National Park Service
U.S. Department of the Interior- Whiskeytown National Recreation Area

Regions 8, 9, 10 and 12

WHISKEYTOWN ENVIRONMENTAL SCHOOL REBUILD

Environmental Assessment

January 2026

As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural and cultural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to assure that their development is in the best interests of all. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

How to Comment on this Environmental Assessment

The public is encouraged to comment for this project online and the EA is available at: https://parkplanning.nps.gov/WES_Rebuild

This EA is being made available to the public; federal, state, and local agencies; and organizations through press releases distributed to a wide variety of news media and announced on the Park website. The release of this EA will initiate a 30-day public review and comment period.

Comments will also be accepted via mail to:

Superintendent

Whiskeytown National Recreation Area

PO Box 188

Whiskeytown, CA 96095

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. You can request to have your personal identifying information withheld from public review, but this cannot be guaranteed. Responses to substantive comments on the EA will be addressed in the proposed Finding of No Significant Impact (FONSI) or will be used to prepare an environmental impact statement if warranted.

ON THE COVER

An educator speaking to a group of students about pollinators, with several students holding butterfly nets.

Photo by National Park Service.

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Introduction

Background

In compliance with the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [USC] 4321 et sq)[1]; the Department of the Interior NEPA regulations (43 CFR Part 46); and NPS Director's Order 12: Conservation Planning, Environmental Impact Analysis and Decision-making and its accompanying NPS NEPA Handbook, the National Park Service (NPS) prepared an Environmental Assessment (EA) for the Whiskeytown Environmental School Rebuild project. The Department of the Interior (DOI) published an interim final rule, NEPA Implementing Regulations, on July 3, 2025, "rescinding and making necessary targeted updates to its remaining regulations implementing" NEPA. 90 Fed. Reg. 29498 (July 3, 2025). This EA is consistent with DOI's July 3, 2025, NEPA Implementing Regulations.

The Whiskeytown Environmental School (WES) site is located within the Southern section of Whiskeytown National Recreation Area (WHIS). The terms "WHIS" or "park" are used interchangeably with throughout this document. WES sits at the intersection of Clear Creek and Paige Boulder Creek, at the base of Shasta Bally, in Northern California (Figure 1). WES provides outdoor education opportunities for K-8 students in Shasta County and neighboring counties having a multi-generational impact for Shasta County residents and beyond.

WHIS is one of eighteen national recreation areas managed by the National Park Service (NPS), under the U.S. Department of the Interior. WHIS is a 42,500-acre recreation area within the Klamath Mountains of Northern California and is located eight miles from downtown Redding. The most

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[1] Executive Order 14154, *Unleashing American Energy* (Jan. 20, 2025), and a Presidential Memorandum, *Ending Illegal Discrimination and Restoring Merit-Based Opportunity* (Jan. 21, 2025), require the Department to strictly adhere to the National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321 et seq. Further, such Order and Memorandum repeal Executive Orders 12898 (Feb. 11, 1994) and 14096 (Apr. 21, 2023). Because Executive Orders 12898 and 14096 have been repealed, complying with such Orders is a legal impossibility. The [bureau] verifies that it has complied with the requirements of NEPA, including the Department's regulations and procedures implementing NEPA at 43 C.F.R. Part 46 and Part 516 of the Departmental Manual, consistent with the President's January 2025 Order and Memorandum. The National Park Service has also voluntarily considered the Council on Environmental Quality's rescinded regulations implementing NEPA, previously found at 40 C.F.R. Parts 1500–1508, as guidance to the extent appropriate and consistent with the requirements of NEPA and Executive Order 14154.

dominant feature of the park is the 3,200-acre Whiskeytown Lake. While the primary focus of WHIS is water-based recreation, the park also contains rugged canyons, forests, streams, and waterfalls (Douglas et al., 2020). The land surrounding Whiskeytown Lake provides recreational opportunities including hiking, mountain biking, and horseback riding. WHIS is characterized by steep and rugged terrain, winter rains, long and dry summers, which coupled with frequent wildfires create diverse habitats, from old-growth forests to oak woodlands, chaparral, and riparian bottomlands (Douglas et al., 2020, and NPS, 2022). Visitors and locals alike enjoy the lake, wildlife habitat, recreational opportunities, and the power-generating properties of the Central Valley Water project (Douglas et al., 2020).

On July 23rd, 2018, the Carr Fire ignited near the intersection of Carr Powerhouse Road and Highway 299 (NPS, 2022). The fire spread swiftly to other parts of the park, eventually engulfing 39,000 of the park's total 42,500 acres (NPS, 2022). The fire spread to WES, destroying ten cabins, and damaging many other structures (NPS, 2021b).

The Wintu People inhabited the WES site for thousands of years prior to Euro-American contact (Douglas et al., 2020). During the 19th Century California Gold Rush, the Paige brothers explored and mined the area for gold (Johnson et al., 1974). In 1957, the site was converted to the "Vision Valley Youth Camp" run by North Valley Baptist Church (Johnson et al., 1974). In 1968, the National Environmental Education Development (NEED) program was created by the NPS (WESC, 2021b). By 1969, the camp was deeded to the NPS and Whiskeytown Superintendent Leon Mitchell designated the site as a NEED Camp. The program was part of the budding environmental movement in the late 1960s and 1970s providing a shift to the study of ecological relationships and focusing interpretative efforts on school children (Avery Historical Consulting, 2022). The camp was renamed Clear Creek Nature Camp and is one of the first NEED camps established (Avery Historical Consulting, 2022). From the 1980s onward, the NPS improved the campus by adding several new features including converting the student tent cabins to four-walled cabins and adding electricity to cabins. The camp has operated for 55 years and is one of the longest outdoor education programs in the National Park System. Before the Carr Fire, up to 5,000 children attended WES each year, with fifth and sixth graders attending a week-long residential program (SCOE, 2024). The school currently operates limited day field trips through a formal partnership between the NPS, the Shasta County Office of Education (SCOE), and the Whiskeytown Environmental School Community (WESC), a non-profit partner (WESC, 2021b).

The vision for WES is to impact multiple generations by growing each student's appreciation of wild places and helping them become long-term environmental stewards (WESC, 2021a). The number of students served since 1971 is estimated at over 138,700 students (SCOE, 2024) (See Appendix C). Meaningful experiences noted among the student testimonials are night skits, hikes, environmental education, and free time (WESC, 2021b). Students create skits to demonstrate understanding of what was taught that day, hikes utilize the trails surrounding WES, and free time allows students to develop emotional and social skills, interacting with students from other groups or schools. Overall, the program has positively impacted communities in Shasta County and beyond.

WES provides a clear and unique legacy of learning, including growth stemming from three categories: ecosystem learning, relationship building, and personal change. The science learning program is centered around students, with a key takeaway that students learn to think like a scientist. The school gives students a chance to excel in building friendships and a greater acceptance of differences. Personal change and growth include increased self-confidence and independence. This multi-faceted approach to

WES allows for far-reaching impacts that touch the lives of students, teachers, and staff. [Houseal and Petrick 2020]

