are described below.

> **Beneficial:** Effects that many individuals or groups would accept or recognize as improving economic or social conditions, either in general or for a specific group of people, businesses, or organizations. Examples of beneficial effects include increases in job opportunities and personal income, lower unemployment, and contributions to economic and social diversity and sustainability.
>
> **Adverse:** Effects that most individuals or groups accept or generally recognize as diminishing economic or social welfare, either in general or for a specific group of people, businesses, or organizations. Examples of adverse effects include fewer job opportunities, reductions in visitor expenditures for local businesses, or an erosion of fiscal resources to fund public facilities and services.
>
> **Indeterminate:** Those effects for which the size, timing, location, or individuals or groups that would be impacted cannot be determined, or those which include both beneficial and negative effects, in some instances affecting different communities or populations, such that the net effect is indeterminate.

ANALYSIS OF IMPACTS ON SOCIOECONOMICS

Implementation of the no-action or any of the action alternatives would occur concurrently with other economic, demographic, and social changes in the region. Information collected as part of the NPS Visitor Services Project showed that California residents account for approximately two-thirds of the overall visitation to the parks, and the parks' wilderness staff are of the opinion that California residents comprise at least a comparable share of wilderness use.

Long-term population forecasts prepared by the California Department of Finance anticipate a net population increase of 54% in the region by 2040, and an increase of 28% statewide. The latter equates to nearly 10.4 million additional residents by 2040. This projected population growth is not viewed as a precursor to comparable increases in wilderness use, both because trailhead permits and quotas regulate actual use and because there is a historical trend of declining or steady use of the parks' wilderness during periods in which substantial population growth occurred. Instead, the projected population growth is viewed as indicative of continued long-term demand for wilderness and wilderness experience of the type provided by the parks and other nearby wilderness.

IMPACTS OF ALTERNATIVE 1: NO-ACTION / STATUS QUO

Continuation of the current permit system and quotas under the no-action alternative could serve to constrain visitor use during peak periods. Consequently, annual wilderness use at the parks under the no-action alternative may increase, but not substantially. Major long-term decreases are not anticipated either.

Changes in spending by wilderness visitors at local stores, motels and hotels, and other tourism-related businesses and attractions (including wilderness guides and outfitters) would generally mirror any changes in the levels of visitor use. Most of any changes in spending would accrue to businesses located in the gateway communities serving as staging areas for overnight wilderness trips, the stock guides and other businesses operating in the parks under CUAs. Although the gross income derived from visitors using private stock, commercial dunnage, and other guide and outfitter services is critical to the continued economic viability of individual guides and outfitters, total expenditures associated with wilderness use represent a very small portion of the overall regional economy. The economic stimulus associated with wilderness use would remain highly seasonal under alternative 1.

State and local governments would experience little changes in sales taxes and other revenues in response to changes in visitor spending under the no-action alternative.

Implementing the no-action alternative would contribute to the parks' sustained economic infusion to the region over the life of the WSP. The infusion would result from ongoing operating expenditures, including staff payroll, one-time capital outlays, and environmental research and restoration projects associated with wilderness. NPS maintenance staff would perform much of the work to address maintenance and preservation, restoration, and rehabilitation activities. The no-action alternative would not, however, necessitate or support any substantive changes or reprioritization of budgeted resources to fund park operations in wilderness.

Little change in park-related demands on community services and facilities across central California would result from the no-action alternative. The parks would not become a direct catalyst for regional population growth under the no-action alternative. The influence of the parks' wilderness management on community attitudes and lifestyles would not alter dramatically under the no-action alternative.

At the regional level, the socioeconomic effects related to the parks' wilderness visitors and park operations would be both beneficial and adverse, but there would be little change in the short and long term.

Cumulative Effects: From the economic and social perspectives, the parks cannot be readily isolated from past, present, and future development in the surrounding areas. Past human activity and development in the parks and surrounding region were instrumental in establishing existing land use and ownership patterns, which are also tied to the cultural and historical landscapes. But for establishment of the parks, the affected lands would undoubtedly provide far fewer opportunities for public use and natural

resource protection. Social and economic effects of the above actions are reflected in the human settlement patterns, community development, road network, traffic, and the seasonal resident and visitor populations associated with the parks.

Social and economic effects of ongoing and planned frontcountry management at the parks could result in short- and long-term economic effects on visitor-related businesses due to changes in visitor-use levels and distribution. Most other ongoing and foreseeable future projects in wilderness have little or no potential for economic and social effects beyond temporary indirect effects associated with the expenditures and application of labor and other resources to completing restoration and maintenance activities. Issuance of the concessions prospectus for Sequoia National Park could result in operational changes of the Bearpaw Meadow High Sierra Camp that could affect wilderness use and the economic contributions therefrom, as could management actions resulting from the future completion of the Yosemite National Park wilderness stewardship plan, and updates of land management plans for nearby national forests. The net effect of those actions is unknown, but potentially of more consequence than the effects under the no-action alternative. Combined with these effects, the no-action alternative would result in limited short- and long-term beneficial and adverse cumulative impacts. The no-action alternative would comprise a small portion of these overall cumulative impacts.

IMPACTS OF ALTERNATIVE 2: PROTECT WILDERNESS CHARACTER BY IMPLEMENTING SITE-SPECIFIC ACTIONS (NPS PREFERRED ALTERNATIVE)

Implementation of alternative 2 would occur against the previously described backdrop of economic, demographic, and social conditions across the region, including substantial population growth through 2040. Alternative 2 would add another set of influences, albeit virtually indiscernible, affecting the region's economic and social environment, but would leave the basic foundations of the area's economic and demographic outlook unchanged.

Wilderness management actions under alternative 2 would accommodate about the same overall use levels. However, the more direct consequences of the restrictions placed in the busiest areas of wilderness, such as limits on commercial services in the Mount Whitney Management Area, and limits on grazing in some additional areas, could result in lower use and the redistribution of use geographically.

The net effects on visitor use, a key driver of potential socioeconomic effects associated with the plan, are unclear, depending on public response to limits on commercial services and grazing. For instance, visitors who are unable to obtain a permit for their preferred destination may decide to go to an alternative destination, shift their planned visit to a time period for which a permit for their preferred destination is available, or cancel their plans. The portion of visitors who will choose each of these reactions is unknown; thus, shifts in visitor use are uncertain. Shifts in destination or time could actually result in higher use, whereas cancellations would reduce use. The reductions in party size limits proposed for some uses and locations would reduce use slightly. Stock use would similarly be subject to offsetting tendencies from the designation of additional stock use areas. Whether the net long-term effect on visitor use would result in decreasing, stable, or increasing visitation relative to the no-action alternative is unknown, but is likely to be of limited magnitude in any event.

The effects on local socioeconomic conditions are also indeterminate. Higher use and visitor spending could translate into higher economic contributions in the region, including incremental increases in seasonal employment. There would be no reduction in commercial services wilderness-wide under this alternative; however, there would be a limited reduction in commercial service allocations for both stock and non-stock service providers in the Mount Whitney Management Area. Although the net effects are indeterminate, some individuals and businesses are likely to be adversely affected by the reduction in allocations in the Mount Whitney Management Area, and some individuals and businesses would not be

affected. Reduced commercial services in the Mount Whitney Management Area could reduce income for some outfitters, but over time these effects would probably be mitigated by a shift in commercially supported visitor use to other areas of the parks' wilderness.

Implementing alternative 2 would contribute to the parks' sustained economic infusion to the region over the life of the WSP. The infusion would result from ongoing operating expenditures, including staff payroll, capital outlays, and environmental research and restoration projects associated with wilderness. Alternative 2 would not necessitate or support substantive changes or reprioritization of budgeted resources to fund park operations in wilderness. NPS maintenance staff would perform much of the work to address maintenance and preservation, restoration, and rehabilitation activities. Consequently, management actions to implement the actions would likely be achieved through reprioritization and reallocation of available funding.

Short-term increases in seasonal employment and spending would result if the parks secured additional funds in response to completion of the plan. The availability, timing, and amount of such funds are uncertain and depend on budgetary approvals by Congress. Budget allocations within the NPS produce long-term effects on employment, business sales, income, and other related measures.

Regardless of the net effects on visitor use and spending and the parks' operating and maintenance spending, the economic contributions to the regional economy would remain highly seasonal.

The effects of wilderness visitor use and the parks' management on state and local governments would be essentially the same under alternative 2 as under the no-action alternative. Changes in wilderness use under alternative 2 would not be a direct catalyst for changes in regional population. Little change in park-related demands on community services and facilities across central California would result from implementing alternative 2. The influence of the parks' wilderness management on community attitudes and lifestyles would not alter dramatically under alternative 2.

Cumulative Effects: Implementation of alternative 2 would occur against the same set of past, ongoing and future conditions and influences described for the no-action alternative above.

Social and economic effects of ongoing and planned frontcountry management at the parks could result in short- and long-term economic effects on visitor-related businesses due to changes in visitor-use levels and distribution. Most other ongoing and foreseeable future projects in wilderness have little or no potential for economic and social effects beyond temporary indirect effects associated with the expenditures and application of labor and other resources from completing restoration and maintenance activities. Issuance of the concessions prospectus for Sequoia National Park could result in operational changes of the Bearpaw Meadow High Sierra Camp that could affect wilderness use and the economic contributions therefrom, as could management actions resulting from future completion of the Yosemite National Park Wilderness Stewardship Plan and updates of land management plans for nearby national forests. The net effects of those actions on visitor use and associated economic contributions are unknown, but they are potentially of comparable or greater consequence than the effects under alternative 2.

The contributions of alternative 2 to the cumulative economic and social effects, including those associated with increased visitor and NPS operating expenditures, would be perceptible on a localized scale in both the short and long term and are indeterminate in nature. Impacts of alternative 2 would comprise a small portion of these overall cumulative social and economic effects.

IMPACTS OF ALTERNATIVE 3: PROVIDE MORE OPPORTUNITIES FOR PRIMITIVE RECREATION

Implementation of alternative 3 would occur against the previously described backdrop of economic, demographic, and social conditions across the region, including substantial population growth through 2040. Alternative 3 would add another set of influences, albeit virtually indiscernible, affecting the region's economic and social environment, but would leave the basic foundation of the area's economic and demographic outlook unchanged.

Wilderness management actions under alternative 3 would accommodate some increase in overall use levels through moderate increases in use in some popular areas and expanded opportunities for commercial service providers (i.e., increased allotments wilderness-wide). The allotment for commercial service providers in the Mount Whitney Management Area would be higher under this alternative than the other action alternatives.

The net long-term effect of alternative 3 on visitor use, a key driver of potential socioeconomic effects associated with the WSP, is expected to be an increase in overall wilderness use. Overall spending by wilderness visitors would increase over the long term under alternative 3 due to the increase in use and expanded commercial opportunities. The reductions in consecutive night limits proposed for some locations may discourage some use.

Spending by wilderness visitors at local stores, motels and hotels, and other tourism-related businesses and attractions would likely increase over time compared to the other alternatives. Much of the additional spending would be captured by recreation-oriented businesses located in the gateway communities serving as staging areas for overnight wilderness trips and by the guides, outfitters and other businesses that operate in the parks under CUAs. The economic stimulus associated with wilderness use would remain highly seasonal. State and local governments could collect incrementally higher sales taxes and other revenues from the increases in visitor spending under alternative 3 than under the no-action alternative, but the overall contribution of such revenues to overall receipts would be slight.

Wilderness use in the parks would not be a direct catalyst for regional population growth under alternative 3. Little change in park-related demands on community services and facilities across central California would result from implementing alternative 3. Alternative 3 would not be expected to dramatically alter the influence of the parks' wilderness management on community attitudes and lifestyles.

Implementing alternative 3 would contribute to the parks' sustained economic infusion to the region over the life of the plan. The infusion would result from ongoing operating expenditures of the parks, including staff payroll, one-time capital outlays, and environmental research and restoration projects associated with wilderness.

No major changes in budgeted resources to fund park operations in wilderness would be anticipated under alternative 3. NPS maintenance staff would perform much of the work to address maintenance and preservation, restoration, and rehabilitation activities. Management actions to implement alternative 3 would be achieved through reprioritization and reallocation of existing funds. A series of short-term increases in seasonal employment and spending would result if the parks successfully gain access to additional funds. Additional funding could speed the implementation of the actions under this alternative.

At the regional level, the socioeconomic effects related to the parks' wilderness visitors and the parks' wilderness operations under alternative 3 would be beneficial in the short and long term.

Cumulative Effects: The social and economic effects from other projects would be the same under alternative 3 as under alternative 2 (see above). From the economic and social perspectives, the contributions of alternative 3 to the cumulative economic and social effects, including those associated with increased visitor and NPS operating expenditures would be discernible in a localized area in the short and long term, similar to those under the no-action and alternative 2. Impacts of alternative 3 would comprise a small portion of these overall cumulative social and economic effects.

IMPACTS OF ALTERNATIVE 4: EMPHASIZE UNDEVELOPED QUALITY AND NON-COMMERCIAL RECREATION

Implementation of alternative 4 would occur against the same backdrop of economic, demographic, and social conditions across the region described above for the no-action. Alternative 4 would add another set of influences, albeit inconsequential, affecting the region's economic and social environment, but would leave the basic foundation of the area's economic and demographic outlook unchanged.

Wilderness management actions under alternative 4 would generally constrain use in some popular areas, overall use levels would remain similar to current conditions, though there could be reduced use levels in the highest use areas. The removal of food-storage boxes, privies, the required use of waste pack-out kits, and reductions in the extent of areas where campfires are allowed could discourage some future wilderness use and encourage use by others who appreciate less developed natural environments. The element of alternative 4 with the most prevalent effects is the net reduction of commercial services wilderness-wide, with the greatest reduction of commercial services in the Mount Whitney Management Area when compared with the other action alternatives.

The level of commercial services, both stock and non-stock use under alternative 4 would decline in the long term due to the reduced allotment, combined with the reduced on- and off-trail party sizes, and new grazing restrictions. These effects could reduce income for outfitters, adversely affecting the long-term economic viability of some outfitters, potentially to the point that one or more outfitters may choose to forego pursuit of CUAs. Such a decision could have indirect economic and social effects in community(ies) that serve as the base of operations for those outfitters, such as reduced demand for lodging and restaurant expenditures by clients before and after their trips. These in turn could adversely affect seasonal employment opportunities in those communities.

The net long-term effect of alternative 4 on visitor use, a key driver of potential socioeconomic effects associated with the plan is indeterminate, but would likely be a net decline. Overall spending by wilderness visitors would be lower under alternative 4 due to the decrease in use.

Spending by wilderness visitors at local stores, motels, and hotels, and other tourism-related businesses and attractions could be lower over time compared to the no-action alternative. The reduction in spending would affect recreation-oriented businesses in gateway communities serving as staging areas for self-guided overnight wilderness trips and trips supported by guides and outfitters. The decline in visitor use and spending could also result in a reduction in jobs supported, but the net effects would likely be negligible to minor. The economic stimulus associated with wilderness use would remain highly seasonal. State and local governments could realize slightly lower revenues from visitor spending than under the no-action alternative, but the loss would be negligible in the context of the overall stimulus associated with the parks and the overall size and scale of the regional economy.

Wilderness use in the parks would not be a direct catalyst for regional population growth under alternative 4. Little change in park-related demands on community services and facilities across central California would result from implementing alternative 4. The influence of the parks' wilderness management on community attitudes and lifestyles would not alter dramatically under alternative 4.

No major changes in budgeted resources to fund park operations in wilderness would be anticipated under alternative 4. NPS maintenance staff would perform much of the work to address maintenance and preservation, restoration, and rehabilitation activities. Management actions to implement alternative 4 would be achieved through reprioritization and reallocation of existing funds. Implementation of alternative 4 may initially require more effort directed toward removal of facilities and subsequent rehabilitation actions. In the long term, reduction in maintenance at the removal sites would facilitate other management actions. The elimination of all grazing could necessitate increased helicopter use and expense.

A series of short-term increases in seasonal employment and spending would result if the parks successfully gain access to additional funds.

At the regional level, the socioeconomic effects related to the parks' wilderness visitors and park operations under alternative 4 would be both adverse and beneficial.

Cumulative Effects: The social and economic effects from other projects would be the same under alternative 4 as under alternative 2. From the economic and social perspectives, the contributions of alternative 4 to the cumulative economic and social effects, including those associated with increased visitor and NPS operating expenditures, would be similar to those under the no-action and alternative 2. Impacts of alternative 4 would comprise a small portion of the overall cumulative social and economic effects.

IMPACTS OF ALTERNATIVE 5: EMPHASIZE OPPORTUNITIES FOR SOLITUDE

Implementation of alternative 5 would occur against the same backdrop of economic, demographic, and social conditions across the region described under the no-action alternative (i.e., substantial population growth through 2040). Alternative 5 would add another set of influences, albeit virtually indiscernible, affecting the region's economic and social environment, but would leave the basic foundation of the area's economic and demographic outlook unchanged.

Wilderness management actions under alternative 5 would reduce overall wilderness visitation. The level of commercial use would decline long-term under alternative 5 due to the combination of reduced visitor use levels and reduced commercial services allotments wilderness-wide. These effects could reduce income for outfitters, adversely affecting the long-term economic viability of some outfitters, potentially to the point that one or more outfitters may choose to forego pursuit of CUAs. Such a decision could have indirect economic and social effects in community(ies) that serve as the base of operations for those outfitters, such as reduced demand for lodging and restaurant expenditures by clients before and after their trips. These in turn could adversely affect seasonal employment opportunities in those communities.

Due to the net long-term reduction in use expected under alternative 5, overall spending by wilderness users would decrease under alternative 5. Guides and outfitters, including stock and dunnage providers, could experience long-term revenue declines. These effects could reduce income for outfitters, adversely affecting the long-term economic viability of some outfitters, potentially to the point that one or more outfitters may choose to forego pursuit of CUAs.

Reductions in spending by wilderness visitors at local stores, motels, and hotels, and other tourism and recreation-related businesses would be concentrated in gateway communities serving as staging areas for self-guided overnight wilderness trips and trips supported by guides and outfitters. The decrease in spending could result in net reductions in jobs supported, but the net effects would likely be negligible to minor. The economic stimulus associated with wilderness use would remain highly seasonal. State and

local governments could realize slightly lower revenues from visitor spending than under the no-action alternative, but the loss would be negligible.

Changes in wilderness use in the parks would not be a direct catalyst for regional population growth or decline under alternative 5. Little change in park-related demands on community services and facilities across central California would result from implementing alternative 5. The influence of the parks' wilderness management on community attitudes and lifestyles would not alter dramatically under alternative 5.

Implementing alternative 5 would contribute to the parks' sustained economic infusion to the region over the life of the WSP. The infusion would result from ongoing operating expenditures of the parks, including staff payroll, one-time capital outlays, and environmental research and restoration projects associated with wilderness. The stimulus would be lower than under the no-action alternative and other action alternatives, but the differences would be negligible in the context of the overall stimulus associated with the parks and the overall size and scale of the regional economy.

No major changes in budgeted resources to fund park operations in wilderness would be anticipated under alternative 5. Management actions to implement the alternative would be achieved through reprioritization and reallocation of existing funds. Implementation of alternative 5 may initially require more effort directed toward removal of certain facilities and the rehabilitation of those areas. Over the long-term the reduction in maintenance at these sites could yield savings that might facilitate other management actions.

A series of short-term increases in seasonal employment and spending would result if the parks successfully gain access to additional funds.

At the regional level, the socioeconomic effects related to the parks' wilderness visitors and the parks' wilderness operations under alternative 5 would be both adverse and beneficial, in the short and long term.

Cumulative Effects: The social and economic effects from other projects would be the same under alternative 5 as under alternative 2. From the economic and social perspectives, the contributions of alternative 5 to the cumulative economic and social effects, including those associated with increased visitor and NPS operating expenditures, would be lower than those under the no-action and alternative 2. Impacts of alternative 5 would comprise a small portion of these overall cumulative social and economic effects.

CONCLUSION

Visitor use in the parks, the associated spending, and the operations and maintenance of the parks by the NPS contribute to existing economic and social conditions in the region. It is estimated that visitor spending supported about 1,817 jobs, with the annual operating budget at the parks directly and indirectly supporting another 615 jobs in the region. Although substantial, those contributions represent a small portion of the overall regional economy.

The no-action and all action alternatives would sustain the economic infusions and social contributions of wilderness use in the regional economy. Any changes would be small in scale over the long-term, and would result in a combination of adverse and beneficial effects. As compared to current contributions, changes in future effects would generally be directly correlated to changes in the levels of wilderness use.

Alternatives that allow for increased visitor use, such as alternative 3, may therefore result in long-term increases in the economic and social benefits, and alternatives that reduce visitor use such as alternative 5, may result in limited reductions in economic and social benefits. Some individual outfitters and guides could be affected by changes associated with specific alternatives. For example, the effects of alternatives 4 and 5 could reduce income for outfitters, adversely affecting the long-term economic viability of some outfitters, potentially to the point that one or more outfitters may choose to forego pursuit of CUAs. Such a decision could have indirect effects in one or more gateway communities. However, the magnitude, type, and scale of either the adverse or beneficial effects anticipated from any of the WSP/FEIS alternatives would not be significant on a regional scale.

VISITOR USE AND EXPERIENCE

Visitor experience is personal and difficult to quantify. What may detract from one person's experience may enhance or not affect the experience of others. In an effort to quantify differences between the alternatives, survey results from permitted overnight users presented in chapter 3 are used where appropriate to discuss potential changes to overall use and experience.

METHODOLOGY FOR ANALYZING IMPACTS

Visitor experience can be affected by the types of activities, access opportunities and convenience, visitor restrictions, the number and types of administrative and visitor-related facilities, the condition of wilderness (e.g., campsite conditions, trail conditions, and evidence of visitor use), and the opportunity to experience wilderness using a commercial service provider.

Each alternative was examined to determine its effect on the visitor's use of wilderness, and their ability to experience the parks' wilderness. Public input and field staff observations of visitation patterns, combined with an assessment of current visitor use of wilderness, were used to estimate the relative effects of each of the alternatives. Impacts on visitor use and experience in the parks' wilderness were evaluated by identifying projected increases or decreases in access and other visitor uses under each alternative and determining how these projected changes would affect visitor experience, to what degree, and for how long. The analysis was also based on whether there would be a change in access or experience, or a change in perception of wilderness management and condition. Note that effects on solitude or opportunities for primitive or unconfined recreation are analyzed in the "Wilderness Character" section in this chapter.

TYPES OF IMPACTS ON VISITOR USE

Visitor Encounters: The type and number of encounters a visitor has on their trip can affect their experience. Under each alternative, a variety of group types would continue to be allowed. Permit requirements and trailhead quotas help manage the number of visitors encountered to optimize visitor use and experience. The quota system establishes a cap for overnight visitors during peak months (late May through September) and this time period accounts for the majority of visitors to the parks' wilderness. None of the alternatives would extend or reduce the quota period, and no change to the seasonal nature of overnight visitation is expected to occur. The effect of visitor encounters on opportunities for solitude or primitive and unconfined recreation was discussed in the "Wilderness Character" section in this chapter; therefore this topic will not be further discussed.

Visitor Access: Visitor access would be modified in several ways under the alternatives. Reducing trailhead quotas could limit the number of permits available for certain areas of wilderness, while increasing quotas could result in improved access opportunities by increasing the number of permits available. These actions could result in visitors selecting alternative entry points from their desired

destination. The implementation of day-use permits could result in reduced access for day hikers and riders. Day users may also change their entry point due to permit limitations and requirements, and may not be able to visit their desired destination.

The level of trail development could alter visitor access. Generally, more developed trails provide easier access into wilderness. However, some wilderness visitors prefer the lowest level of development so they can have a more adventurous wilderness experience. Abandoning currently maintained trails could limit access to wilderness for some users; however, under all alternatives, visitors would continue to have a variety of options for on-trail and off-trail wilderness use. Some alternatives also involve changes to the locations where visitors are permitted to travel or camp with stock.

Seasonality and trip length would not be affected by the alternatives. It is likely that overnight visitation would remain seasonal in nature under all of the alternatives; therefore this topic will not be further discussed.

Visitor Restrictions: Visitors value independence and spontaneity in wilderness, and rules and restrictions that reduce independence and spontaneity affect visitor use and experience. Restrictions on party size, campfire use, food storage, and management of human-waste can affect visitor experience and vary across alternatives, and are therefore further discussed below.

Visitor restrictions related to length of overnight stay would also vary across the alternatives. However, as stated in chapter 3, the majority of overnight visitors (80%) spend seven consecutive nights or less in wilderness (Martin and Blackwell 2013). None of the alternatives impose a restriction lower than this limit, and limits on overall trips would remain close to the current level. Alternative 3 proposes the greatest limit on length of stay with 7 nights at one location and 20 nights per trip in wilderness. Changing to a 20-night limit would affect an estimated 1.1% of wilderness users; close to 99% of visitors would not be affected. Because changes to maximum trip length affect very few visitors under any of the alternatives, this topic will not be further analyzed. Party size limits on- and off-trail vary by alternatives and can affect visitor use and experience. Therefore this topic will be further evaluated.

Visitor Use and Freedom: Where people can camp can affect the visitors' overall experience. All of the alternatives establish the first allowable camp area. Generally, first-camp limits do not vary among the alternatives. However, the alternatives do consider a few exceptions to allow close-in camping. Allowing camping in close-in areas would result in a beneficial effect on user groups that may not be able to access points farther in wilderness, but could adversely affect those visitors who are day hiking in those areas.

Promoting the use of established campsites (i.e., previously disturbed areas) is common to all alternatives. Some alternatives would include designated campsites, some would add designated sites in popular areas, while some alternatives would eliminate designated campsites, and control use through other methods (e.g., trailhead quotas or destination permits). The visitor experience and use is influenced by requirements to camp in designated sites. This topic relates to the opportunities for primitive and unconfined recreation and was discussed in the "Wilderness Character" section in this chapter.

Condition of Wilderness: The wilderness-wide improvement in campsite conditions over the past 30 years has been attributed to increased regulation of visitor use, the extensive adoption of minimum-impact techniques by visitors, and increased restoration of areas impacted by campfires and visitor use. All of the alternatives would strive to maintain or improve campsite conditions to improve the visitor experience in wilderness.

The condition of wilderness can also be affected by the types of visitor and administrative uses occurring in a given area. Stock use results in manure on trails, hoof prints, dusty conditions in certain areas,

trampling around hitching posts and high lines, and the existence of stock-related facilities such as drift fences and gates. Areas with concentrated visitor use (stock or non-stock) may be impacted by trampling and bare ground, and the presence of toilet paper or human waste. Areas popular with climbers may have installations such as bolts and fixed anchors, which can detract from the visitor experience. These types of impacts may all detract from the visitor experience, depending on visitor's expectations. These effects are difficult to quantify and vary greatly among individuals.

For example, in Martin and Blackwell (2013), the majority of respondents (73.5%) felt that horse manure on trails was either a small problem or not a problem, and 84.5% felt that stock damage to vegetation (e.g., trampled meadows and damaged trees) was either a small problem or not a problem. Yet, according to Martin and Blackwell (2013), 11.8% of respondents reported that manure levels on trails was a "big problem."

Meadows and their surroundings are often perceived as a focal point of the wilderness experience and frequently serve as principal destinations for wilderness travelers. For those who ride and/or pack into wilderness, these areas also provide forage for stock. The popularity of meadows remained fairly constant from 1992 to 2012; stock groups repeatedly use the same meadows and campsites year to year. The availability of meadows for grazing, and the availability of non-grazed meadows, affects visitor use and experience. Some visitors prefer to see ungrazed meadows while visitors with stock may rely on meadows to support their use. For example, visitors may notice that vegetation height in grazed meadows would be lower than in ungrazed meadows. In Martin and Blackwell (2013), 84.5% of respondents felt that stock damage to vegetation (e.g., trampled meadows and damaged trees) was either a small problem or not a problem. Regardless, under all action alternatives, there would still be ample opportunities to view and experience ungrazed meadows.

Because these impacts are difficult to quantify in terms of how they affect the wilderness visitor experience and wilderness aesthetics, this topic will be briefly discussed in the following section. A more thorough analysis of wilderness condition and its effects on wilderness have been analyzed under wilderness character, soils, vegetation, and water quality.

Activities: Under all of the alternatives, visitors would continue to have the opportunity to experience a variety of recreational activities consistent with the Wilderness Act. All action alternatives allow for the continuation of these types of activities; therefore, this topic will not be further discussed.

Administrative Developments and Facilities: Under all alternatives, there would be facilities in wilderness to allow for the administration of wilderness. Facilities can attract visitors and provide solace and comfort. The facilities and rangers stationed in the wilderness can also provide information and assist wilderness visitors in many ways. While facilities in wilderness can reduce impacts on resources and enhance some users experience, they also can also concentrate use and adversely affect some visitors' experiences. Since there would continue to be facilities in wilderness under all alternatives, the effects across alternatives are not perceptible, and the effects of facilities on wilderness character were discussed in the "Wilderness Character" section in this chapter, this topic will not be further discussed.

Visitor-related Facilities: The alternatives allow for different types and numbers of facilities to manage wilderness visitor use and protect resources, including food-storage boxes and privies, and stock-related structures (fences/gates and hitch rails). These facilities are considered a convenience by some visitors and off-putting for other visitors, and thus will be further analyzed.

Availability of Commercial Services: Commercial services can facilitate visitor access to wilderness for those individuals who may not be prepared to engage in a specific activity without the support of an experienced professional. Commercially operated facilities in wilderness, such as the Bearpaw Meadow

High Sierra Camp and the Pear Lake Ski Hut (currently operated under a cooperative agreement) are destinations for some visitors and can result in a beneficial effect on visitor use and experience. However, these facilities can adversely affect some visitors who believe they are inappropriate in wilderness.

IMPACTS OF ALTERNATIVE 1: NO-ACTION / STATUS QUO

Visitor Access: Under the no-action alternative, there would be no change to the permitting system and no adjustment to trailhead quotas. There would continue to be no day-use permit or day-use quota system. The trail system and level of trail development would not change under this alternative. Therefore, under the no-action alternative, visitor use and experience would not change from current conditions.

Visitor Restrictions: There would be no additional limits imposed on campfires. Food-storage and human-waste requirements would not change. Party size limits for all groups on- and off-trail would not change. Therefore, under the no-action alternative, visitor use and experience would not change from current conditions.

Condition of Wilderness: The campsite conditions would be expected to remain stable. Areas with concentrated stock and visitor use would continue to have the sights, smells, and signs of that use (e.g., trampled vegetation, informal trails, manure on trails, or litter). Meadows would continue to be a focal point for both stock and non-stock overnight users. Visitors who wish to experience ungrazed meadows would have the ability to view these resources but they may have to alter their travel plans to do so. Under the no-action alternative, visitor use and experience would not change from current conditions.

Visitor-related Facilities: There would be no change in the number or locations for food-storage boxes, restrooms and privies, and stock-related facilities. Under the no-action alternative, visitor use and experience would not change from current conditions.

Availability of Commercial Services: The parks issue about 32 commercial use authorizations annually. Approximately 6.5% of wilderness visitors take advantage of guide services to facilitate their wilderness experience for a variety of reasons. The commercial operation of the Bearpaw Meadow High Sierra Camp and the winter use of the Pear Lake Ski Hut would continue, resulting in both adverse and beneficial effects on visitor use and experience, depending on the visitor's expectations. Under the no-action alternative, the parks' staff would conduct a specialized Wilderness Act finding to determine the "extent necessary" for commercial services in wilderness.

Cumulative Effects: There are several past, present, and foreseeable future projects in the parks' wilderness and nearby USFS administrated lands that affect visitor use and experience. These are separate from projects proposed by this WSP/FEIS and include resource management and science, fire management, maintenance of the communication system, ongoing and future management plans, and area transportation projects.

Resource management and science actions may affect visitor use and experience through temporary closures, the placement of installations, increased encounters with park staff, and stock and helicopter use. Current and future projects include permitted research activities, soils mapping, forest monitoring, lake sampling, air quality monitoring, snow surveys, mountain yellow-legged frog restoration activities, Sierra Nevada bighorn sheep recovery actions, bear management actions, invasive species eradication, meadows restorations projects, and others determined necessary to promote the natural quality of wilderness character.

While the purpose of these projects is to gather knowledge and restore the area to natural conditions, visitors may not wish to see these activities in wilderness, and may be adversely affected by temporary

closures, viewing tagged or collared animals, seeing installations, hearing or seeing helicopters, having reduced opportunities for fishing (from aquatic ecosystems restoration program), or experiencing invasive species eradication actions. However, some visitors may benefit from the opportunities to experience these actions as they would learn more about wilderness resource management and restoration activities.

The Sequoia and Kings Canyon National Park fire management program, along with the fire management program of adjacent U.S. Forest Service administered lands, may affect the wilderness visitor use and experience. The area fire programs allow, under certain conditions, natural fires to burn in wilderness. This could result in area and trail closures, reduced visibility due to smoke, and impacts on visitor health from smoke, which would affect visitor use and experience. Some visitors would change their itineraries to avoid the fire-affected areas. However, in the long-term areas would be restored to a more natural fire regime, and this would result in wilderness ecosystem less manipulated by fire suppression activities as well as a reduced risk of extreme fire behavior that could result in a larger closure, and diminished wilderness conditions.

The maintenance of the existing communication network (radio repeaters) in the parks places equipment in wilderness; however, the communication network allows rangers and other park staff to communicate emergencies to search and rescue teams. Installations in wilderness diminish visitor experience, however, they aid in emergencies, so there are both beneficial and adverse effects on visitor use and experience.

Management plans that could affect visitor use within the parks' wilderness, or in the region, include the Sequoia and Kings Canyon Cave Management Plan which would address recreational access to the parks caves; USFS wilderness plans for the John Muir, Golden Trout, Jenny Lakes, and Monarch wilderness areas; the USFS forest plan amendments for the Sierra, Inyo, and Sequoia national forests and Giant Sequoia National Monument (adjacent wilderness areas); and the Yosemite Wilderness Stewardship Plan (future). The USFS wilderness plans established restrictions on visitor use, including trailhead quota limits, caps on commercial services, and exit quota limits on Mount Whitney. The ongoing planning efforts would include a recreational use component to balance resource protection mandates with visitor enjoyment. These plans would enhance visitor experience through preservation of natural conditions, while affecting some visitor activities through the implementation of additional restrictions or regulations.

In addition, some ongoing and future implementation plans and projects specifically address visitor use and experience in wilderness. The Concessions Prospectus (ongoing) for Sequoia National Park will address the operation of Bearpaw Meadow High Sierra Camp. Whether this operation is allowed to continue in the future will be directly linked to this WSP. The Mineral King Management Plan (ongoing) would determine what facilities are necessary in the Mineral King area with the goal of supporting continued wilderness access. The Lodgepole area (including Wolverton and Wuksachi) plan (future) is a comprehensive visitor service and facilities plan to improve visitor services and could affect access to wilderness. The USFS stock use management program (on-going) establishes the party size, access, and commercial use of stock in USFS managed lands.

The present Generals Highway Project to rehabilitate the Generals Highway and the Sequoia National Park Transit System (on-going) are in the frontcountry and can affect wilderness access. The Generals Highway Project may require periodic lane closures and vehicular delays resulting in no early-morning access to some trailheads. The current transit system provides shuttle access to the Lodgepole Visitor Center, Wuksachi, Dorst Creek Campground, Wolverton, and Crescent Meadow, and provides visitors with transportation to wilderness entry points.

Since this alternative proposes no changes to the management of wilderness, except for the determination of the proper levels and types of commercial services, there would be no significant cumulative impacts on visitor use and experience associated with the alternative.

IMPACTS OF ALTERNATIVE 2: PROTECT WILDERNESS CHARACTER BY IMPLEMENTING SITE-SPECIFIC ACTIONS (NPS PREFERRED ALTERNATIVE)

Visitor Access: Trailhead quotas would remain at their existing levels, approximately; but there could be a reduction in quotas in busy areas. Existing destination quotas would continue to be applied and additional destination quotas may be added for specific areas. A reduction in trailhead quotas in busy areas, and the application of additional destination quotas could impact some visitors wanting to visit these areas. Visitors may need to change their entry point, destination, or the day of the week they enter the wilderness. If day-use permits or quotas are implemented, visitors may decide not to utilize those trailheads, or may not be able to obtain a permit at the trailhead of their choice, resulting in an adverse effect on visitor use and experience.

Visitors would continue to have opportunities to travel on a maintained trail and in untrailed areas. There would be several trails designated as hiking-only trails, allowing visitors the opportunity to travel in areas without the sign of stock use. Trails closed to all stock use would increase by approximately 30 miles. This would have a minimal effect on the geographic distribution of stock users as most of these trails have not been frequently utilized by stock users.

Visitor Restrictions: Areas where visitors are allowed to have campfires would decrease under alternative 2 to 395,710 acres. Those visitors who wish to experience a campfire may adjust their camp locations below the elevation limits, resulting in an effect on the geographic distribution of visitors. Those visitors who do not wish to camp within the sight or smell of a campfire would have more areas to camp under this alternative where they would not be affected by campfires.

The requirement to store food in animal-resistant containers would remain similar to the no-action alternative. This requirement may be expanded into areas where there is a higher risk of human-bear interactions. This could result in an inconvenience to those visitors who need to carry additional food-storage containers.