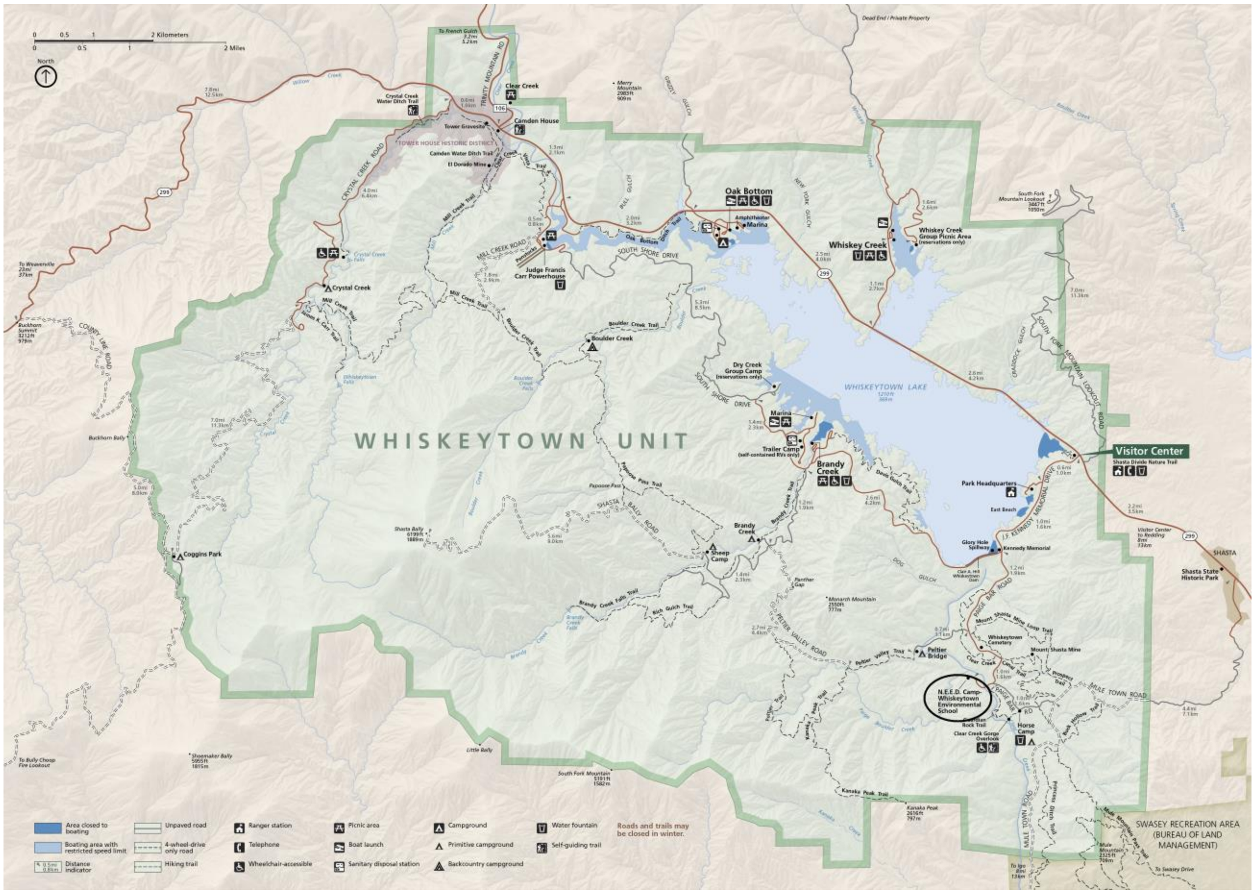

FIGURE 1. LOCATION OF WHISKEYTOWN ENVIRONMENTAL SCHOOL (WITHIN THE BLACK CIRCLE).

Purpose for the Project

The purpose of the project is to restore week-long residential education programs at WES by removing dilapidated and unsafe buildings damaged by the Carr Fire and creating a renovated campus that would serve the community through interpretation, research, and partnerships. The WES Rebuild project would bring existing facilities up to modern building code standards including updates to the dining hall and commercial kitchen and new residential cabin construction. The project also includes construction of a new arbor, improvements for site accessibility to ensure ABAAS compliance, expanded parking, upgrades to utilities, as well as the Paige Boulder Creek bridge removal and replacement with construction of a new footbridge.

The purpose of restoring residential educational programs is tied to the WES site because of the infrastructure already in place, the history of use of the site for residential educational programs, and because residential education programs at WHIS will not be possible other than at the WES site.

Need for Action

The need for the project is to provide a home for residential environmental education programs for K-12 students from the greater local communities. Without the cabins, mess hall, associated facilities, and infrastructure, the residential experience cannot occur because there are no habitable cabins for overnight use by students. The campus rehabilitation would also enhance the experience of students attending daily education programs at WES. Restoring this facility is essential to modernize outdated infrastructure and buildings, construct new buildings, and improve access, efficiency, and year-round use while ensuring public safety.

This facility serves as a vital community hub, offering space for educational programs, tribal and community meetings, workshops, training, and research. Along with supporting continued access to recreational activities such as fishing, hiking, biking, and swimming, it can also create opportunities to generate resources to fund facility and site maintenance.

The program aligns with the purpose of the NPS and WHIS, including encouraging public recreation and scientific discovery. Restoration of WES is necessary to uphold WHIS's mission to preserve scenic, scientific, and historic values for the enjoyment of present and future generations, as outlined in Public Law 89-336 (HR 797). The program helps the NPS by serving the need for interpretive programs in the park.

Whiskeytown National Recreation Area has a long-standing partnership with the Shasta County Office of Education (SCOE) at the Whiskeytown Environmental School, making environmental education a core part of WHIS's history. WES is one of the longest-running outdoor education centers in the National Park System. The continuation of this outdoor education program is of high importance across multiple organizations (NPS, SCOE, WESC). This long running partnership, coupled with interpretation, research, and collaboration, provides outstanding opportunities for understanding and appreciating the area's natural and cultural resources in an immersive setting.

The benefits of a restored campus include opportunities for expanded use of the site by community members and the return of residential outdoor education programs for K-12 students supporting improvements to critical thinking, communication, problem solving, and an increased motivation to learn new things. Students would also develop improved social skills, learn leadership, and teamwork while gaining self-confidence. Additional environmental benefits include learning to reduce water use, increased recycling, and participation and increased engagement in community clean ups or other civic activities. [Ardoin et al., 2018]

WES has offered daily and residential educational programs for K-8 grade levels. The curriculum is based on the California Science Standards and varies based on grade level (See Appendix C). Until 2018, five-day overnight programs were offered, but due to the degraded condition of the site and fire-damaged or destroyed buildings, residential programs are not currently available. Day programs resumed in 2021 with field labs for K-8 students offered in the spring and fall and full-day programs offered in the summer (SCOE, 2024). Currently, the existing campus has no overnight accommodations or gathering spaces, and limited food preparation services. These conditions preclude the use of the site as a residential outdoor education program.

Following the Carr fire, SCOE analyzed 32 total sites within Shasta County and beyond for possible locations to rebuild the school and determined that the WES site remained the ideal location. This evaluation was based on eight factors: distance from Redding and emergency services; bus access; support from the site owner/manager in terms of safety and site maintenance; stream/pond/river access for educational programs; adequate trails; existing facilities; low likelihood of snow; and cost. These factors highlight the distinctive location, diverse mix of habitats, and rich history of the WES site creating an overall unique experience for students, teachers, researchers, and visitors. The NPS has evaluated other sites within the park and found that there is no other comparable site within WHIS that could serve as a residential outdoor education campus.

Objectives in Taking Action (Project Objectives)

The project objectives are specific goals that fulfil the purpose and need and must be achieved for the project to be considered a success. The following are the primary objectives of the proposed campus project:

1) The projects associated with the WES rebuild, identified in Chapter 2, Preferred Alternative, need to be completed.

2) Provide a school facility that is a model of sustainability and ecological sensitivity that protects park resources, encourages responsible interaction with the environment, and exemplifies WES vision and goals.

3) Modernize dorms, dining, bathroom, and kitchen facilities to accommodate up to 192 occupants.

4) Provide a safe and universally accessible place to learn and work by integrating accessibility throughout the project. In accordance with the current Floodplain Statement of Findings and out of an abundance of caution, implement safety plans to address flooding and enhance structural resilience to wildfire through modern building materials and current building codes, making the site safer and more resilient.

Issues

Issues Selected for Detailed Analysis

Impact topics represent resources that could be affected, either beneficially or adversely, by implementing the proposed alternatives. The NPS used an interdisciplinary review process and existing studies and data to determine which resources would likely be affected by this project. The following topics are carried forward for further analysis in this EA:

- Floodplains

- Water Quality

- Visitor Use and Experience
- Threatened and Endangered Species
- Wildlife
- Cultural Resources

Issues Considered but Dismissed

The following issues were identified, considered, and dismissed from further analysis:

Erosive Soils: Erosive soils are dismissed as an impact topic because the potential for sediment entering Clear Creek is covered in-depth under the Water Quality and Threatened and Endangered Species impact analysis sections. The potential for loss of topsoil is considered minor in the actions presented, because much of the site has "minor" to "moderate" soil erodibility rates under the USDA WebSoil Survey (USDA, 2000, 2021). After construction, vehicle traffic would be on constructed roads and remaining ground would have vegetation cover, both of which reduce the risk of erosion. Relevant mitigation measures would be implemented to reduce the erosion risks to minor levels. For a comprehensive list of mitigations related to construction, see Appendix D.

Air Quality: Construction equipment generates dust, diesel, and gas emissions that result in a minor adverse impact to air quality. Impacts would be reduced to minor levels with mitigation (Appendix D), including water trucks to moisten disturbed or exposed soils and reduce dust transport and limiting the idle time for construction equipment to less than five minutes. Air quality is dismissed as an impact topic because of the minor impacts that are reduced by mitigation.

Cultural Landscapes, Historic Districts and Structures: The WES property was evaluated for inclusion onto the National Register of Historic Places (NRHP, 54 USC 300101 et seq) in 2022 and determined not eligible under any criteria, either as individual features or as a district. As a result of this determination the proposed project would have no effect to cultural landscapes, a historic district, or historic structures.

Human Health and Safety: Human Health and Safety was evaluated and dismissed. The demolition of the existing buildings and construction of new structures would involve the regulated handling and use of minor amounts of hazardous materials and waste.

Lightscapes: Construction of new buildings and facilities would include safety lighting at night that would result in minor adverse impacts to the lightscape and dark night skies. The site was previously lit when it was operated as an education camp and the new design includes outdoor lighting. To reduce the impact of reintroducing lighting, the design is consistent with the Sustainable Outdoor Lighting Principle (NPS, 2024c). The 2006 NPS Management Policies stress the importance of a natural photic environment for ecosystem function and the importance of the natural lightscape for aesthetics. NPS enacts sustainable outdoor lighting principles to preserve natural darkness by ensuring the lighting is only where needed, is the minimum light level, uses recessed and fully shielded fixtures, and is LED in warm colors (NPS, 2024c).

Paleontological Resources: Paleontological resources were considered but dismissed from further analysis as there is no known potential for adverse impacts to this resource. No paleontological resources are currently known within the area. If inadvertent discoveries of buried paleontological materials occur during construction, construction will stop, relevant NPS Staff will be notified, and the site will be flagged off, pending further investigation.

Socioeconomics: The proposed project would result in positive impacts to SCOE and WESC by restoring the WES program. Implementation of the proposed project is not expected to impact the economies of nearby communities bordering WHIS. Construction contracts would result in minor positive impacts to the local economy from the purchase of local goods and materials and construction operations.

Soundscapes: Heavy equipment needed for project implementation would include bulldozers, excavators, dump trucks, and front-end loaders. Noise levels would exceed ambient conditions during site work but would be temporary in nature and would not result in a permanent increase in noise levels. These impacts are adverse, but short-term in duration, and minor in intensity.

Viewsheds: The impact topic of viewsheds is dismissed for further analysis as the project would have minimal impacts on the viewshed. The WES site is located in a rural area that has been impacted by wildland fire that destroyed and damaged many of the structures. The project would have some positive impacts on the viewshed by removing the deteriorating fire damaged buildings and constructing ranch style dorms and outdoor spaces that are compatible with the rural setting. Views from the road coming into the site would be enhanced by road improvements, removal of fire damaged buildings, and the introduction of matching structures designed in a manner to protect the landscape setting.

Vegetation: Portions of the park's forested landscapes and other types of vegetation cover were cleared or highly impacted by land use practices, such as mining, logging, farming, and roadbuilding. Many of these activities occurred before the park was established. The amount of vegetation removed would be a negligible adverse impact. There are no known rare or listed plant species within the WES site. The spread of invasive plant species is a potential negative impact that would be reduced to minor levels through mitigations in Appendix D that protect native plants and prevent the spread of nonnative invasive species.

Wetlands: Wetlands are dismissed from further analysis because impacts to wetlands are anticipated to be minor and positive from two independent actions included in the Preferred Alternative:

1. Restoration of the Education Pond
2. Replacement of the Bridge over Paige Boulder Creek

Restoration of the Education Pond:

A freshwater pond was created at the site, likely in the 1950s. The 0.4-acre pond served educational purposes and provided artificial wetland habitat. When the WES school closed, the pond dried up because it was not being filled with water. This pond will be recreated through the installation of a liner on the bottom to prevent water loss, addition of an aeration system, and improvements to the pond edge. This pond is not a wetland at present – either natural or artificial. This project will have minor beneficial impacts by creating small (less than 0.25 acre) artificial wetland habitat. The pond restoration is excepted from DO 77-1 Procedural Manual's requirements for preparation of a Wetland Statement of Findings because project actions will not impact existing wetlands (DO 77-1 Procedural Manual section 5.3.2.2).

The pond will be protected by temporary fencing during construction as described in the Mitigation and Monitoring Plan (Appendix D).

Replacement of the Bridge over Paige Boulder Creek:

The Preferred Alternative also includes the replacement of the vehicular bridge over Paige Boulder Creek with a new pedestrian bridge at the same location. The work includes removal of the concrete apron and abutments in the creek bed as well as the failed concrete wingwall which will disturb a small amount (less than 0.25 acres) of riverine wetlands. The removal of structures from the creek will restore natural conditions including a net positive impact on riverine wetlands by removing the concrete apron, failed wing wall, and abutments from the creek bed, allowing development of wetland vegetation on the banks. Revegetation of soils disturbed during the removal of the bridge abutments will be completed using locally sourced willow and/or alder cuttings. The new pedestrian bridge will have minimal impacts to the creek because it will be a clear span design with abutments at least 1.5 times wider than the bank full stream width. The bridge removal is excepted from DO 77-1 Procedural Manual under Section 4.2.2-8:

> "Bridge replacements (full reconstruction of existing bridges). This exception allows for up to 0.25 acres of new, permanent impacts on wetlands. Temporary, construction-related impacts on wetlands of 0.25 acre or less may be allowed under this exception if disturbed sites are actively restored to pre-disturbance conditions during, or immediately after, construction."

An excepted action under DO 77-1's Procedural Manual section 4.2.1, such as this action, does not require completion of a Wetland Statement of Findings as long as the action complies with the Best Management Practices listed in Appendix 2 of the Procedural Manual. This project will undertake all Best Management Practices listed in Appendix 2 and therefore is excepted from the requirement for a Wetland Statement of Findings.

This EA does not include a Statement of Findings for Wetlands because impacts to wetlands are anticipated to be positive by restoring creek function and the short-term adverse impacts are below the threshold for requiring a Statement of Findings for Wetlands.

This EA does include a Statement of Findings for Floodplains in Appendix F that evaluates the risk of the WES investment to flooding along Paige Boulder Creek and Clear Creek. Separately, consultation with appropriate agencies will occur for compliance with Section 401 and Section 404 of the Clean Water Act.

Chapter 2: Alternatives

This EA analyzes a no-action alternative and one action alternative for the proposed WES Rebuild project. The no-action alternative continues current management of WES and provides a basis for comparing the effects of the action alternative. The action alternative presents a different approach to address the plan's purpose and need as described in Chapter 1 and is the NPS preferred alternative. The action alternative presented in this section was created based on recommendations of an interdisciplinary planning team and evaluation of environmental impacts. This chapter also includes alternatives considered but dismissed from further consideration.

No Action Alternative

The No Action Alternative continues current management of the WES site, carried into the future. This alternative represents current conditions and serves as a baseline for comparison with the action alternative. There would be no change to existing programs, facilities, program capacity, or parking. Under the No Action Alternative, the WES site would continue to be used for day school use, with no overnight outdoor educational opportunities. The conditions identified below would continue:

No Dormitory/Overnight Cabin Space – Under this alternative, no reconstruction of cabins would occur. The demolition of damaged facilities including cabins and other structures was completed in 2025.

Outdated Dining Hall and Kitchen - Hatcher Hall, the dining hall at WES, is out of compliance with food and health codes for a commercial kitchen and needs repairs due to the building age. The kitchen equipment and the current food storage are inadequate because of rodent infestation, appliances that no longer work, and fire suppression systems that have not been tested or upgraded. Under the No Action Alternative, the building would continue to deteriorate and eventually be demolished.

Amphitheater – The amphitheater was demolished in 2024 due to safety risks. The amphitheater is scheduled to be rebuilt prior to the actions identified in this EA with a separate NEPA/NHPA compliance path.

Universal Accessibility and ABAAS - Limited universal accessibility at WES would remain, with no access route to the drop off area or group pavilion and some outdoor activity areas. Only Hatcher Hall has accessible restrooms.

Parking and Pick-Up / Drop-Off – The student pick-up and drop-off area would remain small and inefficient, with limited space for large vehicles such as buses to turn around, inadequate parking spots for teachers and school staff, and poor visibility.

Limited Reach and Impact – WES would remain open for day-use programs only, limiting program curricula and effectiveness to the K-8 grade target audience.

Paige Boulder Creek Bridge- The bridge over Paige Boulder Creek would remain in its current condition and location, restricting the creek channel, and increasing flood risk. The concrete sill and failed wing wall within the channel would continue to inhibit fish passage.

Inadequate Staff Space – There would continue to be limited office space and storage for SCOE administration in the Hatcher Dining Hall and adjacent buildings, reducing the level of on-site support and oversight provided by SCOE.

Action Alternative (NPS Proposed Action and Preferred Alternative)

The Proposed Action:

Under the proposed action, the NPS would restore capacity to WES by rebuilding facilities at the current WES site, expanding program capacity, and restoring overnight use.

This alternative includes the Paige Boulder bridge removal and footbridge construction, improvements to pedestrian and vehicle circulation, renovation of Hatcher Hall and the existing administrative building, and construction of four to six double cabins, one quad cabin, one field instructor cabin, an administration building, teacher accommodations, new pavilions, new fire road, accessibility improvements, and a new arbor for large gatherings (Figure 2). A buildable zone has been outlined where new buildings, associated utilities, and roads would be developed, however the exact scenarios may vary within this zone. Roads would be graded with outslopes so that water will run off the road surface and reduce the potential for impacts from high intensity storms or creek flooding. Also included in this alternative is renovation of the existing pond, parking expansion, as well as upgrades to utilities, including water, power, and sewer lines. This alternative would allow for the maximum of 192 occupants, increasing campus capacity to exceed pre-Carr fire capacity resulting in more students served. The proposed outline of the rebuild scope is shown in Table 1. A new paved fire road would run through the middle of the site and increase in construction footprint. A total of nine to eleven structures, including pavilions and the arbor, would be constructed in conformance with the International Building Code, including the Wildland Urban Interface (WUI) code. The WUI code is a set of standards designed to mitigate the risks of wildfire to life and property. Revegetation would use native plant species, sourced from local genotypes within WHIS and clearing of existing vegetation would follow the National Fire Protection Association's Firewise guidance to reduce the amount of vegetation near buildings.