Human-waste requirements, such as the requirement to carry out waste, could be expanded into new areas to minimize the need for restrooms and privies. This could cause an inconvenience to some visitors.

Camping night-limits would be expanded to include some additional popular and or close-in areas and would be more stringent in popular areas where they are now in place. This could result in an inconvenience to some users by requiring them to move their camps more frequently, provided they have chosen to stay in popular areas for extended time periods. It may also result in an effect on the geographic distribution of visitors. Night-limits may lead to improved experiences for some users as completion is reduced for campsites. Night-limits can also have beneficial effects on solitude.

Camping in designated campsites or camp areas would continue to be required in four areas. Additional designated campsites may be established. Designated campsites may appeal to some visitors, but other visitors consider the establishment of designated sites an adverse effect on their wilderness experience and may choose to camp elsewhere due to this requirement.

On-trail party size would remain similar to alternative 1, with some reduction in the largest allowable stock-party sizes. Off-trail party sizes would be reduced for stock and foot parties. These additional limits would affect the largest parties (more than 12) traveling off-trail, which account for less than 1.3% of overnight visitors. Area specific party size limits of eight would be adopted in five areas of the park. Party size restrictions reduce the areas in which large groups are able to travel together in wilderness, resulting in adverse effects on the visitor experience and use of those groups. Reduced party sizes, however, result in an improved visitor experience for visitors who wish to view fewer people in wilderness.

Condition of Wilderness: Campsite conditions would continue to improve as a result of restoration actions, removal of campfire rings in campfire-prohibited areas, decreases to night and group size limits, and the removal of facilities from certain locations.

Areas with concentrated stock and visitor use would continue to have the sights, smells, and signs of that use (e.g., trampled vegetation, informal trails, manure on trails, or litter). Some additional meadows would be closed to grazing. Stock users may choose to visit a different location to graze, while hikers may be attracted to meadows where grazing is prohibited. Visitors who wish to view ungrazed meadows would have more opportunities, as compared with alternative 1, and this could improve their visitor experience.

Visitor-related Facilities: Of the food-storage boxes currently in the wilderness, 48 would be retained in the most popular areas of the parks, 25 would be removed, and 13 would be considered for removal. Visitors tend to use food-storage boxes where they are available; for other visitors they detract from the wilderness experience. Alternative 2 would result in the removal of some privies. For some visitors, the privies and toilets enhance their recreational experience by providing a desired convenience; for others, they detract from the wilderness experience by reducing wilderness' primitive quality. Thus, their removal would result in adverse effects on some visitors' experiences and beneficial effects on other visitors' experiences. Grazing-related structures in wilderness would be reduced. This would adversely affect some stock users who rely on those facilities to confine their stock, but stock visitors could still use and experience these areas by using alternative methods of confinement.

Visitors that have expectations of using these facilities would benefit where these facilities remain and would be adversely affected in areas where these facilities are removed. Visitors who do not wish to have these facilities in wilderness would continue to be adversely affected, but there would be a slight benefit to these visitors from the reduction of the number of facilities overall.

Availability of Commercial Services: Per the specialized Wilderness Act finding to determine the "extent necessary" for commercial services in wilderness, commercial services would continue to be allowed under alternative 2. This availability of commercial support would be of particular benefit to those visitors that wished to engage in a stock-supported trip, and to visitors that wished to have introductory or educational experiences in wilderness travel or in particular wilderness activities. However, the levels and types of commercial services authorized in the Mount Whitney Management Area would be reduced with the intent to improve natural and social conditions in that area, which would improve the visitor experience overall. However, those visitors who wish to access Mount Whitney with a commercial service provider may not be able to do so on the day, or year, of their choice if commercial service allocations are at capacity.

The commercial operation of the Bearpaw Meadow High Sierra Camp and the winter use of the Pear Lake Ski Hut would continue to be authorized, resulting in both adverse and beneficial effects on visitor use and experience depending on their expectations.

Cumulative Effects: As stated under alternative 1, visitor use and experience have been affected by past and present actions, such as resource management and science projects, the NPS and USFS fire management program, the administration of the existing communications network within the parks, and the implementation of rules, regulations, and visitor-use restrictions in the parks and on adjacent USFS wilderness areas. In addition, visitors can be affected by frontcountry activities that enhance or restrict access, such as the Generals Highway rehabilitation project (past, present, and future) and the existence of a transit system within Sequoia National Park.

The cumulative impacts of this alternative relate primarily to restrictions in access for commercial service providers. Past wilderness management plans for the adjacent USFS areas have already restricted commercial use in Inyo National Forest wilderness. Further restrictions imposed under this alternative in the Whitney Management Area could result in fewer opportunities for some visitors to use commercial service providers to access the parks' wilderness in this area. However, there would still be ample opportunities to use commercial services in other areas of wilderness.

This alternative would result in localized adverse and beneficial effects in the most popular areas. Considered together there would be no meaningful additive or interactive effects between these projects and the proposed actions under this alternative that would constitute a significant cumulative effect on visitors.

IMPACTS OF ALTERNATIVE 3: PROVIDE MORE OPPORTUNITIES FOR PRIMITIVE RECREATION

Visitor Access: Trailhead quotas would increase at trailheads that currently fill during peak season. Other trailhead quotas would remain the same. Existing destination quotas would continue to be applied and no additional destination quotas would be implemented. It is likely that increases in popular trailhead quotas would result in increased visitor use in those areas. This could benefit visitors who wish to use these trailheads. Other visitors may adjust where and when they enter wilderness to avoid the busiest trailheads or time periods. No day-use permit or day-use quota system would be implemented; therefore, there would be no impacts on day users from the implementation of a permit system.

Compared to the no-action alternative, there would be an additional 59 miles of maintained trails. Since the majority of visitors use trails, the additional miles of maintained trails would allow visitors more options for on-trail travel. There would be no additional limits on hikers going off-trail. This would allow hikers to disperse, although it is likely to have a minimal effect on the geographic distribution of hikers.

Trails closed to all stock use would increase by approximately 27 miles, and maintained trails open to overnight use by stock would decrease by about 21 miles. Stock would continue to be allowed off-trail. There would be little effect on stock users' geographic distribution from current conditions, but some stock visitors would be adversely affected by the decreased access opportunities.

Visitor Restrictions: Areas where visitors are allowed to have campfires would decrease under alternative 3 to 293,840 acres. Those visitors who wish to experience a campfire may adjust their camp locations below the elevation limits, resulting in an effect on the geographic distribution of visitors. Those visitors who do not wish to camp within the sight or smell of a campfire would have more areas to camp under this alternative where they would not be affected by campfires.

The requirements to store food in animal-resistant containers would remain similar to the no-action alternative; however, additional food-storage boxes could be placed in the wilderness. These would allow for visitor storage of food, and reduce the need to carry additional food-storage containers.

Human-waste requirements would be the same as alternative 1.

Similar to alternative 2, camping in designated campsites or camp areas would continue to be required in four areas. Additional designated sites could be established. Designated campsites may appeal to some visitors, but some visitors consider the establishment of designated sites as an adverse effect on their wilderness experience, and may choose to camp elsewhere due to this requirement.

On- and off-trail party sizes would remain the same for hikers, and would increase for stock users. Increased party size would benefit some visitors by allowing larger groups to travel in more areas. Increased party sizes could, however, result in adverse effects on the visitor experience for visitors who wish to view fewer people in wilderness.

Condition of Wilderness: Campsite conditions would continue to improve as a result of restoration actions and the removal of campfire rings in campfire-prohibited areas. However, there could be adverse effects on campsite conditions where additional food-storage boxes and privies are constructed as a result of increased use in these areas.

Areas with concentrated stock and visitor use would continue to have the sights, smells, and signs of that use (e.g., trampled vegetation, informal trails, manure on trails, or litter). Some additional meadows would be closed to grazing. Grazing would generally be prohibited in areas open to off-trail use by stock, with some exceptions. Stock users may choose to visit a different location to graze, or choose to carry in feed, while hikers may be attracted to meadows where grazing is prohibited. Visitors who wish to view ungrazed meadows would have more opportunities when compared with alternative 1, and this could improve their visitor experience.

Visitor-related Facilities: All food-storage boxes would be retained and up to 35 additional boxes may be installed. Some campers congregate around food-storage boxes, making campsites more noticeable; resulting in a less natural condition and thereby diminishing visitor experience. However, some visitors use food-storage boxes where they are available and this enhances their visitor experience. Additional privies may be added in more popular areas to address increased visitor use.

Grazing-related structures in wilderness would be reduced. This would adversely affect some stock users who rely on those facilities to confine their stock, but stock visitors still could use and experience these areas by using alternative methods of confinement. Removing all stock facilities would improve the visitor experience for those visitors who do not wish to see those types of facilities in wilderness.

Visitors that have expectations of using these facilities would benefit where these facilities remain and would be adversely affected in areas where these facilities are removed. Visitors who do not wish to have these facilities in wilderness would continue to be adversely affected, but there would be a slight benefit to these visitors from the reduction of the number of facilities overall.

Availability of Commercial Services: Per the specialized Wilderness Act finding to determine the "extent necessary" for commercial services in wilderness, commercial services would continue to be allowed under this alternative. This availability of commercial support would be of particular benefit to those visitors that wished to engage in a stock-supported trip, and to visitors that wished to have introductory or educational experiences in wilderness travel or in particular wilderness activities. The levels and types of commercial services authorized in the Mount Whitney Management Area would be similar to current or slightly reduced with the intent to improve the natural and social conditions in that area, improving the visitor experience overall. However, those visitors who wish to access Mount Whitney with a commercial service provider may not be able to do so on the day, or year, of their choice if commercial service allocations are at capacity.

The commercial operation of the Bearpaw Meadow High Sierra Camp and the winter use of the Pear Lake Ski Hut would continue, resulting in both adverse and beneficial effects on visitor use and experience, depending on their expectations.

Cumulative Effects: As stated under alternative 1, visitor use and experience have been affected by past and present actions, such as resource management and science projects, the NPS and USFS fire

management program, the administration of the existing communications network within the parks, and the implementation of rules, regulations, and visitor-use restrictions in the parks and on adjacent USFS wilderness areas. In addition, visitors can be affected by frontcountry activities that enhance or restrict access, such as the Generals Highway rehabilitation project (past, present, and future) and the existence of a transit system within Sequoia National Park.

The cumulative impacts of this alternative relate primarily to restrictions in access for commercial service providers. Past wilderness management plans for the adjacent USFS areas have already restricted commercial use in Inyo National Forest wilderness. Further restrictions imposed under this alternative in the Whitney Management Area could result in fewer opportunities for some visitors to use commercial service providers to access the parks' wilderness in this area. However, there would still be ample opportunities to use commercial services in other areas of wilderness.

This alternative would result in localized adverse and beneficial effects in the most popular areas. Considered together there would be no meaningful additive or interactive effects between these projects and the proposed actions under this alternative that would constitute a significant cumulative effect on visitors.

IMPACTS OF ALTERNATIVE 4: EMPHASIZE UNDEVELOPED QUALITY AND NON-COMMERCIAL RECREATION

Visitor Access: Trailhead quotas would remain the same or be slightly reduced, resulting in visitor use that would be the same as under the no-action alternative in most areas. Existing destination quotas would continue to be applied and additional destination quotas may be implemented at popular areas. If day-use permits or quotas are implemented, visitors may decide not to utilize those trailheads, or may not be able to obtain a permit at the trailhead of their choice, resulting in an adverse effect on visitor use. There also could be a change in use patterns as visitors who cannot obtain a permit would be redirected to another trailhead.

Compared to the no-action alternative, maintained trails would decrease by about 10 miles. This is not a substantial decrease in maintained trails and thus is not expected to influence the spatial distribution of visitor use in wilderness.

Trails closed to all stock use, and those closed to overnight stock use, would increase under this alternative. Private stock parties would be allowed to travel in four off-trail areas, but commercial stock would not be allowed off-trail; however, few commercial parties currently travel off-trail based on stock use and grazing reports, and private use by stock parties is low. This alternative would not result in a substantial effect on the geographic distribution of stock users.

Visitor Restrictions: There would be no campfires allowed in wilderness. Those visitors who wish to experience a campfire in wilderness would no longer be able to do so, resulting in a diminished wilderness experience for them. Those visitors who do not wish to camp within the sight or smell of a campfire would be able to camp anywhere in the wilderness without being affected by campfires.

All overnight visitors would be required to carry portable animal proof containers to keep wildlife from accessing food or scented objects. Those visitors who relied on food-storage boxes for storing food would no longer be able to do so. Some visitors would adjust their wilderness visit based on this requirement, but as other adjacent wildernesses have container requirements, there should be little effect on the visitor use and experience. The removal of food-storage boxes could result in increased human-wildlife interactions, and wildlife obtaining human food. Visitors could lose their food to wildlife, resulting in an adverse effect on their experience. Also, if more wildlife management actions are needed as a result of

wildlife becoming habituated or food-conditioned, this could result in an adverse effect on the visitor experience.

Since all privies would be removed, cat-holes, or pack-out waste kits where cat-holes are not feasible, would be required to manage human waste in wilderness. This may adversely affect the experience of those who use these facilities. In the highest use areas, removal of these facilities could result in adverse effects on a visitors' wilderness experience.

Party sizes would be reduced for hikers and stock users both on- and off-trail. These limits would affect on-trail groups of more than 12 people (which account for less than 1.3% of overnight visitors) and off-trail stock users with more than eight people in the party. Further area-specific restrictions would be implemented in Redwood Canyon. Party size restrictions reduce the areas in which large groups are able to travel together in wilderness, resulting in adverse effects on the visitor experience and use by those groups. Reduced party sizes, however, could improve the visitor experience of some users.

Grazing would be prohibited in wilderness. Since the number of stock per party would also be reduced, this may further limit where stock parties could travel due to the need to carry feed.

Condition of Wilderness: Campsite conditions would continue to improve as a result of restoration actions, removal of designated campsites, night limits, group size limits, and the removal of facilities. Prohibiting campfires wilderness-wide would improve campsite conditions because there would be no fire rings and a more natural setting for visitors to experience.

Areas with concentrated stock and visitor use would continue to have the sights, smells, and signs of that use (e.g., trampled vegetation, informal trails, manure on trails, or litter).Visitors who wish to see ungrazed meadows would have more opportunities to do so under this alternative, as all grazing would be eliminated; this could improve their wilderness experience.

Visitor-related Facilities: All food-storage boxes and privies would be removed wilderness-wide. For some visitors, these facilities enhance their recreational experience by providing a desired convenience; for others, they detract from the wilderness experience by reducing wilderness' primitive quality. Thus, their removal would result in adverse effects on some visitors' experiences and beneficial effects on other visitors' experiences. All stock facilities not associated with administrative use would be removed. This would adversely affect some stock users who rely on those facilities to confine their stock, but stock visitors still could use and experience these areas through alternative methods of confinement. Removing all stock facilities would improve the visitor experience for those visitors who do not wish to see those types of facilities in wilderness.

Availability of Commercial Services: Per the specialized Wilderness Act finding to determine the "extent necessary" for commercial services in wilderness, commercial services would continue to be allowed under this alternative; however, they would be reduced to levels lower than those under the no-action alternative. This reduced availability of commercial support would have particularly adverse consequences for those visitors that wished to engage in a stock-supported trip, and to visitors that wished to have introductory or educational experiences in wilderness travel or in particular wilderness activities. Pear Lake Ski Hut would no longer be operated as a commercial service in the winter, and the Bearpaw Meadow High Sierra Camp would be removed. Many visitors who want to experience wilderness but who need additional support to do so may not be able to receive this support from commercial services.

Cumulative Effects: As explained in alternative 1, visitor use and experience have been affected by past and present actions, such as resource management and science projects, the NPS and USFS fire management program, administration of the existing communications network within the parks, and the

implementation of rules, regulations, and visitor-use restrictions in the parks and on adjacent USFS wilderness areas. In addition, visitors can be affected by frontcountry activities that enhance or restrict access, such as the Generals Highway rehabilitation project (past, present, and future) and the existence of a transit system within Sequoia National Park.

The cumulative impacts of this alternative relate primarily to restrictions in access for commercial service providers. Past wilderness management plans for the adjacent USFS areas have already restricted commercial use in Inyo National Forest wilderness. Further restrictions imposed under this alternative wilderness-wide, with additional limits imposed in the Mount Whitney Management Area, would result in fewer opportunities for some visitors to use commercial service providers to access the parks' wilderness.

This alternative would result in localized adverse and beneficial effects in the most popular areas. Considered together there would be no meaningful additive or interactive effects between these projects and the proposed actions under this alternative that would constitute a significant cumulative effect on visitors.

IMPACTS OF ALTERNATIVE 5: EMPHASIZE OPPORTUNITIES FOR SOLITUDE

Visitor Access: Trailhead quotas would be notably reduced from current levels. Existing destination quotas would be discontinued; however, new destination quotas and day-use permits for popular destinations could be implemented in the future. With a reduction in trailhead quotas, visitors who failed to obtain a permit would be redirected to another, less-preferred trailhead, or choose to forego their trip in the parks' wilderness, resulting in an adverse effect on visitor use and experience.

Most trails would be maintained to their current class so that the broadest diversity of visitors can use them to seek solitude. A few trails would be designated hiking-only trails where there are known threats to sensitive resources. Since the majority of visitors use trails that would be maintained in a similar condition to their current class, there would likely be little influence on user destinations and travel in wilderness.

The number of trails closed to all stock use, and those closed to overnight stock use, would increase under this alternative, and all stock parties would be prohibited from traveling off-trail. Based on stock use and grazing reports, very few stock parties travel off trail. However, this prohibition still could have an effect on the geographic distribution of stock users concentrating them to trails open to stock use.

Visitor Restrictions: Areas where visitors are allowed to have campfires would increase under alternative 5 to 425,276 acres. Those visitors who wish to experience a campfire could use a larger area of wilderness, resulting in an effect on the geographic distribution of visitors. Those visitors who do not wish to camp within the sight or smell of a campfire would have fewer areas to camp under this alternative where they would not be affected by campfires.

This alternative would be similar to alternative 4 in that all food-storage boxes would be removed; however, under alternative 5 visitors have the option to provide a self-determined method to keep wildlife from accessing food or scented objects. The impacts would be the same as described for alternative 4: some visitors would adjust their wilderness visit based on this requirement, there could be an increase in human-wildlife interactions, and visitors could lose their food to wildlife.

Since all privies would be removed, cat-holes, or pack-out waste kits where cat-holes are not feasible, would be required to manage human waste in wilderness. This may adversely affect the experience of those who use these facilities. In the highest use areas, removal of these facilities could result in adverse effects on a visitors' wilderness experience.

On- and off-trail party size limits would be reduced for hikers and stock groups. Based on current hiker- and stock-party size, this would not affect the majority of users.