The design, renovation, and construction of the buildings/structures would utilize non-toxic materials and would follow the NPS Sustainability standards as outlined by the NPS 2006 Management Policies and by the Green Parks Plan: Third Edition. Housing would be electric, interior finishes would be resilient to wear, and high-performance materials would be used for windows, doors, and insulation. Fire-resistant external materials, such as cementitious fiberboard, metal or asphalt shingle roofs would be installed, and the buildings equipped with fire suppression systems. The Green Parks Plan outlines goals to achieve, including to be "Be Energy Smart and Water Wise" and to "Foster a Sustainability Ethic" (NPS 2023a). The Action Alternative would follow these guidelines to the greatest degree possible.

TABLE 1. SUMMARY OF BUILDING FOOTPRINT AREA.

Buildings	**Pre-Carr Fire**	**Existing**	**Preferred Alternative**
Hatcher Dining Hall	6,300 ft^2	6,300 ft^2 (not usable)	Remodeled 6,300 ft^2
Cabins	16 buildings 256 ft^2 each, total 4,096 ft^2	0 (fire/demolished)	5-7 buildings, total 12,000-13,500 ft^2
Bathhouse	800 ft^2	0 (demolished)	0 (demolished)
Building #717 Housing	512 ft^2	0 (demolished)	0 (demolished)
Former SCOE Admin Building, repurposed as housing	1,176 ft^2	1,176 ft^2	1,176 ft^2
Building #723 Storage / Maintenance	640 ft^2	640 ft^2	640 ft^2
New Admin Building			1,800-3,000 ft^2
Potential Additional Housing Unit			1,800-3,000 ft^2
Outdoor pavilions	1,300 ft^2	1,300 ft^2	2,600 ft^2
Large arbor			3,850 ft^2
Total Building Footprint	*14,824 ft^2*	*9,416 ft^2*	*30,166-34,066 ft^2*

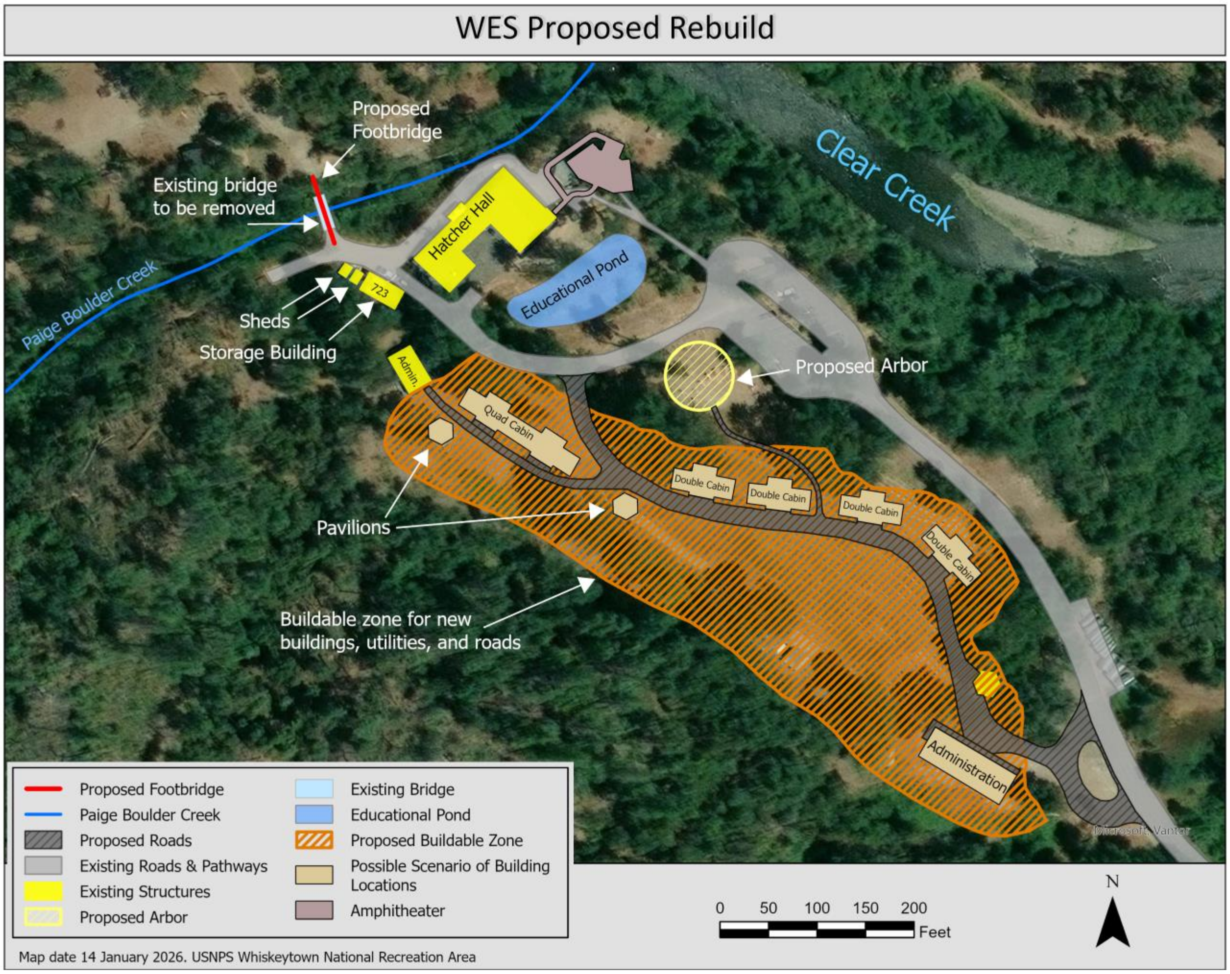

FIGURE 2. A VISUAL REPRESENTATION OF THE PREFERRED ALTERNATIVE. Existing structures are shown in yellow and a possible configuration for most of the new structures are shown in tan. Exact locations of buildings, utilities, and roads may vary within the buildable zone shown in hashed orange. There may be up to six double cabins built within this zone.

The Action Alternative is composed of 10 actions associated with the WES Rebuild:

1. Renovation of Hatcher Hall
2. Construction of double/quad residential cabin buildings
3. Conversion of existing administration building into field instructor housing
4. Construction of new administrative building and teacher accommodations

5. Construction of new arbor
6. Expansion of parking
7. Upgrades to utilities
8. Renovation of educational pond
9. Construction of fire road
10. Paige Boulder Bridge removal and new footbridge construction

Proposed Construction

Hatcher Hall - Renovation of Hatcher Hall includes modernizing the dining hall, restrooms, and commercial kitchen with new finishes, equipment, freezer, and storage. Also included is upgrading utilities, installing a fire suppression system, and changing the internal layout to include storage space, office space, pantry, first aid, and a unisex bathroom designed to meet ABAAS standards. Hatcher Hall would be universally accessible, have utility upgrades, and include the following:

- **Commercial Kitchen** - A commercial kitchen would include a serving bar, a prep area, a walk-in freezer and refrigerator, dry storage pantry, laundry, and dishwashing area.
- **Gear and Tool Storage** - Storage areas would provide adequate space to store materials, props, gear, and tools used for programs.
- **Restrooms** - Restroom facilities would be expanded and would be compliant with the ABAAS standards.
- **Office Space** - The office space would be used by the kitchen manager and program staff.

Circulation - Improved pathways would provide formal connections between buildings and prevent user-created trails. Circulation pathways would be, at a minimum, five feet wide, and constructed to IBC/ABAAS standards. Unpaved surfaces would be primarily used where suitable and paved surfaces used where required to meet building code.

Roads and Parking - The main road would be widened to a minimum 20-foot width from the site entrance to Hatcher Hall per fire code requirements for structural fire apparatus access. In addition, a new curving, unpaved, 20-foot-wide fire road would be constructed through the middle of the site to create a loop and to accommodate emergency equipment access to buildings. This road would also serve as a universal accessible route between buildings. Additional parking would be constructed adjacent to the current main road near the entrance bridge to support the increased housing, expanding parking to accommodate ten vehicles more than the current conditions. A new paved bus drop off loop would be constructed near the site entrance. In order to achieve required grades for accessibility and fire apparatus access, the main entrance road would be regraded for approximately 100 feet in either direction of the new turn around loop (Figure 2).

Bridge Demolition and New Bridge Construction - The current bridge over Paige Boulder Creek creates a flood flow constriction in the creek, increasing risk for flooding at WES, and the bridge would be demolished under the Preferred Alternative. To ensure pedestrian access to trails north of the creek, a new footbridge would be built in the same location as the existing bridge, with the proposed bridge design to allow Paige Boulder Creek to be free flowing. The existing bridge, concrete sill/apron, failed wing wall, and abutments would be removed from Paige Boulder Creek. The new bridge would be approximately 70 feet long and eight feet wide. It would be designed to be long enough that the footings and abutments are set back at least 1.5 times the width of the bankfull channel, where the edge is defined by the transition from a flat floodplain area to a bank-slope that descends into the stream channel. The creek bank may need to be reinforced with riprap or vegetation, but there would be no vertical wall structures in the creek. Construction may involve the installation of a temporary coffer dam to allow for removal of the existing concrete structures in the creek. The coffer dams would block half of the stream and then moved to the other side to allow for wildlife and fish passage during construction. Riprap may be needed at the creek edge to protect Hatcher Hall from undercutting its foundation. A cobble/boulder mix would likely be used to stabilize the creek channel after removal of the concrete in the creek.

Cabins and Staff Housing - Cabins would be grouped into larger consolidated buildings and have integral restrooms (Figures 3 and 4), different from the pre-Carr Fire independent cabins and separate bathhouse configuration. New cabin buildings would contain 2-4 sleeping rooms, each containing 7-14 beds, depending on single or bunk beds. Each building would contain one or two central restrooms, containing toilets, showers, and necessary plumbing and mechanical chases. Cabins would be located out of the drip line of oaks and would have south and southwest facing roofs that would be suitable for future solar panel systems. Retaining walls, up to four feet high, would be required on some buildings, depending on topography.

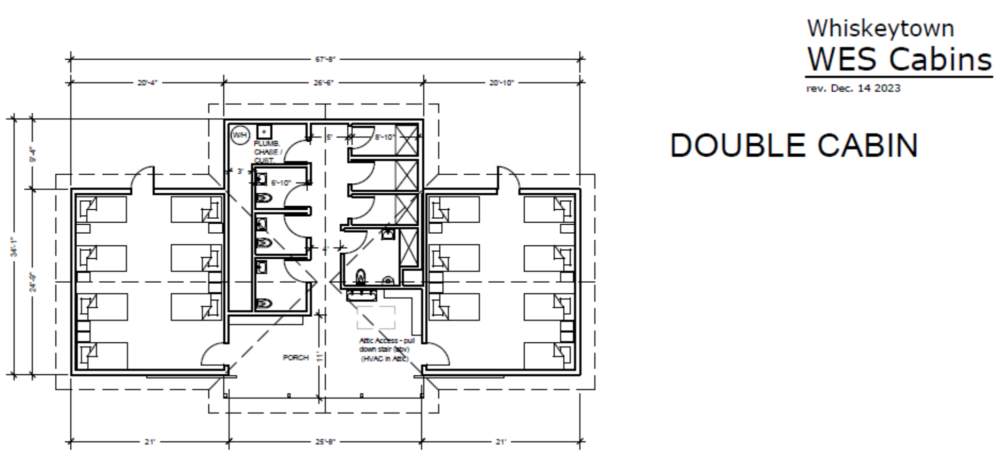

FIGURE 3. DOUBLE CABIN CONCEPTUAL DESIGN FOR WES.

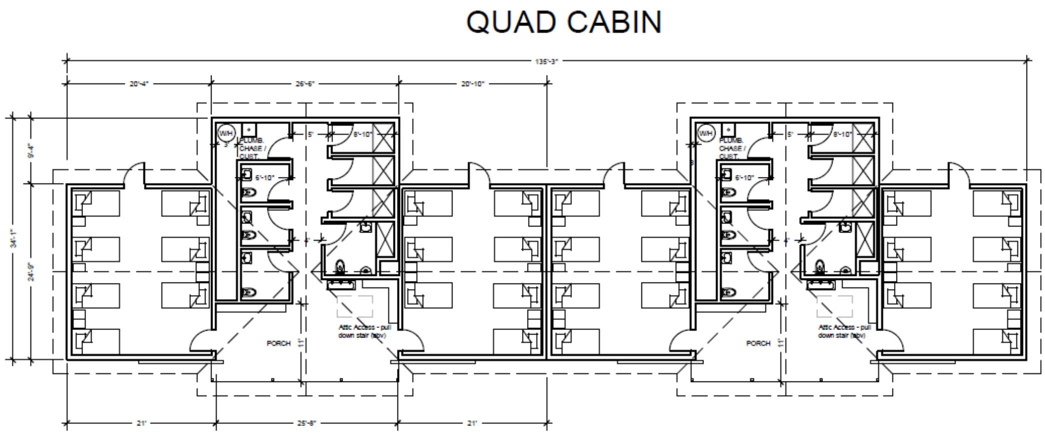

FIGURE 4. QUAD CABIN CONCEPTUAL DESIGN FOR WES.

Cabins would feature exterior opening doors, which enables monitoring of doors from a single vantage point. For ABAAS compliance, one restroom is fully accessible. Building porches and cabin entrances are designed with a front gable that enables the cabins to be closed off with large barn doors when not in use. In addition, custodial storage space would be adjacent to restrooms. Mechanical equipment would be in the attic below a simple cross-gable roof with an access opening in the porch ceiling.

The existing single story administration building would be converted into a three-bedroom house, for use as naturalist staff housing, and would have a view of the cabins for safety. A combined administration and teacher overnight accommodation building would be located at the top of the slope near the main entrance, which allows a view of the front of the cabins and provides a point-of-entry to the WES site.

The new building to support the school administration and support functions would also be built near the main entrance road. One half of the building would contain offices, a staff workspace, a conference room, restrooms and a sick room for students. The other half would be dorm-style overnight accommodations for teachers whose classes are attending the school session. Its location at the site entrance would serve as the check-in point for arriving classes, visiting parents and miscellaneous deliveries and services and be sited to have a view of the main entrance road.

In the future, NPS may also consider constructing a new staff housing dormitory. This building would be located in the same buildable zone as the other new structures to ensure reduced floodplain risk, utility access, and other logistical needs.

Large Arbor - A large open-air pavilion-type structure consisting of support posts, framing and a roof approximately 70 feet in diameter would be constructed near the parking area. The structure would be sized to accommodate all the students and staff on campus as an alternative to the indoor dining hall space. The large outdoor arbor space would support a wide range of large group gatherings. The space would have a route to the parking area and to restrooms and potable water which meets accessibility requirements.

Electric - Electric lines would run from the current main paved road and underneath the proposed paved fire road to each of the buildings (Figure 5).

Water - The WES site underground water main would be replaced from its connection point at Hatcher Hall to the Clear Creek Water District main line on the opposite side of Clear Creek. The new line would be approximately 3,500 feet and it would cross Clear Creek beneath the existing bridge over Clear Creek on conduits installed on the bridge for this purpose. Lateral underground water supply lines for portable water and fire suppression would be installed to each building.

Septic - The existing leach field is being evaluated and in planned to remain in situ with potential expansion of the system in the same general area as part of the existing system will be impacted by building and fire road construction. New underground lateral lines would be installed to connect the septic system to the new buildings.

FIGURE 5. UTILITY DEVELOPMENT CONCEPT SITE PLAN FOR WES.

Storm Drainage - Currently, WES does not have a piped underground storm drainage system and relies on surface sheet flow. Careful grading and siting of the buildings in harmony with the topography would continue natural sheet flow across the site, from hillsides to creek, without damage to buildings. No construction of a piped system is anticipated.

Pond Renovation - Currently, water loss through soil percolation occurs in the pond at average rates ranging from 0.59 to 3.07 inches per day. Because of this excessive percolation through the soil, the method that has been determined to be most effective for water retention in the pond is to install an artificial pond waterproofing lining on top of the existing soil bed. This will involve the grading and compacting of the existing soil bed, installing a protective geotextile filter fabric layer over the compacted soil, installing an artificial Reinforced Polyethylene (RPE) waterproofing panel over the fabric layer, and then installing a protective geotextile fabric layer over the waterproofing liner.

A concrete pond perimeter shoreline edge wall is also proposed to better define the pond perimeter and to allow for a 12-inch water depth at the wall. The majority of this concrete structure would be under the water surface and would be textured and stained to better blend in with the natural environment. The existing concrete steps on the northern edge of the pond would be replaced or renovated to repair cracks, gaps and holes from decades of wear.