Grazing would no longer be allowed in off-trail areas closed to stock use, and some additional meadows would be closed to grazing. Since the number of stock per party would also be reduced, this may further limit where stock parties could travel due to the need to carry feed.

Condition of Wilderness: Campsite conditions would continue to improve as a result of restoration actions, removal of designated campsites, night limits, group size limits, and the removal of facilities. The increased area where campfires would be permitted could result in a decrease in campsite conditions.

Areas with concentrated stock and visitor use would continue to have the sights, smells, and signs of that use (e.g., trampled vegetation, informal trails, manure on trails, or litter). However, the reduction in visitor use overall under this alternative would result in fewer sights, smells, and signs of visitor use throughout the wilderness. This would be most noticeable in busy areas where use would be reduced from current conditions. Visitors who wish to see ungrazed meadows would have more opportunities to do so under this alternative, as grazing off-trail would be eliminated and some additional meadows would be closed to grazing near trails; this could improve their wilderness experience.

Visitor-related Facilities: All food-storage boxes and privies would be removed wilderness-wide. For some visitors, these facilities enhance their recreational experience by providing a desired convenience; for others, they detract from the wilderness experience by reducing wilderness' primitive quality. Thus, their removal would result in adverse effects on some visitors' experiences and beneficial effects on other visitors' experiences.

Grazing-related structures in wilderness would be reduced. This would adversely affect some stock users who rely on those facilities to confine their stock; but, stock visitors could still use and experience these areas with alternative methods of confinement. Visitors that have expectations of using these facilities would benefit where these facilities remain and would be adversely affected in areas where these facilities are removed. Visitors who do not wish to have these facilities in wilderness would continue to be adversely affected, but there would be a slight benefit to these visitors from the reduction of the number of facilities overall.

Availability of Commercial Services: Per the specialized Wilderness Act finding to determine the "extent necessary" for commercial services in wilderness, commercial services would continue to be allowed under this alternative. However, the allocation of commercial support would be reduced to levels lower than those in the no-action alternative, in order to remain consistent with the overall reduction in visitor use under alternative 5. All visitors, including those that wished to engage in a stock-supported trip and those that wished to have introductory or educational experiences in wilderness travel or in particular wilderness activities would have greater difficulty obtaining overnight permits for popular trailheads. Once an overnight permit was obtained, the ability to arrange for commercial support would be comparable to the no-action alternative. The Bearpaw Meadow High Sierra Camp would be reduced in size and the season of operation would be shortened. The Pear Lake Ski Hut would be converted to a non-commercial warming hut operated by the NPS. Visitors who want to experience wilderness but who need additional support to do so may not be able to receive this support from commercial services.

Cumulative Effects: As explained in alternative 1, visitor use and experience have been affected by past and present actions, such as resource management and science projects, the NPS and USFS fire management program, the administration of the existing communications network within the parks, and the implementation of rules, regulations, and visitor-use restrictions in the parks and on adjacent USFS wilderness areas. In addition, visitors can be affected by frontcountry activities that enhance or restrict

access, such as the Generals Highway rehabilitation project (past, present, and future) and the existence of a transit system within Sequoia National Park.

The cumulative impacts of this alternative relate primarily to restrictions in access for commercial service providers. Past wilderness management plans for the adjacent USFS areas have already restricted commercial use in Inyo National Forest wilderness. Further restrictions imposed under this alternative wilderness-wide, with additional limits imposed in the Mount Whitney Management Area, would result in fewer opportunities for visitors to use commercial service providers to access the parks' wilderness.

This alternative would result in localized adverse and beneficial effects in the most popular areas. Considered together there would be no meaningful additive or interactive effects between these projects and the proposed actions under this alternative that would constitute a significant cumulative effect on visitors.

CONCLUSION

All alternatives allow for visitors to continue to use and experience the wilderness. The primary differences relate to access opportunities, visitor restrictions, the number and types of facilities, the wilderness condition, and the opportunity to experience wilderness using a commercial service provider.

Under alternative 1, visitors would continue to have opportunities to experience and use the wilderness. There would be no change to access opportunities, visitor restrictions, facilities, the condition of the wilderness, and commercial services.

Alternative 2 allows for continued access and use; however, in some popular areas visitor use could be affected by reduced trailhead quotas, destination quotas, or day-use quotas. Visitors would continue to have opportunities to experience the wilderness both on- and off-trail. Visitor restrictions would be slightly modified, and wilderness conditions would continue to improve in many areas. There would be fewer facilities. Visitors would continue to utilize commercial service providers to access most areas of the wilderness.

Alternative 3 could result in increased use wilderness-wide, improve the ease of access into wilderness, and add facilities that would either benefit or adversely affect the visitor experience depending on their expectations. There would be increased restrictions under alternative 3.

Alternative 4 would limit certain uses, eliminating grazing, campfires, and reducing commercial services. There would be a reduction in visitor-related facilities. Alternative 4 would result in an adverse visitor experience for those visitors wishing to use stock in wilderness because they would be required to carry in feed. Visitors wishing to view ungrazed meadows would benefit the most under this alternative. This alternative would result in decreased opportunities for visitors to use commercial service providers; however, visitors who wish to see reduced commercial services in wilderness would benefit under this alternative.

Alternative 5 results in the most change to the visitor use and experience resulting from the decreased access wilderness-wide. Fewer visitors would be able to access wilderness, which would result in beneficial effects for those visitors who gain access, but there would be adverse effects from reduced availability of wilderness permits. Stock would no longer be allowed to travel off-trail.

All of the alternatives have both adverse and beneficial effects on visitor use and experience, but overall impacts would not be significant.

PARK OPERATIONS

This section evaluates the impacts on park operations from the alternatives, including the potential for changes to workload, staffing levels, funding, and management facilities.

METHODOLOGY FOR ANALYZING IMPACTS

Impact analyses are based on the current description of wilderness-related park operations and infrastructure presented in chapter 3, and the ability to maintain the infrastructure used in the management of wilderness to adequately protect and preserve resources, and provide for an effective and safe employee environment and visitor experience. Resource-specific context for assessing impacts of the alternatives on park operations includes:

- the ability of the parks to operate within the constraints of the unit-specific budget and number of staff positions that have been allocated by congress and the NPS Director's office;
- the ability of park staff to provide for wilderness education, enforcement, and monitoring to protect wilderness character; and
- the ability of park staff to accomplish facility maintenance activities to protect wilderness resources.

IMPACTS COMMON TO ALL ALTERNATIVES

The majority of the actions proposed in the WSP/FEIS would have little effect on the parks' programs regardless of the alternative selected. The wilderness office would continue to be the principal public contact point for wilderness information and permit reservations. Wilderness and trailhead rangers would continue to patrol wilderness and provide education, enforcement, visitor assistance, and search and rescue. The Division of Interpretation, Education, and Partnerships would continue to play a large role in visitor perception, stewardship, and safety in wilderness. Resource management and science activities would continue to occur within wilderness. It is not anticipated that implementing any of the WSP/FEIS alternatives would have a measureable effect on the aforementioned programs.

The primary effects on park operations relate to changes in the permitting and quota system; the trails management program; the designation of campsites or the establishment of new camp areas; potential reductions or increases in wilderness management facilities; the management of stock use and related monitoring activities; changes in grazing restrictions; the management of commercial services in wilderness; modifications in frontcountry facilities; and, the implementation of the wilderness character monitoring program. The following section describes the effects that are generally common across all action alternatives.

Alternatives that would implement destination quotas and/or day-use permits would require increased levels of coordination between the wilderness office, trailhead staff, and wilderness rangers, along with additional information provided to the public about the new requirements.

There would be a change in the trails management program as a result of implementing the trail management and classification system. The general kind of activities undertaken would be the same under all alternatives, but the specifics would vary considerably. For instance, resources permitting, a Class 1 trail would be maintained only once every 3 to 4 years, a Class 2 trail would be maintained annually, and a Class 3 trail more than once a year. Each alternative calls for different class and design standards for specific trail segments. As these are often different from the existing conditions, each alternative would require a different list of construction and landscape restoration projects to transform the trail or trail

segment from the existing condition into the desired condition. Also, cultural surveys would be required prior to establishing new trails or relocating trail segments. The changes would be implemented as funding allows, so realizing the desired conditions would take more or less time based on the alternative selected. Fully implementing the trail management and classification system for trails management would not be an undue burden on existing park operations.

The placement of new facilities or designation of campsites would result in new disturbed areas that would require cultural surveys to ensure no archeological resources would be affected. The effects will be discussed within the analyses of the alternatives below.

Reduced or increased facilities in wilderness would result in changes in park operations. This would vary across alternatives. Fewer ranger stations would result in changes in the patrol function. Moving ranger stations to more appropriate locations for the patrol function would result in improvements to the patrol functions. Removing ranger stations could result in fewer personnel stationed in wilderness, increasing the patrol areas for the remaining wilderness rangers. It also could result in more trailhead-based patrols, which could limit the areas of patrol. Removing the long-term crew camps would result in changes in the trail maintenance program. Relocating, removing, or adding facilities would result in increased compliance requirements. Since the effects vary across the alternatives, they will be discussed in the following sections.

The management of stock use and meadow monitoring is common across all alternatives except alternative 4. Under alternative 4, there would not be grazing, but there would still be monitoring associated with general stock use (e.g., impacts from holding and feeding). Annual monitoring by the program would continue to be accomplished in cooperation with the wilderness ranger staff; plant ecologists would continue to provide technical oversight and field consultation.

Changes in grazing restrictions under all action alternatives would require some initial work to update information provided to the public, and to educate the public and commercial service providers. However, under the existing wilderness program, restrictions are adjusted every year, as is the information provided to the public. Therefore, implementation of the action alternatives is not expected to affect the current wilderness information program.

Those park operations that utilize stock would be affected by changes in the grazing restrictions and the new feed requirements. The impact would vary across alternatives, and be particularly adverse under alternative 4 because no grazing would be allowed. There could be additional costs involved with limited grazing and the purchasing of feed; however, the parks have been phasing in the feed requirement for several years, and there would be little difference in the costs with running the stock program from the purchasing of allowable feed under alternatives 2, 3, and 5. The effects from alternative 4 will be discussed separately.

The management of commercial services under all of the alternatives (including the no-action alternative) would affect the parks concessions management program, wilderness office, and data management program. There would be new reporting requirements from the commercial service providers and new data management demands for the parks to track and manage the allocations. Existing staff would have to be redirected to manage the program, or new staff would need to be hired.

Across all action alternatives there could be changes in the parks' frontcountry facilities. This would require site-specific planning, design, and compliance, contracting, and project oversight. The planning would be implemented as funding allows, so realizing the desired conditions would take more or less time based on the alternative selected. In addition, since the areas considered are already developed, there would be no additional maintenance needs at most of the facilities, except for the alternatives related to

stock use facilities. Facilities such as new pack stations and stock campsites would require additional monitoring and management oversight. Existing staff would need to be redirected to support these facilities, or new staff would need to be hired.

There is an ongoing program to monitor aspects of wilderness character, including the natural quality, visitor encounters, and campsite conditions. The existing program would be slightly modified under all of the WSP/FEIS alternatives (appendix C) to allow managers to monitor and mitigate effects more proactively. The plan would increase the staff time required to fully implement the program, increase the data management needs for the wilderness management program, and could result in increased staffing levels or a shift of duties of current staff to allow for full implementation.

IMPACTS OF ALTERNATIVE 1: NO-ACTION / STATUS QUO

This alternative would continue the status quo per the BMP and SUMMP. There would be no change to park operations from current conditions.

Cumulative Effects: There are a number of past, present, and future foreseeable projects that have affected or may affect park operations. Past planning efforts, such as the GMP, established goals and objectives for overall parks management. Implementation plans are tiered to the GMP and require staff time. Ongoing planning efforts, such as the high-elevation aquatics ecosystem restoration plan and frontcountry development plans, may result in increased workload for park staff as plans are being prepared. As plans are completed, there are long-term implications; funding and staff may be redirected to support the implementation of the plans. The overall goal with all planning efforts is to have achievable results.

Other considerations include ongoing budget and staffing constraints. Past budget cuts have resulted in reduced staffing levels parks-wide. Some park projects have been postponed or cancelled due to budget and staff limitations.

Since this alternative proposed no changes to the management of wilderness, there would be no significant cumulative impacts on park operations associated with the alternative.

IMPACTS OF ALTERNATIVE 2: PROTECT WILDERNESS CHARACTER BY IMPLEMENTING SITE-SPECIFIC ACTIONS (NPS PREFERRED ALTERNATIVE)

Additional destination quotas and day-use permits could be implemented under this alternative. This would require staff time to develop, implement, and manage the system. This would be accomplished by modifying existing staff priorities and/or hiring seasonal staff to assist with managing this program.

This alternative would modify the existing trails management program, but should not result in undue burdens on park operations. Most park trails are already designed and constructed to provide for appropriate access while preserving wilderness character. A few existing trail segments would be targeted for further development. Some “designated unmaintained routes” listed in the 1986 SUMMP would be designated as Class 1 trails and targeted for appropriate construction and maintenance. Other “designated unmaintained routes” would be abandoned and landscape restoration considered. All this work would be planned and implemented under existing funding strategies, including obtaining project–specific funding, with consideration of workload and staff. There would be no measurable effect on park operations.

The addition of designated campsites that could occur under this alternative would result in short-term effects on park operations as work is being planned and conducted. However, as stated previously, projects would be implemented as funding and workload allows, so there would be no undue burden on

existing park operations. There would be a slight long-term adverse effect as more staff time would be required to manage the reservation program for areas with destination quotas.

Stock access and grazing restrictions would be modified under this alternative. The modifications would have no long-term effect on park operations. Administrative stock would continue to comply with the grazing restrictions. The pastures would remain under this alternative; therefore, there would be no effect on park operations from closing pastures. The new feed requirement would add cost to the parks' stock operations; however, the parks have been phasing this in for several years, and thus fully complying with the requirement would not be an undue burden on park operations.

Most of the ranger stations and crew camps would remain in place under this alternative; locations could change for two stations. One administrative tent platform would be removed and converted to an administrative camp area. Some installations could be removed from administrative camps. The Redwood Canyon Cabin would be retained but the adjacent installations would be removed. During project planning and implementation there would be increased workload for the parks' staff in the short-term; however, there would be no long-term effect on wilderness ranger and trail crew operations.

There could be short-term adverse effects during the removal of food-storage boxes and privies as crews would be diverted from other duties for project implementation. If new privies are constructed in close-in areas or at Rock Creek, the project planning, compliance, and implementation would occur as funding allows, and would not result in an undue burden on existing park operations.

Changes in the commercial services program would require the parks' staff to modify use limits, establish use areas, and then allot the use and administer, monitor, and enforce the restrictions. This would result in an increased workload in the long-term for the concessions management office, wilderness office, and other staff to manage data to track use.

Wilderness character monitoring would continue under this alternative but could be modified by future planning efforts (see appendix C). Fully implementing the wilderness character monitoring program to track encounters, monitor campsite impacts, and other monitoring associated with this program would result in staff being redirected from other duties, and/or hiring additional seasonal staff or using volunteers. This would result in an increased workload for wilderness rangers, trailhead staff, resource and wilderness office staff, and others to manage this program.

The concessions office, the wilderness office, and other staff, would be responsible for managing the commercial services program under all alternatives. Staff would need to be redirected or additional staff would be required to manage the permitting, reporting, and data management for this program.

Modifications to frontcountry facilities would require park staff involvement in site-specific planning, design, and compliance; contracting; project oversight; and maintenance and monitoring of the sites. As stated under "Impacts Common to all Alternatives," these actions would be implemented as funding allows and would not result in an undue burden on existing park operations in the short term. If campsites are added to the Cedar Grove pack station, and other campsites are converted to allow stock camping, these areas too would require additional management and monitoring to ensure the protection of park resources. This would require redirecting staff from other duties, or hiring additional seasonal staff (as these would be seasonal operations).

Cumulative Effects: As stated under alternative 1, there are a number of past, present, and future foreseeable projects that affect park operations. This WSP/FEIS was developed in consideration of these plans. After initial changes to the wilderness-related programs, this alternative would result in impacts that are not substantially different from the no-action alternative. There would be both adverse and

beneficial effects. Considered together there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect on park operations.

IMPACTS OF ALTERNATIVE 3: PROVIDE MORE OPPORTUNITIES FOR PRIMITIVE RECREATION

There would be increases in quotas for all trailheads, but this action would have no effect on park operations. There would be no additional destination quotas and no day-use permits implemented under this alternative. Therefore, this alternative would have fewer effects on the wilderness office than the other action alternatives.

Similar to alternative 2, this alternative would modify the existing trails management program. Alternative 3 would result in the most changes to the trails management program when compared with the other alternatives, as more trails would be designated as Class 3 trails, which require the highest amount of development and maintenance. However, as with the other alternatives, all work would be planned and implemented under existing funding strategies with consideration of workload and staff. Therefore, there would be no measurable effect on park operations.

The addition of designated campsites, along with the construction of associated facilities such as privies and the placement of additional food-storage boxes, would result in short-term effects on park operations as work is being planned and conducted. Projects would be implemented as funding and workload allows, so there would be no undue burden on existing park operations with the development of the sites. There would be a long-term adverse effect as more staff time would be required to manage the reservation program if destination quotas are implemented.

Stock access and grazing restrictions would be modified under this alternative. The modifications would have no long-term effect on park operations. Administrative stock would continue to comply with the grazing restrictions. The pastures would remain under this alternative; therefore, there would be no effect on park operations from closing pastures. The new feed requirement would add cost to the parks' stock operations; however, the parks have been phasing this in for several years and fully complying with the requirement would not be an undue burden on park operations.

All of the ranger stations and crew camps would remain in place under this alternative; six stations could be relocated to allow for more effective patrols. The relocation of the ranger stations and the establishment of new crew camps would require site-specific planning and compliance, adding to the existing workload of park staff in the short-term. In the long-term the relocation of ranger stations would lead to more a more effective patrol function. The additional crew camps would allow for a more effective trails management program. The Redwood Canyon Cabin would be retained, which could result in existing or expanded levels of research to continue in the area. This would also require the NPS to oversee this facility, potentially resulting in increased management and maintenance.

Changes in the commercial services program would require park staff to modify use limits, establish use areas, and then allot the use and administer, monitor, and enforce the restrictions. This would result in an increased workload in the long-term for the concessions management office, wilderness office, and other staff to manage data to track use.

Wilderness character monitoring would continue under this alternative. Fully implementing the wilderness character monitoring program to track encounters, monitor campsite impacts, and other monitoring associated with this program would result in staff being redirected from other duties, and/or hiring additional seasonal staff or using volunteers. This would result in an increased workload for

wilderness rangers, trailhead staff, resource and wilderness office staff, and others to manage this program.