Historically, the water supply for the pond was from nearby Paige-Boulder creek. The intake structure at the creek and the outlet into the pond, connected by a gravity-flow pipeline, have been abandoned and can no longer be found on-site. In recent years a water hose connected to Hatcher Hall has supplied chlorinated water to fill the pond. Three options for water supply were evaluated. The first option is to continue using the chlorinated water source and install carbon filtration in the supply pipeline to remove chlorine before water enters the pond. An automated water sensing and fill mechanism would be installed and would maintain the water surface elevation. Also, a pond aeration system would be installed, which would supply oxygen to the water and would continuously remove chlorine from the water by volatizing it into a gaseous state. The second option would be to install a new well and water treatment system. This option is not recommended, as there is no assurance that a viable subterranean aquifer is present, has acceptable water quality, and that the aquifer is not excessively deep. Also, this method is excessively costly and has a lengthy time frame for construction and permitting. The third option is to install a new sump and water supply pump in Clear Creek. This option is also not recommended, as it may also involve permitting processes and would be excessively costly for installation and development. This EA analyzes Option 1, treated water, in the Preferred Alternative.

In addition to the mechanical carbon filtration of the water supply, a gravel bed biological filter is proposed to remove nutrients and organic matter that can feed algae growth and increase turbidity in the pond. Bacterial colonies in the gravel bed would digest nutrients and organic matter and would also mechanically strain out particulate matter, clarifying the pond water. This filter consists of well screen pipelines under the gravel bed, and all would be placed within a recessed rectangle shape in the deepest part of the pond, 15 feet wide by 80 feet long by 2 feet deep.

Site Grading - Site grading would be needed for the purpose of ABAAS compliance and accessibility of buildings, such as creating level pathways. It would also be utilized for the construction of the new proposed buildings and structures. Retaining walls, anticipated at less than four feet high may be needed.

Construction Staging - Staging and stockpiling areas would be in previously disturbed sites at WES. Parking for construction equipment and vehicles would be limited to staging areas, the existing roadway, parking areas, and other previously disturbed areas. No new areas would be developed for the staging of construction materials and equipment.

Construction Closures - Full closure of the campus would occur during construction activities, with an anticipated closure period of approximately two years.

Alternatives Considered but Dismissed

- **Tent Cabins** – This alternative would include a minimal build option of tent cabins. This alternative was not pursued because of the limited season and functionality of large canvas or vinyl tents erected on a wood platform. The tents would need to be erected at the beginning of the school season and disassembled and stored over the off-season, requiring regular additional staff effort. Left standing year-round the tents would need to be replaced every few years. The cabins would not have heat or air conditioning, which limits the overnight programs to six-week shoulder seasons during the spring and fall in Shasta County. Winters are too cold and rainy and summers too hot and dry for comfortable use. Tent cabins would not have electricity which is problematic for students who need power for medical devices. In addition, tent cabins attract rodents that can spread disease. This alternative was dismissed due to issues with limited site use, lack of heating and cooling, exposure to the elements, short life span, and limited accessibility for all types of students.

Mitigation Measures

Congress charged the NPS with managing the lands under federal government stewardship “in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations” (NPS Organic Act, 16 USC 1). As a result, NPS staff routinely evaluate and implement mitigation measures whenever conditions occur that could adversely affect the sustainability of NPS resources. Mitigation measures are the practicable and appropriate methods that would be used under the Action Alternative to avoid and/or minimize harm to park natural and cultural resources, visitors, and the visitor experience. Mitigation measures have been developed to minimize the degree and/or severity of adverse effects and would be implemented, as needed, during construction activities proposed in the Action (NPS preferred) Alternative. **See Appendix D: Mitigation Monitoring and Reporting Program.**

Chapter 3: Affected Environment & Environmental Consequences

Introduction

The National Environmental Policy Act (NEPA requires that environmental documents discuss the environmental impacts of a proposed federal action, feasible alternatives to that action, and adverse environmental impacts that cannot be avoided if an action is implemented. This chapter begins with an explanation of methods, describes the existing conditions including existing resource trends and planned activities (affected environment and analyzes the potential environmental consequences (impacts or effects that would occur because of implementing the alternatives. This chapter assesses the potential impacts on water quality, floodplains, visitor use and experience, threatened and endangered species, wildlife, and cultural resources.

This chapter describes the affected environment (existing setting or baseline conditions and analyzes the potential environmental consequences (impacts or effects that would occur as a result of implementing the proposed project. Direct, indirect, and cumulative effects are analyzed for each resource topic carried forward. Potential impacts are described in terms of type, context, duration, and intensity.

General Methodology for Establishing and Assessing Impacts

This section describes the current and expected future conditions of the following impact topics: water quality, floodplains, visitor use and experience, threatened and endangered species, wildlife, and cultural resources. These impact topics were identified through scoping as having the potential to be affected by the implementation of the alternatives described in Chapter 2. Additionally, this chapter analyzes the beneficial and adverse impacts that would likely result from implementing either of the alternatives. Impact topics considered but dismissed from detailed analysis are described in Chapter 1.

This chapter is organized by impact topic. The Affected Environment section for each impact topic includes a discussion of trends and past, present, and reasonably foreseeable future actions that could affect that impact topic. The Environmental Impact section evaluates expected impacts from the implementation of each alternative. A factual description of the impact provides the reader with an understanding of how the current and expected future conditions of the resource could change from implementing the alternatives.

Effects that result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable actions, are also analyzed. Past, present, and reasonably foreseeable future actions were identified to determine the extent to which the environment has been or will be disturbed, maintained, or enhanced. Projects and activities were evaluated based on proximity, connection to the same environmental systems, potential subsequent impacts or activities, likelihood of occurrence, and if reasonably foreseeable. Past, present, and reasonably foreseeable future actions in the project area that could affect the impact topics include the following:

- Accessibility Self-Evaluation and Transition Plan (2016) – This plan focuses on designing an effective plan to improve the park's accessibility by upgrading services, activities, and programs at park areas, while instilling a culture of universal access by conveying information to the widest population possible. Specifically discussed within this plan is the WES program and areas for improvement.
- Carr Post-Fire Response Plan (2018) – This plan identified actions to mitigate damage to resources due to the Carr Fire, such as emergency stabilization, rehabilitation, and monitoring. Within this plan, the Burned Area Emergency Response (BAER) team carried out flood mitigating measures such as temporary Hesco barriers and recommended that the site be closed to the public for up to three years.
- Early Detection Survey and Treatment of Invasive Plant Species Post-Carr Fire (2019 to 2025) – Early Detection Rapid Response (EDRR) treatments of invasive plant species have been implemented throughout WHIS, including the WES site.
- Gravel Augmentations (2019-ongoing) – These projects are expected to continue on a cyclical basis along Lower Clear Creek indefinitely. The most recent augmentation occurred just downstream of WES in spring of 2025.
- Zogg Suppression Repair Plan – Dozer Line (2020) – During the Zogg Fire, miles of dozer line were constructed to access Kanaka Peak by way of the WES site. Afterwards, there was a need to restore these dozer lines to their pre-fire conditions as much as possible.
- Rock Barrier Installation for Protection of Sensitive Areas at WES (2021) – This project restricted vehicular access to an archeologically sensitive site via the placement of large native rocks.
- Whiskeytown National Recreation Area Trails Management Plan – Environmental Assessment (2022) - This plan proposes to improve and expand the existing trail system by offering more diverse trail experiences by creating new trails, rerouting existing trails, and decommissioning outdated ones. The scope of this plan includes trails around the WES site and trails within the Lower Clear Creek watershed.
- WES Amphitheater Demolition (2024) – This project removed and disposed of the crumbling amphitheater, which posed a safety risk to occupants at the site.
- WES Cabin Demolition (2025) - This project removed and disposed of eleven structures at the WES site. These buildings were severely damaged resulting from the Carr Fire and the utilities have deteriorated beyond repair.
- Whiskeytown Hazardous Fuels Reduction (2025) - This plan focuses on reducing hazardous fuels around structures, facilities, and roads, thinning 8.6 acres of the WES site and surrounding area.
- WES Amphitheater Construction (2026) – This project will rebuild the amphitheater to meet safety and accessibility standards within the same footprint of the prior amphitheater.
- Peltier Bridge Replacement (Future) – This project proposes to replace the existing bridge built in 1955 with a prefabricated flat truss bridge. This bridge spans Clear Creek ¾ mile upstream from WES and provides access to a campground.