Modifications to frontcountry facilities would require the parks' staff involvement in site-specific planning, design, and compliance; contracting; project oversight; and maintenance and monitoring of the sites. As stated under "Impacts Common to all Alternatives," these actions would be implemented as funding allows and would not result in an undue burden on existing park operations in the short term. If commercial pack stations are reopened at Wolverton and Mineral King, the concessions office would be charged with managing additional concessions contracts, and park staff would be responsible for monitoring the facility to assure that permit conditions are being achieved. If public stock campsites are added to the pack stations, and other campsites are converted to allow stock camping, these areas too would require additional management and monitoring to ensure the protection of park resources. This would require redirecting staff from other duties, or hiring additional seasonal staff (as these would be seasonal operations).

Cumulative Effects: As stated under alternative 1, there are a number of past, present, and future foreseeable projects that affect park operations. This WSP/FEIS was developed in consideration of these plans. After initial changes to the wilderness-related programs, this alternative would result in impacts that are not substantially different from the no-action alternative. There would be both adverse and beneficial effects. Considered together there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect on park operations.

IMPACTS OF ALTERNATIVE 4: EMPHASIZE UNDEVELOPED QUALITY AND NON-COMMERCIAL RECREATION

As in alternative 2, additional destination quotas and day-use permits could be implemented under this alternative. There would be an overall reduction in trailhead quotas. This would require staff time to develop, implement, manage, and communicate the changes to the public. This would be accomplished by modifying existing staff priorities and/or hiring seasonal staff to assist with managing this program.

This alternative would result in the lowest level of developed trails (fewer Class 3 trails than alternatives 2, 3, and 5). Some "designated unmaintained routes" listed in the 1986 SUMMP would be designated as Class 1 trails and targeted for appropriate construction and maintenance. Other "designated unmaintained routes" would be abandoned and landscape restoration considered. This alternative could also result in the removal of several trail bridges. All work would be planned and implemented under existing funding strategies with consideration of workload and staff; therefore, there would be no measurable effect on park operations.

The designated campsites would be removed under this alternative, and no new sites would be designated. This would result in reduced workload for the parks' staff who oversee this program.

This alternative would modify the administrative stock program more than any other alternative. Due to the closure of wilderness to grazing, the administrative stock program would need to be modified greatly. No longer would the program be able to utilize meadows and pastures as staging areas for wilderness maintenance and ranger operations. All feed would need to be carried in by stock or by helicopter, if determined to be the minimum required for the administration of wilderness; this would add costs to the program and could result in a reduction in administrative use of stock.

This alternative would result in a change to the meadow management and monitoring program. Though grazing would not be allowed in wilderness, there would be new monitoring required at "hold and feed"

areas to assure that unacceptable impacts are not occurring. Also there would be increased education and enforcement needed to implement the no grazing policy.

This alternative would result in the lowest level of development. There would be short-term effects on park operations due to increased workload during the project planning, compliance, and the implementation phase. The removal of historic structures would require additional compliance and planning, including the development of memorandums of understanding with the SHPO for actions resulting in adverse effects on cultural resources. Additional staff support may be needed to accomplish this work. Facilities would be removed, as funding and workload allows, so there would be no undue burden on existing park operations.

As facilities are removed, there would be decreased long-term maintenance required for their upkeep. There could be short-term adverse effects during removal operations as staff would be diverted from other duties, or additional staff would be hired to accomplish the removals. Certain facilities, such as ranger stations and crew camps, play an important role in wilderness management and protection. Without ranger stations and administrative camps, there would likely be a change in how the ranger patrols function. Fewer staff would be located in wilderness; instead they would be based out of the trailhead area, resulting in a decrease in ranger patrols. Without long-term trail crew camps, there would likely be reduced trail crew presence in wilderness and reduced levels of trail maintenance. Closing the pastures to administrative use would also affect the trails program, as they would not be able to base operations out of these pastures and would have to find new locations, and would be required to carry in all their feed.

The Redwood Canyon Cabin would be removed. During project planning and implementation there would be increased workload for the parks' staff in the short term. There could be reduced research in the Redwood Canyon area due to the lack of a support facility in the area.

There could be short-term adverse effects during the removal of food-storage boxes and privies as crews would be diverted from other duties for project implementation. This would not result in an undue burden on existing park operations.

Wilderness character monitoring would continue under this alternative. Fully implementing the wilderness character monitoring program to track encounters, monitor campsite impacts, and other monitoring associated with this program would result in staff being redirected from other duties, and/or hiring additional seasonal staff or using volunteers. This would result in an increased workload for wilderness rangers, trailhead staff, resource and wilderness office staff, and others to manage this program.

This alternative would limit commercial services in the frontcountry and wilderness more than the other action alternatives. There would be no additional commercial services at Wolverton and Mineral King, and reduced services at Cedar Grove. The commercial use at the Pear Lake Ski Hut and the Bearpaw Meadow High Sierra Camp would be discontinued. Changes in the commercial services program would require the parks' staff to modify contracts, use limits, establish use areas, and then allot the use and administer, monitor, and enforce the restrictions. This would result in an increased workload in the long-term for the concessions management office, wilderness office, and other staff to manage data to track use.

The alternative would result in the fewest modifications to frontcountry facilities, thus it has the smallest effect on park operations. As stated under "Impacts Common to all Alternatives," any actions would be implemented as funding allows and would not result in an undue burden on existing park operations in the short term.

Cumulative Effects: As stated under alternative 1, there are a number of past, present, and future foreseeable projects that affect park operations. This WSP/FEIS was developed in consideration of these plans. This alternative would result in the most adverse impacts when considered with the other action alternatives. The adverse effects would relate to changes in the wilderness ranger function, trails management program, and administrative stock use program. After initial changes to the wilderness-related programs, this alternative would result in impacts that are not substantially different from the no-action alternative. There would be both adverse and beneficial effects. Considered together there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect on park operations.

IMPACTS OF ALTERNATIVE 5: EMPHASIZE OPPORTUNITIES FOR SOLITUDE

Additional destination quotas and day-use permits could be implemented under this alternative. There would be an overall reduction in trailhead quotas. This would require staff time to develop, implement, manage and communicate the changes to the public. This would be accomplished by modifying existing staff priorities and/or hiring seasonal staff to assist with managing this program.

This alternative calls for most trails to be maintained at their current class, so there would not be undue burdens on park operations. Most park trails are already designed and constructed to provide for appropriate access while preserving wilderness character. Some "designated unmaintained routes" listed in the 1986 SUMMP would be designated as Class 1 trails and targeted for appropriate construction and maintenance. Other "designated unmaintained routes" would be abandoned and landscape restoration considered. All this work would be planned and implemented under existing funding strategies with consideration of workload and staff. Therefore, there would be no measurable effect on park operations.

The designated campsites would be removed under this alternative, and no new sites would be designated. This would result in reduced workload for park staff who oversee this program.

Stock access and grazing restrictions would be modified under this alternative. The modifications would have no long-term effect on park operations. Administrative stock would continue to comply with the grazing restrictions. The new feed requirement would also add cost to the parks' stock operations; however, the parks have been phasing this in for several years, and thus fully complying with the requirement would not be an undue burden on park operations.

This alternative would result in a reduced level of development. There would be short-term effects on park operations due to increased workload during the project planning, compliance, and the implementation phase. The preservation of historic structures under this alternative would result in fewer effects on park operations than alternative 4 due to reduced workload for the cultural resources program. Facilities would be removed as funding and workload allows so there would be no undue burden on existing park operations.

Four ranger stations would be removed under this alternative. All installations would be removed from administrative camps. There could be short-term adverse effects during removal operations, as staff would be diverted from other duties or additional staff would be hired to accomplish the removals. Certain facilities, such as ranger stations and crew camps, play an important role in wilderness management and protection. With fewer ranger stations and no administrative camps, there would likely be a change in how the ranger patrols function. Fewer staff would be located in wilderness; instead they would be based out of the trailhead area, resulting in a decrease in ranger patrols. Also, without long-term trail crew camps, there would likely be reduced trail crew presence in wilderness and reduced levels of trail maintenance. Most pastures would remain open to administrative stock use under this alternative but

could be reduced in size; one pasture would be closed. Therefore, there would be a slight adverse effect on park operations from closing pastures.

The Redwood Canyon Cabin would be removed. During project planning and implementation there would be increased workload in the short term for the parks' staff; however, there would be no long-term effect on wilderness ranger and trail crew operations. There could be reduced research in the Redwood Canyon area due to the lack of a support facility in the area.

There could be short-term adverse effects during the removal of food-storage boxes and privies as crews would be diverted from other duties for project implementation. This would not result in an undue burden on existing park operations.

Wilderness character monitoring would continue under this alternative. Fully implementing the wilderness character monitoring program to track encounters, monitor campsite impacts, and other monitoring associated with this program would result in staff being redirected from other duties, and/or hiring additional seasonal staff or using volunteers. This would result in an increased workload for wilderness rangers, trailhead staff, resource and wilderness office staff, and others to manage this program.

This alternative would result in approximately the same types of commercial services in the frontcountry and wilderness as currently exists. However, the changes in how the wilderness commercial services are managed would require the parks' staff to modify permits, use limits, establish use areas, and then allot the use and administer, monitor, and enforce the restrictions. This would result in an increased workload in the long-term for the concessions management office, wilderness office, and other staff to manage data to track use.

Frontcountry facilities would be similar to current conditions, thus there would be no change to park operations.

Cumulative Effects: As stated under alternative 1, there are a number of past, present, and future foreseeable projects that affect park operations. This WSP/FEIS was developed in consideration of these plans. After initial changes to the wilderness-related programs, this alternative would result in impacts that are not substantially different from the no-action alternative. There would be both adverse and beneficial effects. Considered together there would be no meaningful additive or interactive effects among these projects and the proposed actions under this alternative that would constitute a significant cumulative effect on park operations.

CONCLUSION

All of the action alternatives would result in both beneficial and adverse effects on park operations. The highest potential for adverse impacts on park operations would result from the lack of management facilities such as ranger stations and crew camps, and the inability to graze stock. All alternatives would result in limited adverse effects on park operations related to the wilderness character monitoring program and the additional requirements of the commercial services monitoring and database management program. Overall, impacts on park operations would not be significant.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

In accordance with NEPA and as further explained in Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision-making* (DO-12), consideration of long-term impacts and the effects of foreclosing future options should pervade any NEPA document. According to DO-12, and

as defined by the World Commission on Environment and Development, "sustainable development is that which meets the needs of the present without compromising the ability of future generations to meet their needs." For each alternative considered in an EIS, considerations of sustainability must demonstrate the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity. This relationship is described below for each alternative.

The NPS must consider if the effects of the project alternatives involve tradeoffs in the long-term productivity and sustainability of park resources for the immediate short-term use of those resources. It must also consider if the effects of the alternatives are sustainable over the long term without causing adverse environmental effects for future generations (NEPA section 102(c)(iv)).

Under all of the alternatives, Sequoia and Kings Canyon National Parks would continue to be protected and would continue to be used by the public. The NPS would continue to manage the parks under all the alternatives to maintain ecological processes and native and biological communities, and to provide for appropriate recreational activities consistent with the preservation of wilderness character.

THE RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

All of the alternatives would protect wilderness character in the long-term while providing recreational opportunities for wilderness visitors. Three types of wilderness use by visitors stand out as having the potential to create long-term losses of productivity of wilderness resources if improperly managed. These are camping use, firewood collection, and stock grazing. For each of these uses, the action alternatives propose management approaches that ensure that these uses occur sustainably, and that similar use by future generations is not jeopardized.

Camping use involves localized impacts to soils and vegetation, particularly in frequently used areas, that can result in long-term losses in productivity if camping impacts are not properly monitored and managed. Under all of the action alternatives there are limits placed on campsite condition that ensure that the amount of visitor camping use at particular locations does not exceed the capacity of that area to support camping use in the long term.

Firewood collection, if conducted in excess of downed wood production, can result in a depletion of ground fuels. In some locations this downed wood is also a paleontological resource that, if destroyed, cannot be replaced within a meaningful time frame (i.e., some downed wood resources are thousands of years old). In order to ensure that firewood use is sustainable in the long term while protecting these important resources, all action alternatives propose either elevational limits on campfire use coupled with site-specific campfire closures, or ban campfires altogether (alternative 4). These approaches ensure that campfire use, where permitted, can be conducted sustainably.

Stock grazing is also managed so that this use can occur sustainably without long-term impacts to meadow resources. All of the action alternatives either limit the location, timing, and intensity of grazing by stock, or ban stock grazing altogether (alternative 4). Estimated grazing capacities for wilderness meadows have been developed using a model of biomass production and forage consumption that takes into account the elevation, soil moisture, and condition of the meadow. The capacity of individual meadows and uplands to sustain grazing would continue to be informed by each meadow's vulnerability to erosion or change in hydrologic function, susceptibility to invasion by nonnative plants, habitat requirements of sensitive plants and animals, productivity and the ability to sustain herbage removal, and the requirements of unique ecological communities such as peat-accumulating wetlands. These site-specific grazing capacities would be refined on an ongoing basis to protect resource integrity and to protect the natural quality of wilderness in the face of a changing climate.

The methodology for developing grazing capacities for all the parks' meadows open for grazing is provided in appendix D.

Adverse Impacts that Could Not be Avoided: Even though stock grazing would be managed so that this use can occur sustainably without long-term impacts to meadow resources, where allowed, adverse grazing impacts on vegetation, soils, and wildlife would be measurable on a local scale, but would not be expected to result in significant, long-term changes in ecological structure, function, or composition at the landscape or population scale. Alternatives 2 and 5 would result in decreased impacts from trampling and grazing over those occurring under current conditions. Alternative 3 could produce slightly elevated impacts over current conditions. Alternative 4 would eliminate effects from trampling and grazing in meadows throughout the parks' wilderness.

The proposed stock management policies, including protection of natural processes, visitor education, and restrictions on amounts and extent of grazing and access, would continue to protect wetland and meadow systems throughout wilderness. The majority of wetlands and meadows would remain generally undisturbed, with localized exceptions associated with foot traffic and stock use along trail corridors and in those areas used for grazing. Although grazed meadows would be expected to exhibit some differences in productivity, cover, and composition relative to ungrazed meadows, these differences would not be expected to lead to significant long-term changes in productivity, structure or wetland function. Grazing would continue to be routinely monitored to ensure that impacts to vegetation were kept within acceptable levels, impacts to soils remained localized and would not lead to accelerated rates of erosion, and that new introductions of nonnative species were detected and responded to appropriately. The location, timing, and intensity of grazing would be managed to mitigate impacts on wildlife, ensuring that grazing did not result in significant adverse effects on wildlife populations.

A complete discussion of grazing and meadow management is contained in appendix D.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

The NPS must consider whether the effects of the alternatives are irreversible or irretrievable commitments of resources. Irreversible impacts are those effects that cannot be changed over the long term or are permanent. Irretrievable commitments are those resources that, once gone, cannot be replaced.

Several of the alternatives would involve the removal of historic structures that could not be replaced. Specifically, alternatives 2, 3, 4, and 5 would remove or replace the Bearpaw Meadow Ranger Station. Alternative 4 would also remove the entire Bearpaw Meadow High Sierra Camp, the Redwood Meadow Ranger Station, Simpson Meadow patrol cabin, and the Tyndall Ranger Station. While these actions would reduce development in wilderness, the loss of these historic structures would be permanent and an irretrievable commitment of the parks' resources.

Concern has been expressed about the reversibility of impacts associated with stock grazing. Alternatives 1, 2, 3, and 5 would allow for the continuation of grazing by administrative and recreational stock. At very high grazing levels, such as those due to cattle and unrestricted saddle and pack stock grazing which occurred before the establishment of the parks, some meadows were irreversibly impacted due to the formation of deep gullies, destabilization of stream banks, the destruction of sods, and the intentional introduction of non-native forage species. However, the levels of use proposed under the alternatives that allow grazing are orders of magnitude below the levels that occurred before the establishment of the parks. Under all alternatives that permit grazing, impacts will be limited to a level that is reversible by the cessation of grazing. Under all alternatives, the management framework will ensure that stock use practices are modified if changes in the susceptibility to erosion, changes in hydrologic regimes, or other

irreversible changes begin to occur. Continued monitoring of the system response to grazing will ensure that the use levels in the plan are meeting these standards.

Chapter 5

Consultation and Coordination

ON THE PREVIOUS PAGE
Giant sequoia grove
Photo Courtesy of Steven Bumgardner

CHAPTER 5: CONSULTATION AND COORDINATION

This chapter summarizes the consultation and coordination efforts undertaken for the WSP/FEIS. The plan is being developed in accordance with the NEPA and the implementing regulations developed by the Council on Environmental Quality (CEQ; 40 CFR 1508.22), which require diligence in involving any interested or affected members of the public in the planning process. Compliance with the National Historic Preservation Act (NHPA) is integrated into the NEPA compliance process, using the NHPA section 106 review process to coordinate the evaluation of effects on cultural resources.

Throughout the planning process, park staff encouraged elected officials, culturally associated American Indian tribes and groups, partners in other agencies, park visitors and neighbors, gateway communities, and private citizens, to participate in this planning effort, as summarized below.

THE SCOPING PROCESS

Scoping is an effort to involve agencies and the public in determining the scope of issues to be addressed in an environmental document. It includes consultation with all interested parties and any agency with jurisdiction by law or expertise. Scoping, among other purposes:

- determines important issues and eliminates those that are unimportant;
- allocates assignments among the interdisciplinary team members;
- identifies related projects and documents;
- identifies the need for other permits, data collection, consultation, etc.; and
- helps to determine a schedule that allows for adequate time to prepare and distribute the environmental document for review by all interested parties before a final decision is made.

In 1996, the NPS launched a public-involvement effort to kick off a comprehensive wilderness-planning effort. Several public scoping workshops were hosted, and six internal workshops were held with park employees, to gather information on issues and desired conditions in wilderness. In the spring of 1997, the parks announced the intent to prepare an EIS for a wilderness-management plan (a Notice of Intent was published April 30, 1997, in the Federal Register 23482). This was followed by the development and distribution in May 1998 of a "wilderness workbook" designed to obtain feedback from the public about wilderness issues, concerns, and possible management solutions (NPS 1998a).

However, after receiving national guidance on planning priorities, park staff determined that the wilderness planning process would be suspended until a General Management Plan (GMP) was prepared for the parks. This intensive process was initiated in October 1997 and culminated with a Record of Decision in September 2007. Large-scale wilderness issues were incorporated into the GMP (NPS 2007a), and these provide broad direction for the WSP. The GMP also reaffirmed the need to develop a wilderness plan.

Formal internal scoping for the WSP/DEIS was initiated in March 2011. This process involved discussions among NPS personnel and the interdisciplinary planning team (IDT) regarding the purpose of and need for the management actions and management issues and concerns. An internal scoping meeting was conducted on March 9, 10, and 11, 2011, with the Leadership Team (the parks' superintendent and division chiefs), park staff representing all park divisions, the NPS Environmental Quality Division, and contractor personnel in attendance. The internal scoping meeting included information on the process and background of NEPA, a presentation of wilderness legislation and management concerns, information on

the parks' resource conditions, the wilderness character assessment process, and current research efforts. Participants identified the purpose of and need for action and suggested management issues that could be addressed in the WSP/DEIS.

The public was notified of the upcoming scoping period and public meetings for the WSP/DEIS first in a March 30, 2011 letter sent by U.S. Postal Service mail and email to individuals, businesses, interest groups, agencies, and tribal groups. A scoping newsletter providing a description of the need for action, goals of the scoping process, and information on the planning process was sent on April 11, 2011. Subsequent news releases were distributed on April 20, 2011, and May 5, 2011, to remind the public about public scoping meetings and opportunities. Scoping was officially initiated with the April 26, 2011, publication of the Notice of Intent to prepare an EIS (Federal Register 23335).

Five public scoping meetings were held in California in 2011: Fresno (April 25), Oakland (April 26), Bishop (April 27), Los Angeles (April 28), and Visalia (April 29). Each meeting began with a presentation on the history of the parks, wilderness legislation, the significance of the parks, the purpose and need for the WSP/DEIS, potential issues and concern, and the planning processes. After the presentation, NPS staff was on hand to discuss attendees' issues and concerns, and to answer questions.

A total of 108 individuals attended the public scoping meetings.

- Fresno – 11 attendees
- Oakland – 20 attendees
- Bishop – 18 attendees
- Los Angeles – 14 attendees
- Visalia – 45 attendees

In addition, park staff provided information and received input on the WSP/DEIS at agency meetings with the Sequoia National Forest and Sierra National Forest staff on April 26, 2011, with Inyo National Forest staff on April 28, 2011, and with Yosemite National Park staff on December 5, 2011. Information on the WSP/DEIS was provided to the attendees at the Sierra and Sequoia Tribal Forum Meetings on May 12, 2011, and June 8, 2011, respectively, and an update on the WSP/DEIS planning process was provided to the Sierra Nevada Native American Coalition on February 12, 2012.

The public was invited to submit comments on the scope of the project and potential issues and concerns related to wilderness management through July 25, 2011. On July 14, 2011 the deadline for comments was extended to August 31, 2011. Information about the project scoping was published in the Kaweah Commonwealth (April 15, July 22, August 19, 2011) and Inyo Register (May 10, 2011), and included on several public websites: National Parks Traveler website (April 4, 2011); High Sierra Topix (April 20, 2011); and Sierrawild.gov (July 25, 2011). The public were able to submit their comments on the project using any of the following methods:

- electronically through the NPS Planning, Environment, and Public Comment (PEPC) website;
- in person at the public meetings; and
- by mailing comments to the NPS.

During the entire scoping process, 912 pieces of correspondence were received from 41 states and 4 countries (Australia, Germany, Slovakia, and the United States). All comments were read and analyzed; similar comments were grouped together and concern statements were developed to reflect the public

sentiment for specific topics. Numerous commenters were concerned about issues that have been under discussion for years while others brought forward new wilderness management considerations and ideas. The full text of the public scoping comments and the Public Scoping Comment Summary Report are both available on the NPS PEPC website at: http://parkplanning.nps/sekiwild.

The NPS considered the issues raised during public scoping as they developed the preliminary draft alternatives. These preliminary draft alternatives were developed with a goal of maintaining or improving wilderness character while providing for a diversity of appropriate activities. Because of the complexity of the alternatives, the NPS determined it appropriate to conduct an additional public review period to allow the public the opportunity to provide feedback on the preliminary draft alternatives. On July 16, 2012, the parks provided a news release to 161 area media outlets announcing the upcoming public review of preliminary draft alternatives. A postcard announcing the impending public comment period and public meetings was sent (403) or emailed (921) to individuals, businesses, interest groups, and agencies, and provided to 64 area tribes and tribal groups.

On October 25, 2012, the parks released the preliminary draft alternatives for the WSP/DEIS for public review. The review period ended November 19, 2012. During the 2012 comment period, NPS held five public meetings in California: in Bishop (October 25), Los Angeles (October 26), Oakland (October 29), Visalia (October 30), and Three Rivers (November 5), California. These meetings presented information on the purpose and need for the WSP/DEIS, background on the parks' wilderness and planning process, wilderness legislation, concepts and elements of the alternatives, topics common to all alternatives, and the planning timeline in a formal presentation. After the presentation, NPS staff was available to discuss attendees' questions and concerns.

A total of 93 individuals attended the public alternatives scoping meetings:

- Bishop – 15 attendees
- Los Angeles – 4 attendees
- Oakland – 18 attendees
- Visalia – 36 attendees
- Three Rivers – approximately 20 attendees (a specific count of attendees is not available because the public meeting was incorporated into the monthly Three Rivers Town Hall meeting and no sign-in sheet was used)

The public was able to submit their comments on the project using any of the following methods:

- electronically through the NPS PEPC website;
- in person at the public meetings; and
- by mailing comments to the NPS.

Information on the comment period and public meetings was published in the Kaweah Commonwealth on July 20 and November 16, 2012, and also included on several websites: National Park Traveler (July 27, 2012); Clovis Independent (July 19, 2012); Mineral King District Association website (July 16, 2012); Yosemite News website (July 19, 2012); and the George Wright Society website (July 27, 2012).

All comments received through November 26, 2012, were incorporated in the public alternative scoping process. A total of 201 pieces of correspondence providing feedback on the preliminary draft alternatives were received. All comments were read and analyzed. Similar to the Public Scoping Comment Summary

Report, public comments on the preliminary draft alternatives were grouped by similar topics, and concern statements were developed to capture the essence of the comment. The topics that received the majority of comments were stock use, grazing, commercial services, and zoning. Additional information about the numbers and type of comments received, a list of organizations that commented, and a summary of comment material can be found in the Preliminary Draft Alternatives Public Comment Summary Report available on the NPS PEPC website at http://parkplanning.nps.gov/sekiwild.

Information from the public review of the preliminary draft alternatives was used by the project IDT to update and clarify the final draft alternatives included in the WSP/DEIS.

RELATED PRODUCTS

In November 2011, the parks initiated a wilderness-character assessment. The information for the assessment was compiled through ranger surveys, a wilderness character workshop (November 18, 2011), interviews (November 16–23, 2011), and public comments from both the 1997/98 and 2011 public scoping periods for the WSP. In April 2012, the parks prepared a draft wilderness character assessment which includes the history of wilderness character at the parks, and describes the qualities that define the wilderness character. The assessment outlines the attributes of the parks that contribute to it being untrammeled, natural, undeveloped, providing opportunities for solitude or primitive and unconfined recreation, and other features relevant to wilderness character. In addition to describing the special characteristics of the parks' wilderness, this assessment also identifies actions or conditions which are degrading or improving wilderness character. While not an exhaustive catalog, it identifies major issues and potential trends in wilderness character. The Wilderness Character Assessment was completed in early 2014; the report can be found on the NPS PEPC website under "Supporting Documents."

From May 1 to May 3, 2012, the parks held a visitor capacity workshop, facilitated by a NPS national visitor-use team, with the IDT, park staff, and invitees including USFS and U.S. Geological Survey (USGS) representatives to discuss visitor-use management. The goal of the workshop was to develop a long term strategy for visitor use and capacity management in order to protect wilderness character. The workshop included a review of visitor-use issues, a process to prioritize measures topics, and the development of tentative standards and management strategies that could be integrated into the WSP/DEIS alternatives. The draft visitor capacity framework is included as appendix A.

On September 14, 2012 members of the IDT and other staff from the parks met to begin work on a Wilderness Character Mapping project, which identifies key measures that affect the qualities of wilderness character and assesses these measures spatially, to assist in informing the WSP/DEIS. This project was conducted under the direction of the USFS Aldo Leopold Wilderness Research Institute. Subsequent meetings with the Wilderness Character Mapping Team occurred on November 6, 2012; January 14–15, 2013; and January 25, 2013. The *Mapping Wilderness Character in Sequoia and Kings Canyon National Parks* report was completed in early 2014 (Tricker et al. 2014); the report can be found on the NPS PEPC website page under "Supporting Documents."

On June 2012, members of the IDT plus key staff from visitor/resource protection, concessions management, and the superintendent's office initiated the process to determine which commercial services are appropriate in wilderness and to what extent they would be authorized. This process was concluded in March 2014. The draft Extent Necessary Determination is included as appendix B.

AGENCY AND TRIBAL GOVERNMENT SCOPING AND REVIEW

Agency and tribal government scoping was held in an effort to obtain early input on the scope of issues to be addressed in this WSP/http://www.boredpanda.com/loch-ness-monster-soup-ladle-ototo/. A summary of agency and tribal government scoping is presented below.

AGENCY SCOPING

Agency scoping meetings for the WSP/DEIS were held on April 26, 2011, with representatives from the Sierra National Forest, Sequoia National Forest, and the U.S. Geological Survey, and on April 28, 2011, with Inyo National Forest and representatives from area tribes. Invited but not in attendance were representatives from the Bureau of Land Management, the U.S. Fish and Wildlife Service (USFWS), and Yosemite National Park. These meetings allowed each agency to present issues and concerns with the WSP/DEIS. The NPS provided a presentation and overview of the parks' wilderness, including a background and history of the parks, relevant legislation, the purpose and need for the WPS/DEIS, issues to address, and an overview of the parks' resources.

Agency scoping meetings were held on the WSP/DEIS preliminary draft alternative concepts on October 26, 2012, with representatives from Inyo National Forest, and on November 13, 2012, with representatives from Sequoia National Forest. This meeting allowed USFS representatives to present concerns and comments on the preliminary draft alternative concepts.

Representatives of the WSP IDT met with Yosemite National Park staff on December 5, 2011 and again on June 18, 2013 to discuss issues and concerns related to wilderness management, and to provide an update on the parks' WSP. The issues included developing coordinated approaches to wilderness management, and determining acceptable differences in management and planning approaches.

U.S. FOREST SERVICE

The NPS also invited the Inyo, Sierra, and Sequoia national forests to serve as cooperating agencies in the preparation and review of the WSP/DEIS. This cooperation is needed to achieve consistent management practices across agency boundaries so that wilderness regulations are easily understandable to the visiting public, and to coordinate the management of impacts associated with wilderness visitor use. Invitations were sent on May 16, 2011, to the Inyo, Sierra, and Sequoia national forests. The Inyo National Forest responded to the NPS on June 14, 2011, accepting the request to become a cooperating agency. The Sierra National Forest agreed to become a cooperating agency in a letter dated June 28, 2011. These letters can be found in appendix G.

Representatives from the Inyo National Forest participated in the WSP/DEIS visitor use capacity workshop in May 2012. The Preliminary Draft Alternatives were presented to the USFS on October 10 (Sequoia National Forest), October 22 (Sierra National Forest), and October 26 (Inyo National Forest), 2012. Updated alternatives and draft information was provided to the USFS for their review in July 2013. On February 27, 2014, the NPS met with the Inyo National Forest to discuss specific issues, including access and trails, permitting and quotas, and commercial services. All three national forests were provided with the WSP/DEIS for review and comment.

AREA TRIBES

The NPS has consulted with American Indian tribes and groups having a cultural association with the wilderness and the parks, as well as those in the immediate vicinity, throughout the development of the

WSP/DEIS. Consultation was initiated by Superintendent Karen Taylor-Goodrich in a March 17, 2011, letter to area tribes and tribal groups, inviting participation in the planning process and formal government-to-government consultation.

Information on the WSP/DEIS was provided to the attendees at the Sierra and Sequoia Tribal Forum Meetings on May 12, 2011, and June 8, 2011, respectively, and an update on the WSP/DEIS planning process was provided to the Sierra Nevada Native American Coalition on February 12, 2012. A presentation was provided at that time, along with an invitation to schedule meetings with individual tribes if they had issues to discuss related to wilderness management.

On October 3, 2012, the superintendent sent a letter to area tribes asking for their review on the preliminary draft alternatives, and inviting the tribes to participate in government-to-government consultations. During all of the review stages, NPS provided information to area tribes through mailings and presented the materials at area tribal meetings, including the Sequoia and Sierra National Forest tribal forum meetings (May 12, 2011, April 14, 2011, June 8, 2011, February 2, 2012, September 12, 2012, November 13, 2012, February 26, 2013, August 13, 2013, February 25, 2014 and August 19, 2014) as well as a tribal meeting of the Sierra Nevada Native American Coalition (Dunlap) on February 12, 2012. The NPS also invited area tribes to attend special agency and tribal meetings in Bishop, Fresno, and Visalia. Additional information was provided to the area tribes during the public review of the WSP/DEIS.

U.S. FISH AND WILDLIFE SERVICE

The Endangered Species Act of 1973, as amended (16 USC 1531 et seq.), requires all federal agencies to consult with the USFWS to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of listed species or critical habitat. The NPS notified the USFWS on March 30, 2011 that the planning process was going to be initiated and provided them with information on the preliminary draft alternatives on October 25, 2012. The updated species lists were obtained from the USFWS website on August 9, 2011, and again on February 28, 2014. The NPS submitted a biological assessment to the USFWS on October 15, 2014. The biological assessment is included at: http://parkplanning.nps.gov/sekiwild under “Supporting Documents.” The USFWS responded to the NPS on March 11, 2015 with concurrence that the WSP as proposed is not likely to jeopardize the continued existence of the northern distinct population segment of the mountain yellow-legged frog, the Sierra Nevada yellow-legged frog, and the Yosemite toad (included as appendix R).

STATE HISTORIC PRESERVATION OFFICE

Section 106 of NHPA requires that federal agencies take into account the effect of any proposed undertakings on properties that are listed, or eligible for listing, in the National Register. The process begins with identification and evaluation of cultural resources for national register eligibility, followed by an assessment of effects on eligible resources. This process includes consultation with the California State Historic Preservation Office (CA SHPO) and affiliated American Indian Tribes. Section 110 of the NHPA requires that federal land managers establish programs in consultation with the respective SHPO to identify, evaluate, and nominate properties to the National Register. This act applies to all federal undertakings or projects requiring federal funds or permits.

The NPS notified the CA SHPO on March 30, 2011, of the intent to prepare an EIS. The preliminary draft alternatives were provided to the CA SHPO on October 25, 2012. Consultation with the CA SHPO was formally initiated with the public release of the WSP/DEIS. A proposed area of potential effect (APE) and a determination of effect for the WSP were submitted to the CA SHPO on December 5, 2104. On March 6, 2015, the CA SHPO responded to NPS and concurred that the WSP is an undertaking and that the APE

would be sufficient to address both direct and indirect effects. Because identification efforts of cultural resources are currently incomplete, the NPS recommends developing a Programmatic Agreement through ongoing consultation with the SHPO, Advisory Council on Historic Preservation, Native American Tribes, and other interested parties. The CA SHPO concurs with this approach to take effects of the undertaking into account and complete the Section 106 process. This letter of concurrence is included as appendix S. Consultation with the SHPO will continue for the duration of the WSP planning and implementation period.

OTHER PARTNERS - CONCESSIONERS

Consistent with law (36 CFR 51.23) and agency policies (Directors Orders 48A and 48B), the NPS contracts with private businesses that offer a range of commercial services to the parks' visitors. Currently, the primary hospitality contract is held by Delaware North Companies Parks and Resorts at Sequoia and Kings Canyon National Parks. Delaware North Companies operates lodging, restaurants, sightseeing tours, recreational activities, interpretive programs, and stores in the parks under a contract with the U.S. Department of the Interior. Future concession contracts would be written to incorporate relevant terms and conditions of approved plans, including the WSP.

COMMERCIAL USE AUTHORIZATIONS

As authorized by law (36 CFR 5.3) and NPS Management Policies 2006 and Directors Order 53, the NPS issues commercial use authorizations to business entities that offer services to visitors that are not typically provided by the concessioner. Commercial bus operators, wilderness outfitters and guides, and other small businesses operate in the parks under the terms of commercial use authorizations. Commercial use in designated wilderness is limited in accordance with the requirements of the Wilderness Act, the Concessions Management Improvement Act of 1998, and NPS management policies (see the Extent Necessary Determination in appendix B).

Commercial service providers are important partners and provide access and visitor opportunities in wilderness. The NPS encourages commercial service providers to serve as educators to their clientele, and to provide wilderness training, such as Leave No Trace© training. Appendix H provides more information on the types of education that could be provided by commercial service providers.

PUBLIC REVIEW OF THE WSP/DEIS

A WSP/DEIS was available to the public, federal, state, and local agencies, tribes, and organizations for a 60-day public review period from June 27 to August 25, 2014. The NPS distributed the WSP/DEIS beginning June 26, 2014, and a Notice of Availability was published in the *Federal Register* on June 27, 2014. The NPS posted electronic copies of the WSP/DEIS to the NPS PEPC website on June 26, 2014. Printed or CD copies of the WSP/DEIS was provided to 236 interested parties on the parks' mailing list and to those who requested copies. A printed copy was provided to 18 area public libraries. In addition, a notice of availability of the WSP/DEIS was sent by email or regular U.S. mail to 1,870 people on the parks' mailing list, and to 53 commercial use authorization holders. A news release was distributed to 151 media outlets, and was placed on the parks' website.

The parks' staff presented elements of the WSP/DEIS at seven public meetings, including three informational meetings (in Oakland, Bishop, and Visalia), three meetings with focused discussions on the commercial service portion of the WSP/DEIS (Bishop and Visalia) and a webinar on the management preferred alternative. Total attendance at the public meetings was 79; 25 people viewed the webinar. The parks' staff also conducted meetings with Inyo and Sequoia national forest staff, and presented information at area tribal forum meetings. The public meeting schedule was as follows:

- July 8, 2014: Inyo National Forest headquarters, Bishop, CA
- July 9, 2014: Inyo National Forest headquarters, Bishop, CA
- July 15, 2014: Comfort Inn, Visalia, CA
- July 23, 2014: Richard Trudeau Training Center, Oakland, CA
- July 24, 2014: Eastern Sierra Tri-county Fairgrounds, Bishop, CA
- July 28, 2014: Visalia Marriott Hotel, Visalia, CA
- August 14, 2014: Webinar on Management Preferred Alternative

The NPS received public comment letters through the NPS PEPC system, by fax, U.S. mail, and hand delivery. The full text of public comment letters received can be viewed on the project website at: http://parkplanning.nps.gov/documentsList.cfm?projectID=33225. Personal information included with the comments (e.g., names and contact information) is redacted in the correspondence posted online to protect individuals' privacy. Information is included if the comment was submitted by agencies, tribes, businesses, and organizations.