Water Quality

Affected Environment

This section focuses on the water quality within Lower Clear Creek, which is directly next to the WES site. The portion of Clear Creek analyzed in this section is from River Mile 13.2 to 18.4 (Figure 6) and conditions analyzed include temperature and turbidity. Average temperature in Lower Clear Creek has been variable with no clear trend from 2014 to 2023 (CDWR, n.d.). Within Whiskeytown, the park's driest year was in 2021, when 21 inches of precipitation was recorded (NPS, 2023c). The driest three-year period at WHIS occurred between 2019-2022 (NPS, 2023c). Winter precipitation, including snowpack, can be highly variable within the park

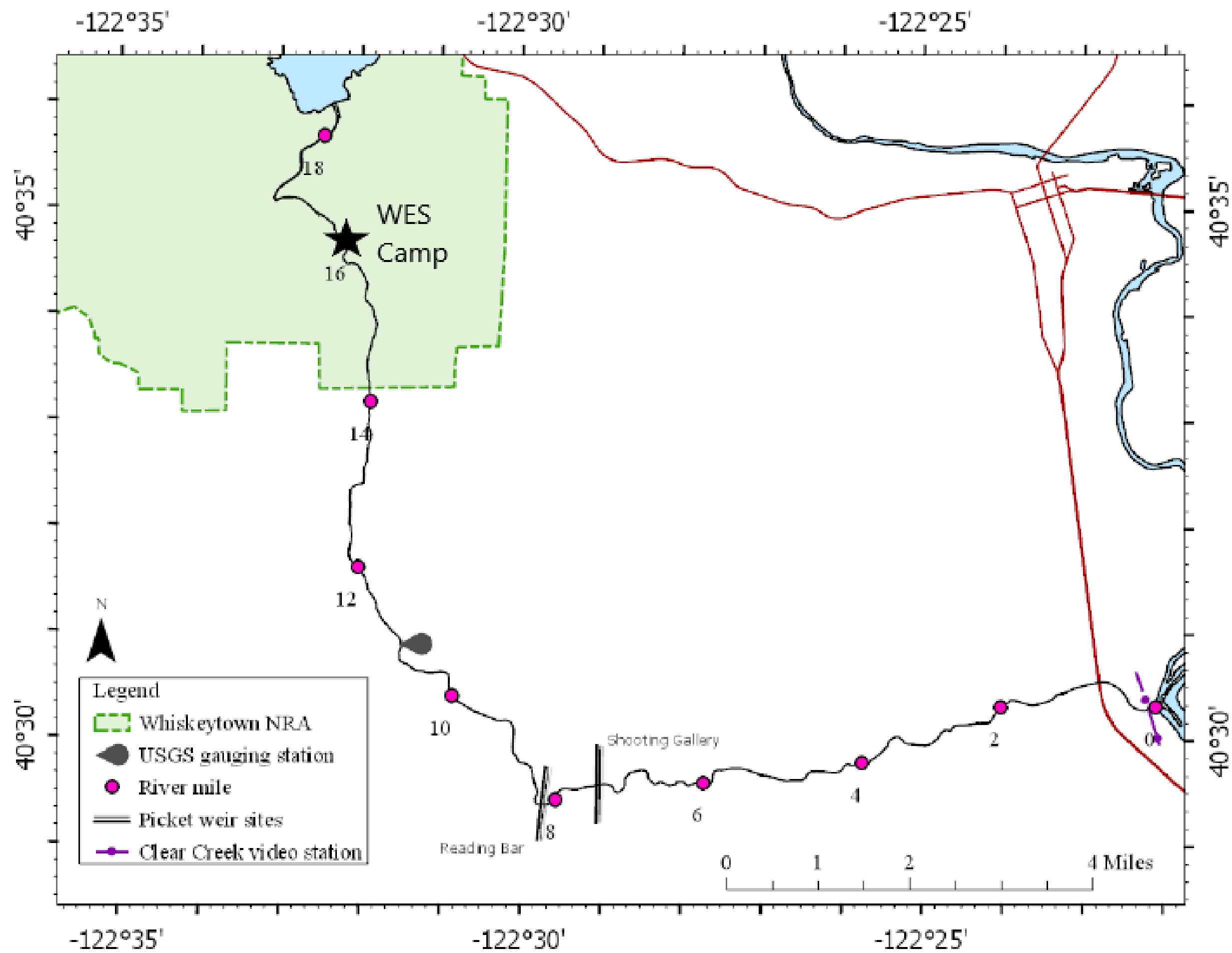

FIGURE 6. AREA MAP SHOWING WES AND LOWER CLEAR CREEK TO SACRAMENTO RIVER. The sections covered for water quality includes the river miles (RMs) from 13.2 to 18.4, WES is located at RM 16.1, as indicated by the black star (Schaefer et al., 2023).

Turbidity units, measured in Nephelometric Turbidity Units or NTUs, are used to describe water clarity by analyzing suspended particles in water (Water Science School, 2018). Generally speaking, a water sample with higher turbidity has more particles, particulates, and sediment than one with lower NTU. In most cases, lower NTU indicates better water quality for a particular body of water. Turbidity within Lower Clear Creek jumped, as expected, after the Carr Fire of 2018, with a high observed value of 1.484 NTU (Schaefer, 2024). Comparing the WES area with the rest of the park, WES burned less intensely than other areas that had total stand replacing fires with high intensity and duration. Over the next two years, turbidity decreased consecutively, by 0.384 and then by 0.03 the following year. In 2022, turbidity increased by 0.04, which is a small increase compared to the increase in 2019 after the Carr Fire.

For biotic conditions, such as quantity of various life stages of special-status species, see Threatened and Endangered Species in the Affected Environment.

Impact of No Action Alternative

Under the No Action Alternative, the potential for adverse impacts to water quality due to the amphitheater and cabin demolition and amphitheater rebuild would be reduced or avoided by using the mitigation measures identified in Appendix D including BIO-7 which includes actions to protect waterways and wetlands. Regarding the amphitheater demolition, an informal consultation with the National Marine Fisheries Service (NMFS) indicated that the proposed mitigations were sufficient to avoid adverse impacts to water quality. While there is some potential for turbidity from sedimentation in Clear Creek, with the proper erosion and water quality mitigation measures, including BIO-7, impacts are reduced to minor levels.

Conclusion – The No Action Alternative has the potential to impact water quality by increasing turbidity within Lower Clear Creek, directly adjacent to the WES site, however adverse impacts would be avoided with mitigation measures for existing projects.

Impact of Action Alternative (Preferred Alternative)

Under the Action Alternative – Proposed Action, there would be potential for similar impacts to water quality as the No Action Alternative and with the addition of the proposed action, there is a potential for minor to moderate adverse impacts resulting from construction adjacent to Clear Creek including construction activities that would clear vegetation and disturb soils. The area of disturbance is approximately 1.5 acres. These actions could adversely impact the section of Lower Clear Creek directly adjacent to WES. The proposed activities have the possibility of worsening water quality conditions through erosion runoff and increasing turbidity.

The water quality mitigation measures are designed to contain erosive soils, resulting in no permanent change in water quality. Mitigation measures include erosion control measures such as silt fences, erosion control mats, and water and check bars where necessary and are included in Appendix D.

Conclusion – The potential negative impacts to water quality under the Action Alternative are expected to be greater than the No Action due to the larger project scope and footprint. However, with the mitigation measures, the threats to water quality would be reduced to minor to moderate levels.

Cumulative Impacts

Regarding cumulative impacts: in 2019 and 2020 two Lower Clear Creek habitat restoration projects installed 15,000 tons of spawning size gravel into the creek system. In 2019, gravel was placed just downstream of Peltier Bridge (upstream from WES). In 2020, the project added gravel just downstream of WES. These projects had the potential to adversely impact water quality due to increasing turbidity. However, these impacts to water quality were short-term in nature, only occurring during the gravel placement and coupled with approved mitigation measures. There are several future projects planned in the WES area, including ongoing gravel augmentations near WES and at other locations along Lower Clear Creek planned for the next decade, as well as the Peltier Bridge Replacement. The removal of Peltier Bridge, located upstream of WES, has the potential to adversely impact water quality due to disturbance of the water in Clear Creek, contributing to turbidity issues. Activities related to the Trails Management Plan are also ongoing around the WES area, however an EA and associated agency consultations were completed (NPS, 2022a) to ensure no adverse effects to water quality with standard mitigations in place for erosion control. Additional water quality monitoring and BMPs recommended by the Central Valley Regional Water Quality Board, NOAA Fisheries, and the U.S. Fish and Wildlife Service (USFWS) would be integrated to reduce adverse impacts from these projects.

Floodplains

Affected Environment

The WES school is located adjacent to two waterways including Clear Creek and Paige Boulder Creek that have the potential to flood. This section discusses the past flooding events and evaluates the risk for the investment in the WES site. While the risk of normal flooding is considered low, floodplains has been retained for further analysis due to the risk of human health, safety, and welfare by occupying the site, citing Floodplain Management Director's Order (DO) 77-2 and Executive Order (EO) 11988.

On New Year's Eve 1997 a storm delivered 19 inches of rain in a 48-hour period to watersheds that were already saturated within WHIS (NPS 1997). Rapid snowmelt in areas above 4500' elevation exacerbated the effects of the storm, contributing to the excessive streamflow. Heightening the effects of flooding, debris flows originated in headwater regions and caused extensive damage to park facilities. Much of the upper Paige Boulder watershed is underlain by Shasta Bally granodiorite, which is rich in the mineral biotite that weathers relatively quickly and deeply and causes hillslope instability (Bilderback, 2020). The erosive soils combined with the storm led to a debris flow in Paige Boulder Creek. It began as a small-scale failure originating in locations disturbed by prior logging operations and progressed into a much larger "debris torrent" in the downslope basin and mainstem of the creek. The "debris torrent" removed one bridge and cut access to another bridge at WES (Figure 7). The three buildings closest to Paige Boulder Creek (Hatcher Hall, Buildings 717 and 723) during this storm experienced water damage or very narrowly avoided water damage (Bilderback, 2020).