During the 60-day public review period, the parks received 255 public comment letters: 212 from individuals; 4 from federal, state, county, or local governments; 1 from a non-governmental organization; 1 from a non-governmental organization; 23 from recreational or conservation-related interest groups; and 14 from businesses. The analysis of these letters identified 1,040 discrete comments, from which 240 concern statements were generated. The results of the public comment analysis process and the NPS responses to substantive public comments are provided in "Appendix Q: Public Comment Analysis Report." The changes to the WSP/DEIS resulting from public comment are summarized in chapter 1 of this WSP/FEIS.

LIST OF AGENCIES AND ORGANIZATIONS THAT RECEIVED A COPY OF THE FINAL WSP/EIS

The following is a list of the agencies, organizations, and businesses who received a printed copy, CD, or email or written notification of the WSP/FEIS.

United States Congressional Representatives

- Senator Barbara Boxer, California

  Office of Senator Boxer, Fresno – District Director Ameen Khan
- Senator Dianne Feinstein, California

  Office of Senator Feinstein – Field Representative Sarah Moffat
- Representative Kevin McCarthy, 23rd District, California

  Office of Representative McCarthy – Field Representative Keenan Hochschild
- Representative Tom McClintock, 4th District, California

  Office of Congressman McClintock, California – District Director Rocky Deal

Federal Agencies

National Oceanic and Atmospheric Administration: National Weather Service

Smithsonian Institution

U.S. Department of Agriculture:

- Natural Resource Conservation Service
- U.S. Forest Service:
  - Humboldt-Toiyabe, Inyo, Sequoia, Sierra, and Stanislaus national forests

U.S. Air Force: Edwards Air Force Base

U.S. Army: Fort Irwin

U.S. Army Corps of Engineers: Lake Kaweah, Pine Flat Lake

U.S. Department of Interior:

- Bureau of Land Management
- National Park Service:
  - Washington D.C. Office
  - Pacific West Regional Office
  - Death Valley, North Cascades, Pinnacles, Point Reyes, and Yosemite national parks Manzanar National Historic Site
- U.S. Fish and Wildlife Service:
  - Blue Ridge National Wildlife Refuge
  - Kern National Wildlife Refuge
  - Pacific Southwest Region, Sacramento Fish & Wildlife Office
- U.S. Geologic Survey: Sequoia/Kings Canyon, Yosemite field stations

U.S. Department of Transportation: Federal Aviation Administration

U.S. Drug Enforcement Administration

U.S. Environmental Protection Agency

U.S. Navy: Lemoore Naval Air Station

California State Government Representatives

- Governor Jerry Brown, State of California
- State Senator Jean Fuller, California
- State Assemblyman Jim Patterson, California

  Office of State Assemblyman Patterson – Alicia Wolfe, Field Representative
- State Assemblywoman Connie Conway, California

  Office of State Assemblywoman Conway – Stuart Anderson, Field Representative
- State Senator Tom Berryhill, California

County Government Representatives

Fresno County Board of Supervisors

Fresno County Office of Tourism

Fresno County Sheriff's Office

Inyo County Board of Supervisors

Inyo County Film Commission

Inyo County Sheriff's Office

Tulare County Board of Supervisors

Tulare County Civic Center

Tulare County Conservation District

Tulare County Environmental Health

Tulare County Sheriff's Office

Tulare County Resource Conservation District

City Government Representatives

City of Clovis, Business Manager

City of Dinuba, Deputy City Clerk

City of Fowler, City Clerk

City of Fresno, Communications Office

City of Hanford, City Manager

City of Kingsburg, City Clerk

City of Orange Cove, Mayor

City of Parlier, City Manager

City of Reedley, City Council

City of Reedley, Mayor

City of Sanger, Mayor

City of Selma, Executive Director

City of Tulare, City Manager

City of Visalia, Convention and Visitor Bureau

City of Visalia, Mayor

City of Visalia, Community Relations Manager

City of Visalia, Transit Analyst

City of Woodlake, City Council

State Agencies

California Travel and Tourism Commission

California Department of Pesticide Regulation

California Department of Toxic Substances Control

California Environmental Protection Agency

California Department of Forestry and Fire: Cal Fire: Fresno Air Attack Base

California Air Resources Board

California Conservation Corps

California Department of Conservation

California Department of Transportation

California Department of Fish and Game

California Farm Bureau Federation

California Geological Survey

California Highway Patrol

California Resources Agency

California State Board of Education

California State Clearinghouse

California State Office of Historic Preservation

California State Parks:

- Allensworth State Historic Park
- Indian Grinding Rock State Historic Park
- Red Rock State Historic Park
- Mono Lake Tufa State Natural Reserve

California State University: Bakersfield, Fresno

California State Water Resources Control Board

Fresno Yosemite International Airport

Kern Valley Resource Conservation District

University of California, Merced

University of Colorado, Denver

American Indian Tribes and Organizations

American Indian Council of Mariposa County

Benton Paiute Reservation

Big Pine Paiute Tribe of Owens Valley

Big Sandy Rancheria of Mono Indians

Bishop Indian Tribal Council

Bishop Paiute Tribe

Bridgeport Paiute Indian Colony

California Basket Weavers Association

California Native American Heritage Commission
Chemehuevi Reservation
Chumash Native Nation
Cold Springs Rancheria of Mono Indians
Dumna Wo-Wah Tribal Government
Dunlap Band of Mono Indians
Eshom Valley Band / Wuksache Indian Tribe
Fort Independence Paiute Indians
Fort Mojave Indian Tribe
Haslett Basin Traditional Committee
Kawaiisu Tribe
Kern River Paiute Council
Kern Valley Indian Community Tribal Council
Kings River Choinumni Farm Tribe
Kitanemuk & Yowlumne Tejon Indians
Kutzadika Indian Community Cultural Preserve
Lone Pine Paiute-Shoshone Reservation
Mono Lake Indian Community
Native American Heritage Commission
North Fork Mono Tribe
North Fork Rancheria of Mono Indians
Northern Band of Mono Yokuts
Ramona Band of Cahuilla Mission Indians
San Manuel Band of Mission Indians
Santa Rosa Rancheria
Serrano Nation of Mission Indians
Sierra Nevada Native American Coalition
Squaw Valley Tribe
Table Mountain Rancheria
Tejon Indian Tribe
The Choinumni Tribe of Yokuts
The Mono Nation
Traditional Choinumni Tribe
Tubatulabals of Kern Valley
Tule River Indian Tribe

Tule River Tribal Elders Committee

Wukchumni Tribal Council

Local Organizations

Bear Mountain Library

Central California Hispanic Chamber of Commerce

Central Sierra Chamber of Commerce

College of the Sequoias

Dinuba Chamber of Commerce

Exeter Chamber of Commerce

Fresno Chamber of Commerce

Fresno Economic Development Corporation

Fresno Parks & Recreation

Greater Fresno Area Chamber of Commerce

Greater Reedley Chamber of Commerce

Kern Valley Resource Conservation District

Kingsburg Chamber of Commerce

Lindsay Chamber of Commerce

Lone Pine Chamber of Commerce

Porterville Chamber of Commerce

Sequoia Foothills Chamber of Commerce

Sequoia Natural History Association

Sequoia Parks Foundation

Sequoia Riverlands Trust

Sierra Business Council

Sierra Nevada Conservation

Tulare Kings Hispanic Chamber of Commerce

Visalia Chamber of Commerce

Other Special Interest, Private Organizations, and Businesses

Access Fund

Adventure Travel West, Inc.

Alpine Skills International

American Alpine Club

American Canoe Association

American Conservation Experience

American Fisheries Society

American Hiking Society

American Mountain Guides Association

American Rivers

American Trails

American Whitewater

Andrew Skurka Adventures, LLC.

Anne Lang's Emporium

Audubon: Tulare County Chapter

Backcountry Horsemen of America

Backcountry Horsemen of California

Backcountry Horsemen of California, High Sierra Unit

Back to Earth

Balch Park Pack Station

Bardini Foundation, Inc.

Bat Conservation International

Bay Area Orienteering Club

Bay Area Outdoor Adventure Club

Bear Mountain Pizza

Big Trees Marketing

Bishop Pack Outfitters

Blue River Law

Bold Earth Teen Adventures

Boojum Institute

Boyden Cavern Adventures & Tours

Brecon Estate, Inc.

Buck Rock Foundation

Buckeye Tree Lodge

California Alpine Guides

California Equestrian Trails & Land Coalition

California Climate & Agriculture Network

California Invasive Plant Council

California Native Plants Society

California Oaks Foundation

California Preservation Foundation

California Travel and Tourism Commission

California Wilderness Coalition
California Wildlife Foundation
Californians for Alternatives to Toxics
Californians for Western Wilderness
Call of the Wild
Campaign Against Marijuana Planting
Cave Research Foundation
Cedar Grove Pack Station
Center for Biodiversity Informatics
Center for Biological Diversity
Central Sierra Fly Fishing Adventures
Century 21 – Three Rivers
Civilian Conservation Corps Legacy
Clyde Pack Outfitters
Coalition of National Park Service Retirees
Comfort Inn & Suites, Three Rivers
Community Presbyterian Church
Conservation International
Consultant David Visher
Cottonwood Pack Station
CPBiofuels, LLC, DBA: Trans-Sierra Club
DBA Earth Images
Defenders of Wildlife
Delaware North Company Parks & Resorts
Democratic Party, MoveOn.org
Disney Corporation Drouet Design
Earth Cache
Eastern High Sierra Packers Association
Ecological Farming Association
Espresso Yourself
Fifth Plane Associates
Fitpacking
Four Season Guides
Fresno Audubon Society
Friends of the Earth

Friends of the River
Friends of the South Fork Kings River
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Girl Scouts of the USA
Glacier Pack Train
Golden Ram Sportsman's Club, Inc.
Golden Trout Wilderness Packtrains
Great Old Broads for Wilderness
Greater Yellowstone Coalition
Greenpeace
Groundspeak
High Sierra Hikers Association
High Sierra Pack Station
High Sierra Volunteer Trail Crew
Holiday Inn, Visalia
Horse Corral Pack Station
Hume Lake Christian Camp
I 5 Business Development Corridor, Inc.
International Mountain Biking Association
International Society for Fungal Conservation
JMT Adventures
Kaweah Commonwealth
Kaweah Fly Fishers
Kaweah Marina
Kern River Fly Fishing
Kings Canyon Park Services Company
Kings River Conservation District
Kiper & Kiper Logging & Lumber
Lamp Liter Inn
Lazy J Ranch Motel

Lemon Cove Sequoia RV camping

Lions Club

Lost Valley Camp Pack Station

Marriott, Visalia

MEChA

Mineral King District Association

Mineral King Preservation Society

Mosley Dental – Three Rivers

Mountain Light Photography

Mountain View Realty Three Rivers

Mt Whitney Hikers Association

Muir Trail Ranch

National Hispanic Environmental Council

National Audubon Society

National Center on Accessibility

National Forest Recreation Association

National Park Foundation

National Parks Conservation Association

National Speleological Society

National Wildlife Federation

National Sustainable Agricultural Information Service

Natural Resources Defense Council

Naturalists at Large

NatureServe

National Parks Conservation Association:
National Office, Pacific Regional Office, California Desert, Central Valley, and Mojave field offices

Off the Beaten Pack

Orienteering USA

Outdoor Adventure Club

Outdoor Alliance

Outward Bound Center

Pacific Crest Trail Association

Pacific Gas & Electric

Panthera

Partners in Amphibian & Reptile Cons.

Peace and Freedom Party

Placerville Spinal Cord Injury Support

Planeto Azul Hydrology

Planning & Conservation League

Plantation Bed and Breakfast

Programs & Safety Outward Bound California

Public Employees for Environmental Responsibility

Public Lands Foundation

Rainbow Pack Outfitters

Red's Meadow Resort and Pack Station

REI Berkeley

REI Fresno

Reimer's Candies

RN Wilderness, DBA: Backcountry Journeys

Rock Creek Pack Station Inc. / Mount Whitney Packtrains

San Francisco Bay Chapter of the NSS

San Joaquin River Conservancy

San Joaquin Valley College: Fresno Campus

San Joaquin Valley Grotto

Save the Redwoods League

Sea & Summit Expeditions, Inc.

Sequoia Council Boy Scouts of America

Sequoia Kings Pack Trains and Pine Creek Pack Station

Sequoia Lake YMCA Camp

Sequoia Motel

Sequoia River Dance B & B

Sequoia Riverlands Trust

Sequoia Sightseeing Tours

Sequoia Village Inn

Sequoia – Kings Canyon Park Services Company

Shannon Valley Property Owners Association

Sierra Cat Haven

Sierra Club

Sierra Club Outing Department

Sierra Club, Tehipite Chapter

Sierra Fly Fisher

Sierra Forest Legacy

Sierra Gateway Trust, Inc.

Sierra Mountain Center

Sierra Mountain Guides, Inc. Sierra Mountaineering International

Sierra Wilderness Seminars, Inc. / SWS Mountain Guides

Silver City Resort

Silver City Service Club

Soararsis

Southern California Edison

Southern Yosemite Mountain Guides

Springville Inn

Squaw Valley Herb Gardens

Squaw Valley Motel

Student Conservation Association

Sue Sa's Creative Catering

Tejon Ranch Conservancy

The Cougar Fund

The Garden Law Firm, P.C.

The Geological Society of America

The Law Office of Loren N. Kleier

The Log House Lodge B&B

The Mountain Lion Foundation

The Mountaineers

The Nature Conservancy

The Thoughtful Gift

The Trust for Public Land

The Wilderness Society

The Wildland Trekking Company

The Wildlife Society

The World Outdoors

Three Corner Round Pack Outfit, Inc.

Three Rivers Village Market

Timberline Bike Tours

Tulare County Citizens for Responsible Growth

Tulare County Audubon Society

U.S. Hang Gliding and Paragliding Association

United Nations Educational, Scientific, and Cultural Organization

Verizon

Visalia Convention Center

Visalia Economic Development Corporation

Walden West Backpack Adventures

White Horse Inn

Whitebark Pine Ecosystem Foundation

Wilderness Land Trust

Wilderness On Wheels

Wilderness Reflections

Wilderness Watch

Wilderness Watch of the Eastern Sierra

Wildlands Conservancy

Wildlife Advocacy Project

Wilsonia Historic District Trust

Wood 'N' Horse

Yosemite Conservancy

Local Libraries

California State University: Bakersfield, Fresno

Clovis Regional Library

Fresno County Libraries:

- Central
- Fowler
- Kingsburg
- Orange Cove
- Parlier
- Reedley
- Sanger
- Selma
- Sunnyside

Inyo County Libraries

- Bishop
- Lone Pine

Kern County Library, Bakersfield

Porterville Public Library

Tulare County Libraries:

- Lindsay
- Dinuba
- Three Rivers
- Visalia

University of California: Merced

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Glossary

ON THE PREVIOUS PAGE
Hamilton Lake
NPS Photo

GLOSSARY

abandoned trail – see trail, below.

adaptive management – a system of management practices based on clearly identified desired conditions and monitoring of those conditions to determine if management is achieving them. If not, adaptive management facilitates changes that will either best ensure the desired conditions or reevaluate them. This system recognizes that knowledge about natural resources is sometimes uncertain; it is the preferred method of management in these cases. (Adapted from *Departmental Manual 516 DM 4.16*)

administrative structure – development or facility used to support the administration of wilderness but not intended for public use, for example, ranger stations.

appropriate use – a use that is suitable, proper, fitting, and legal within wilderness.

archeological resource – any material remains or physical evidence of past human life or activities that are of archeological interest, including the record of the effects of human activities on the environment. Archeological resources are capable of revealing scientific or human information through archeological research.

backcountry – primitive, undeveloped portions of parks, some of which may be managed as wilderness.

best management practices –practices that apply the most current means and technologies available to comply with mandatory environmental regulations, and to maintain a superior level of environmental performance. See *mitigation*, below.

cat-hole – a small user-dug hole at least 6 inches deep where human waste is deposited, covered with soil, and left to break down naturally. See *toilet* below.

character – see *wilderness character* below.

closed to grazing – open to travel and camping with stock (see *stock* below) provided that animals are confined on a hardened surface and given substitute feed.

commercial enterprise –for the purposes of this plan, the Bearpaw Meadow High Sierra Camp and the Pear Lake Ski Hut are the only allowed commercial enterprises in the wilderness in Sequoia and Kings Canyon National Parks (pursuant to the House Report 98-40).

commercial service – an activity in which any duties or work are provided by one person or entity for another person or entity in exchange for money; it includes diverse services commonly associated with guiding and outfitting; it may be performed by a for-profit or nonprofit entity. See *day ride, commercial* below.

counterbalance – a food-storage method in which two bags are hung opposite each other over a branch or rock in a manner that keeps the food inaccessible to wildlife, especially bears.

cultural landscape – a reflection of human adaptation and use of natural resources expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built.

cultural resources – archeological resources, historic structures, cultural landscapes, ethnographic resources, and museum objects. Cultural resources may be linked to historic events or noteworthy people; they may be embodiments of technical accomplishment, design, or workmanship; they may be sources of information important in historical or archeological research; or they may be important in the cultural system of an ethnic group (*NPS-28 Cultural Resource Management Guideline 1998; NPS Management Policies 2006*). See *ethnographic resource* below.

day ride – a horseback ride that does not involve an overnight stay. Areas *open to day rides and pass-through travel only* are open to stock travel but animals may not graze or stay overnight. See *stock* below.

> **commercial day-ride** – guided horseback ride, provided by a commercial-services provider, that does not involve an overnight stay.
>
> **wilderness camp day-ride** – horseback rides (commercial or private party) that start and end from a single campsite in wilderness.

day use – wilderness use that does not involve an overnight stay. Day-use activities could include hiking, canyoneering, climbing, sightseeing, wildlife viewing, cross-country skiing, day rides, etc., in which the visitor expects to exit wilderness on the same day they enter.

designated campsite – a campsite delineated with a marker that identifies a location in which people who would like to camp in the vicinity are required to camp. Such campsites may or may not include associated facilities (e.g., firepits, toilets, food-storage boxes, etc.).

Designated Potential Wilderness Addition (DPWA) – federal lands that Congress intends to become fully designated wilderness upon the elimination of an existing and allowed nonconforming use prohibited by the Wilderness Act that is associated with that land.

desired condition – qualitatively describes an ideal condition of wilderness character. This is both a holistic condition, as well as the desired condition for all qualities of wilderness character: *untrammeled*, *natural*, *undeveloped*, and *opportunities for solitude or primitive and unconfined recreation*, and the other features of value quality.

destination quota – a limit on the number of visitors, groups, or campsites in a specific wilderness location. Destination quotas help to protect wilderness quality and visitor experience in given areas. Quotas are based on resource information, desired condition, and professional judgment by an interdisciplinary team of specialists and decision makers.

dunnage – when visitors' supplies and/or equipment are carried into wilderness on stock (see *stock*, below), or by a porter, while the visitors hike in; stock or porter(s) leave once the supplies are delivered to the visitors at their destinations. This could occur at the beginning of a trip, in the middle of a trip as a resupply, or at the end of a trip to remove supplies and/or equipment.

effect (used interchangeably in this document with the word *impact*) – the likely impact of an action or proposed action upon specific natural, cultural, social, or socioeconomic resources. Effects may be direct, indirect, individual, cumulative, beneficial, or adverse.

established camp – a campsite that has been previously used and has indications of use, such as bare ground or a fire ring.

ethnographic resource – expressions of human culture and the basis of continuity of cultural systems (*NPS-28 Cultural Resource Management Guideline* 1998). Ethnographic resources can include sites, structures, objects, traditional landscapes, or a natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a traditionally associated group.

food-storage box – also referred to as food-storage *locker*: an administrative structure that is semi-permanently fixed to a location such as a campsite, intended to prevent bears and other wildlife from obtaining food.

food-storage container – a portable, visitor-owned or rented, bear-resistant storage device that is designed to be carried from location to location. Note: Only products allowed by *both* Sequoia and Kings Canyon National Parks and Yosemite National Park can be used in the parks.

forage – plant material (mainly plant leaves and stems) eaten by grazing animals. Forage areas are defined as the parks' primary meadows and their associated forested or upland grasslands that are commonly used by stock for grazing. See *weed-free forage,* below.

formal trail –see *trail* below.

frontcountry – areas of the parks that are not designated or managed as wilderness. The frontcountry contains developed park areas and is generally along or accessed by roads.

gateway community – a community in close proximity to a national park, whose residents are often affected by decisions made in the course of managing the park and whose decisions may affect the resources of the park. Because of this, there are shared interests and concerns regarding decisions. Gateway communities usually offer food, lodging, and other services to park visitors. They also provide opportunities for employee housing, and a convenient location to purchase goods and services essential to park administration.

General Management Plan (GMP) – a comprehensive plan that guides park management for 15–20 years. It is accompanied by a draft and final environmental impact statement. The Sequoia and Kings Canyon National Parks General Management Plan was approved in 2007.

historic structure – "a constructed work…consciously created to serve some human activity" (*NPS-28 Cultural Resource Management Guideline 1998*). Usually immovable, although some have been relocated and others are mobile by design. Historic structures in Sequoia and Kings Canyon National Parks include buildings, cabins, historic districts, shelters, Civilian Conservation Corps (CCC)-era structures, campgrounds, roads, fences, and other structures of historic, aesthetic, or scientific importance.

historic travelway– a route and/or formal trail that has special value under the National Historic Preservation Act (NHPA).

impact (used interchangeably in this document with the word *effect*) – the likely effect of an action or proposed action upon specific natural, cultural, social, or socioeconomic resources. Impacts may be direct, indirect, individual, cumulative, beneficial, or adverse.

impairment – an impact that, in the professional judgment of a responsible NPS manager, would harm the integrity of park resources or values and violate the 1916 NPS Organic Act's mandate that park resources and values remain unimpaired.

indicator – a distinct and important element within each quality of wilderness character, which has measurable attributes that can be the focus of wilderness character monitoring. These function as categories that have one or more measures within them, and are established in *Keeping it Wild* (Landres et.al. 2008). See *qualities of wilderness*, below, and "Appendix A: Visitor Capacity."

informal trail – a landscape impact such as bare ground or damaged vegetation, caused solely by repeated use, that looks like a segment of trail. An informal trail does not receive trail maintenance. See *trail* below.

inholding – privately-owned land that is inside the boundary of the parks.

installation – structure used to support activities such as telecommunications, water development, grazing, or wildlife management. It includes debris such as old dump sites, aircraft-crash sites, or memorials or other monuments. It also includes unattended measurement devices for the purpose of recording environmental data, such as meteorology or seismic activity.

invasive species – a nonnative species whose introduction does or is likely to cause economic or environmental harm or harm to human health. Invasive species display rapid growth and spread, establish over large areas, and persist.

lacustrine – see *wetlands*, below.

Leave No Trace© – in this document, this phrase refers to principles of minimum-impact camping and wilderness travel put forth by an educational organization, the Leave No Trace Center for Outdoor Ethics, with which the NPS has a Memorandum of Understanding.

management actions – deliberate actions taken by park management to address anticipated problems or mitigate undesirable conditions or impacts.

management directive – a document providing NPS field employees with guidance on NPS policy, including compilations of legal references, operating policies, standards, procedures, general information, recommendations, and examples. They may reiterate or compile requirements (for example, laws, regulations, and policies) that have been imposed by higher authorities.

measure – a specific aspect of wilderness resources or character that can be measured or quantified. Specific feature(s) used to quantify an indicator, as specified in a monitoring or sampling protocol. One or more specific measures may be used to quantify or qualitatively evaluate the condition of an indicator at a particular place and time.

Minimum Requirement Analysis (MRA) – a written analysis that helps determine and document if potential actions by the National Park Service or its approved cooperators are the minimum necessary to accomplish a particular objective in wilderness and, if so, how to minimize any adverse effects.

minimum tool – a use or activity that has been determined to be necessary in order to accomplish an essential task in a wilderness area. It is generally the tool, equipment, device, force, regulation, or practice that has the least impact on wilderness character while achieving the management objective.

Mission 66 – the most recent intensive systemwide program of park development. It represented a nationwide response to deteriorated park conditions and increasing visitorship in the postwar era. The program sought to implement large-scale capital improvement between 1956 and 1966 (the latter marked the 50th anniversary of the founding of the NPS). Mission 66 buildings have been recognized by the

National Register of Historic Places as significant historic structures and as important representatives of a new building type.

mitigation – activities that will avoid, reduce the severity of, or eliminate an adverse environmental impact.

monitoring – activities designed to detect changes or trends in a resource over time. Further defined as collection and analysis of repeated observations or measurements to evaluate changes in condition and progress toward meeting a management objective. As used in this document, it is synonymous with tracking change in wilderness character. See *wilderness character,* below.

National Environmental Policy Act of 1969 (NEPA) – a public law requiring federal agencies to look at alternatives for proposed major federal actions and to fully analyze the impacts of those alternatives on the human environment before a decision is made.

native species – all species that have occurred, now occur, or may occur in a given area as a result of natural processes. Native species in a place have evolved in concert with each other.

natural quality – one of the qualities of wilderness character. See *qualities of wilderness,* below.

necessary – important in order to achieve a specific result, or desired by authority or convention.

nonnative species – those species that occupy or could occupy park lands directly or indirectly as the result of deliberate or accidental human activities. (Also commonly referred to as *exotic, alien,* or *invasive* species.) Because a nonnative species did not evolve in concert with the species native to the place, it is not a natural component of the natural ecosystem at that place.

nonconforming use – uses or activities that do not conform to the purposes and preservation of wilderness outlined in the Wilderness Act; for example, the presence of modern structures, installations, habitations, and the use of motor vehicles, motorized equipment, or mechanical transport in wilderness. Nonconforming uses influence the *undeveloped* and *solitude* qualities of wilderness.

off-trail – travel in areas with no formal trail. See *trail*, below.

on-trail – travel along a Class 1, Class 2 or Class 3 trail. See *trail*, below.

other features of value quality – See *qualities of wilderness*, below.

pack-out waste kit – a user carried waste kit composed of a bag(s) with a chemical agent where waste is deposited. Kit is carried out by user and disposed of in a waste receptacle (e.g., WagBag®, or Restop®). See *toilet*, below.

palustrine – see *wetlands*, below.

pass-through area – an area open to stock travel but animals may not graze or stay overnight.

pass-through rides – stock rides (commercial or private party) that start and end in wilderness when relocating to a new wilderness-based campsite. Areas *open to day rides and pass-through travel only* are open to stock travel but animals may not graze or stay overnight. See *stock* below.

permit – a written authorization to engage in uses or activities that are otherwise prohibited, restricted, or regulated.

porter – a person(s) who carries materiel for another person as a commercial service. This could involve carrying in supplies at the start of a trip, carrying in food/equipment in the middle of a trip as a resupply, or carrying out equipment at the end of a trip.

preferred alternative – the alternative NPS decision-makers have identified as preferred at the draft EIS stage. It is identified to show the public which alternative is likely to be selected to help focus their comments.

primeval – of or relating to the first or earliest age or ages, where forces other than humans dominate, wild (referenced in the Wilderness Act Section 2(c): "wilderness is . . . an area of undeveloped Federal land retaining its primeval character and influence").

primitive – of or relating to early or earliest state or stage of development, marked by simplicity, e.g., walking is a primitive form of transport (referenced in the Wilderness Act Section 2(c): "a primitive and unconfined type of recreation").

pristine – having its original purity uncorrupted, unsullied, or unspoiled; remaining in a pure state (pristine is not contained in the Wilderness Act and thus is not a mandatory condition or standard to be achieved).

privy (or privies) – see *toilet*, below.

propagule – any part or structure of a plant capable of being propagated or acting as an agent of reproduction.

propagule pressure – a measure of the number of individual nonnative plants released into an area, or the quality, quantity, and frequency of invading organisms.

public involvement – public input sought in planning for public lands and required under National Environmental Policy Act of 1969 (NEPA). Comment is sought at the initial scoping and at the draft environmental impact statement (DEIS) stages. Substantive comment on the DEIS must be responded to in the final environmental impact statement (FEIS).

Public purposes of wilderness – wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use" (§4(b) of the Wilderness Act).

qualities of wilderness – primary elements of wilderness character that link directly to the statutory language of the 1964 Wilderness Act. All defined qualities are assessed to establish trends in wilderness character. See *wilderness character*, below, and "Chapter 3: Affected Environment."

> ***natural* quality** – This quality is related to the effects of modern society on ecological systems inside wilderness since the time the area was designated. Wilderness ecological systems are to be substantially free from the effects of modern civilization.
>
> ***other features of value* quality** – sometimes referred to as the *fifth quality*, this quality of wilderness character has been defined by the National Park Service to capture features with ecological, geological, scientific, educational, scenic, or historical value that may not be included under the other four qualities. This quality is unique to an individual wilderness and, typically, the *other features of value* occurs only in specific locations within a wilderness.

***solitude or primitive-and-unconfined-recreation* quality** – wilderness is to provide opportunities to experience solitude or primitive and unconfined recreation, including the values of inspiration and physical and mental challenge. This quality is related to conditions that affect the opportunity for people to experience solitude or primitive, unconfined recreation, rather than monitoring visitor experiences per se.

***undeveloped* quality** – wilderness is to be essentially without permanent improvements or modern human occupation. This quality is related to the presence or absence of structures, installations, habitations, and other evidence of modern human presence or occupation.

***untrammeled* quality** – wilderness is to be essentially unhindered and free from modern human control or manipulation. This quality is related to human activities that directly control or manipulate the components or processes of ecological systems inside wilderness.

Record of Decision (ROD) – a document that states the official decision for alternative actions proposed by agencies in a draft environmental impact statement and revised in a final environmental impact statement.

restroom – see *toilet,* below.

riparian – adjacent to, or living on, the bank of a river, or sometimes a lake or pond.

riverine – see *wetlands*, below.

route – see *trail,* below.

scoping – internal NPS decision-making on issues, alternatives, mitigation measures, the analysis boundary, appropriate level of documentation, lead and cooperating agency roles, available references and guidance, defining purpose and need, and so forth. External scoping is the early involvement of the interested and affected public.

service day (or commercial service day) – all or part of a day spent by a client of a commercial service provider on NPS-managed lands.

soil orders – the most general level of classification in the USDA system of soil taxonomy, frequently defined by a single dominant characteristic affecting soils in a location. Soil orders in these parks include Mollisols, Entisols, Alfisols, Inceptisols, Spodosols, and Gelisols.

solitude, or primitive and unconfined recreation quality – see *qualities of wilderness,* above.

spookum – a temporary barrier at a narrow or "pinch" point to contain stock. Temporary barriers may only be used when stock is actually roaming free in permitted grazing areas; barriers must be removed when the stock is gathered. Damaging natural resources and preventing unencumbered travel by the public when constructing temporary barriers is prohibited.

spot trip – a trip in which visitors ride stock into wilderness and are dropped off at their chosen site. The stock are then removed from the area. This also includes visitors being picked up from a camp in wilderness and all or part of a party riding out of wilderness.

standards – the thresholds which conditions should not exceed. Standards identify the minimum level of acceptable wilderness condition, beyond which management action to improve conditions is triggered.

s**tewardship** – the ethic of using the most effective concepts, techniques, equipment, and technology to prevent, avoid, or mitigate unacceptable impacts on natural or cultural resources.

stock – defined as horses, mules, burros/donkeys, and llamas only (as designated in the Superintendent's Compendium) that can be ridden or used to carry supplies.

stock use – travelling, camping, and grazing with horses, mules, burros/donkeys, or llamas.

Superintendent's Compendium – park-specific rules implemented under the discretionary authority of the park superintendent. It serves as public notice with an opportunity for public comment, identifies areas closed for public use, provides a list of activities requiring either a special-use permit or reservation, and elaborates on those public-use and resource-protection regulations that pertain to the specific administration of the park. It does not contain those regulations found in 36 Code of Federal Regulations (CFR) and other United States Codes (USC) and CFR titles, which are enforced without further elaboration at the park level.

Toilet, varieties of – methods of containing human waste:

> **cat-hole** – a small user-dug hole at least 6 inches deep where human waste is deposited, covered with soil, and left to break down naturally.
>
> **pack-out waste kit** – a user carried waste kit composed of a bag(s) with a chemical agent where waste is deposited. Kit is carried out by user and disposed of in a waste receptacle (e.g., WagBag®, or Restop®).
>
> **privy (or privies)** – a primitive toilet facility usually consisting of a dug hole with a small privacy structure, and a toilet seat on a platform constructed over the dug hole. Deposited waste is left to break down naturally. The privy structure is portable and is moved to a new hole in the general locale when necessary.
>
> **restroom** – a permanent building that houses one or more composting toilets. There are only two public restrooms in the parks' wilderness, one at Emerald Lake and one at Pear Lake.
>
> **vault toilet** – a self-contained vault where human waste is deposited, then subsequently removed.

trail, types of –

> **abandoned trail** –a trail that was once a formal, maintained trail, but maintenance has been discontinued.
>
> **formal trail** – designated Class 1, Class 2, or Class 3 trails that are regularly maintained.
>
> **informal (or social) trail** – a landscape impact, such as bare ground or damaged vegetation, caused solely by repeated use that looks like a segment of trail. An informal trail does not receive trail maintenance.
>
> **restored trail** – a feature that was at one time a formal or informal trail that has had restoration work done to restore the landscape to its natural, untrailed condition.

route – a travel corridor of social value with no designated trail; it does not receive maintenance (except in rare cases where restoration may occur to protect resources). Traffic may create informal trails in parts of a route; a route may include informal trails and abandoned trails.

unmaintained trail – an informal term that includes many different situations. For clarity, this term will not be used.

transitory crew camps – short-term camps used by small traveling work crews who use minimum-impact practices and rehabilitate the camps when work is completed.

undeveloped quality – see *qualities of wilderness*, above.

untrammeled quality – see *qualities of wilderness*, above.

vault toilet – see *toilet*, above.

visitor capacity –a component of visitor-use management consisting of the maximum amounts and types of visitor use that an area can accommodate while sustaining desired resource conditions and visitor experiences, consistent with the purpose for which the area was established. See *desired condition*, above.

visitor/user of wilderness – a person in the wilderness. The term includes hikers, backpackers, and stock users.

weed-free forage, certified – hay, feed, or straw products grown in a field that received reasonable and prudent visual inspection that detected no propagative plant parts or seeds from state or federal noxious-weed list. Fields passing inspection are state certified; the producer may then label the product *certified weed-free*. Certification does not guarantee complete absence of noxious weeds, nor are these materials inspected for nonnative or invasive plants not listed on the state- or federal-noxious weed list.

weighted value per campable mile (WVCM) – a metric that considers three factors of a travel subzone: length of shoreline of water courses and lakes; the number of campsites; and the condition class of the campsites. The final WVCM number is calculated using these three factors (Parsons and Stohlgren 1987, Cole and Parsons 2013).

wetlands – all wetlands within these parks fall into one of three system types: **riverine** (rivers, creeks, and streams), **palustrine** (shallow ponds, marshes, swamps, and sloughs), or **lacustrine** (lakes and deep ponds). The lacustrine class represents wetlands and deepwater habitats that are situated in topographic depressions or dammed river channels; that lack trees, shrubs, and emergent mosses and lichens over 60% of their area; and that are greater than 8 hectares (20 acres) in size.

wilderness:

designated wilderness – federal land designated by Congress as a component of the national wilderness preservation system.

eligible, study, proposed and/or recommended wilderness – federal lands found to possess wilderness character based on the criteria specified in the Wilderness Act. The four categories reflect different stages of the wilderness review process; all are managed to preserve the wilderness resources and values that make them eligible for wilderness designation.

potential wilderness – federal lands surrounded by, or adjacent to, lands designated or proposed for wilderness designation that do not themselves immediately qualify for designation due to temporary, nonconforming uses or incompatible conditions. Potential wilderness is a subset of the other wilderness categories (it can be eligible, study, proposed, recommended, or designated potential wilderness).

wilderness character – the combination of biophysical, experiential, and symbolic ideals that distinguishes wilderness from other lands. These ideals combine to form a complex and subtle set of relationships among the land, its management, its users, and the meanings people associate with wilderness (source: *Keeping It Wild*, 2008). See *qualities of wilderness*, above, and "Chapter 3: Affected Environment."

wilderness character monitoring – gathering data on selected measures of wilderness character in order to assess if and how wilderness character is changing over time. See "Appendix C, Wilderness Character Monitoring Strategy."

wilderness travel zone, and subzone – the parks use wilderness travel zones as a way of monitoring and analyzing wilderness conditions and use, and to address a variety of wilderness-stewardship issues. In the early 1970s, park managers divided the parks into 52 wilderness travel zones overlying the parks' wilderness, generally based on geographic features (watersheds). Each zone is subdivided into multiple subzones (273 in total).

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NPS Photo

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BLM	Bureau of Land Management, in the U.S. Department of the Interior
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CFGC	California Fish and Game Commission
CNDDB	California State Natural Diversity Database
CNPS	California Native Plant Society
NPS	National Park Service, in the U.S. Department of the Interior
NRC	National Research Council
SEKI	Sequoia and Kings Canyon National Parks, in the National Park Service
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service, in the U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service, in the U.S. Department of the Interior
USGS	U.S. Geological Survey, in the U.S. Department of the Interior
WACAP	Western Airborne Contaminants Assessment Project

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