Figure 7. Photo documentation of storm and debris flow damage caused by the 1997 New Year's storm. Photos show bridge destruction by creek, high water, and destroyed building.

The NPS has considered moving Hatcher Hall due to the perceived increased flood risk. It was previously recommended that Hatcher Hall and Building 723 be relocated as the buildings are located adjacent to areas that could experience damage from debris flows and where flooding damage could be expected at some point in the future (Bilderback, 2020). However, it was later determined through hydraulic modeling that the level of risk to Hatcher Hall and nearby facilities is within what would be considered acceptable (NPS, 2022b). The primary risk to Hatcher Hall would occur if the adjacent bridge spanning Paige Boulder Creek became plugged by debris during a large flood event, causing flood water discharges over the banks and toward the west side of the building. The likelihood of these conditions occurring simultaneously is very low (less than 1% annual chance). Figure 8 demonstrates an extreme scenario of a 2,627 CFS flow in Paige Boulder Creek along with an 80% plugging of the bridge with debris. This would result in the flood elevation reaching the building. Even with this scenario, the inundated depth of Hatcher Hall would be ~ 1 ft and ~ 3 ft/s velocity, which does not place this facility in a high-risk category. [NPS, 2022b].

Extreme precipitation events are expected to increase within the Clear Creek watershed that feeds Whiskeytown Lake, which can result in increased flood risk in lower Clear Creek (NPS, 2021c). A threefold increase in events similar to California's 'Great Flood of 1862' is expected as a result of changes to climate systems. Atmospheric rivers also contribute to extreme precipitation events and flooding, especially on the West Coast of the U.S.

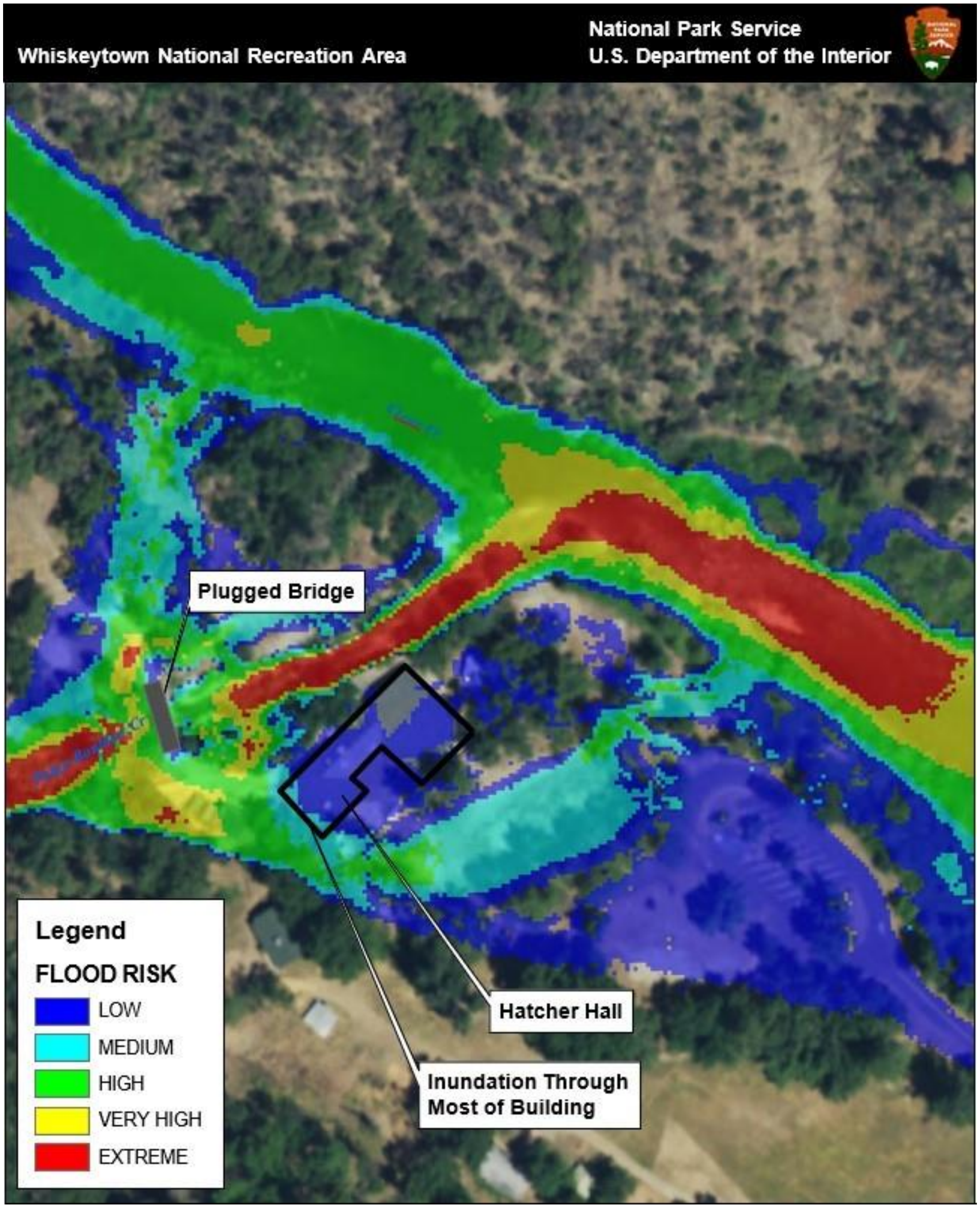

FIGURE 8. MAP REPRESENTING A 100-YEAR FLOOD EVENT IN PAIGE-BOULDER CREEK AND THE ASSOCIATED FLOOD HAZARD RISK TO LIFE AND PROPERTY, IN POST CARR FIRE CONDITIONS WITH THE PAIGE-BOULDER BRIDGE 80% PLUGGED WITH DEBRIS (NPS 2022B).

The replacement of Paige Boulder Creek vehicular bridge with a footbridge is included in the Proposed Action due to the poor condition of the existing bridge and to limit potential for plugged debris (NPS, 2022b). While the debris flow and subsequent flooding event is highly unlikely**,** NPS is proposing to remove and replace the existing bridge in part due to the flooding concerns.

Impact of No Action Alternative

Under the No Action Alternative, the risk to health and safety from flooding is direct and minimal. There is currently no overnight use, and the site can be closed in the case of severe weather, reducing the risk to WES employees and participants. The risk to the existing buildings and infrastructure is direct and moderate because of the potential of a debris flow to clog the Paige Boulder Creek Bridge and flood Hatcher Hall and adjacent buildings. This could cause impacts for WES, including but not limited to closure of campus for multiple seasons and campus closure depending on the severity of the damage.

Conclusion –While the flood risk at WES is minimal and direct, it has been retained due to the risk to human welfare, safety, and health. This is due to buildings being present within and adjacent to the floodplain, and due to the history of events like the 1997 flood, which caused damage to the buildings at WES and posed a risk to human safety.

Impact of Action Alternative (Preferred Alternative)

The purpose of EO 11988 is to avoid long and short-term adverse impacts due to occupying and modifying floodplains (EPA, 1977). DO 77-2 works in conjunction, fulfilling a similar role on an NPS level, managing floodplains by minimizing potentially hazardous conditions associated with flooding (NPS, 2003). Each agency is required to minimize the impact of floods on human health, safety, and welfare. There is a responsibility to evaluate potential effects of actions in a floodplain. This is typically evaluated by NPS standards with a Statement of Findings, in which non-structural measures to reduce hazards to human life and property are employed. This would also ensure that structures and facilities are designed to be consistent with the intent, standards and criteria of the National Flood Insurance Program. A Statement of Findings has been prepared for the Action Alternative and is attached in Appendix F. The Paige Boulder Bridge removal in the Action Alternative is expected to reduce flooding risk to the campus (Figure 9). The results from a bridge removal scenario show that risks to facilities could be further reduced when the bridge and its associated flow restriction is removed (NPS 2022b).

Conclusion – Overall, the impacts of the Proposed Action Alternative to floodplains are expected to be direct, long term, adverse, and minor to moderate because the removal of the Paige Boulder Bridge would reduce the flooding potential. See Appendix F for more detailed information.

Cumulative Impacts

Future projects such as ongoing gravel augmentations along Clear Creek, the future planned Peltier Bridge replacement and activities related to the Trails Management Plan are not expected to impact floodplains. The cumulative impact to floodplains would be negligible for both the No Action and Action Alternative.

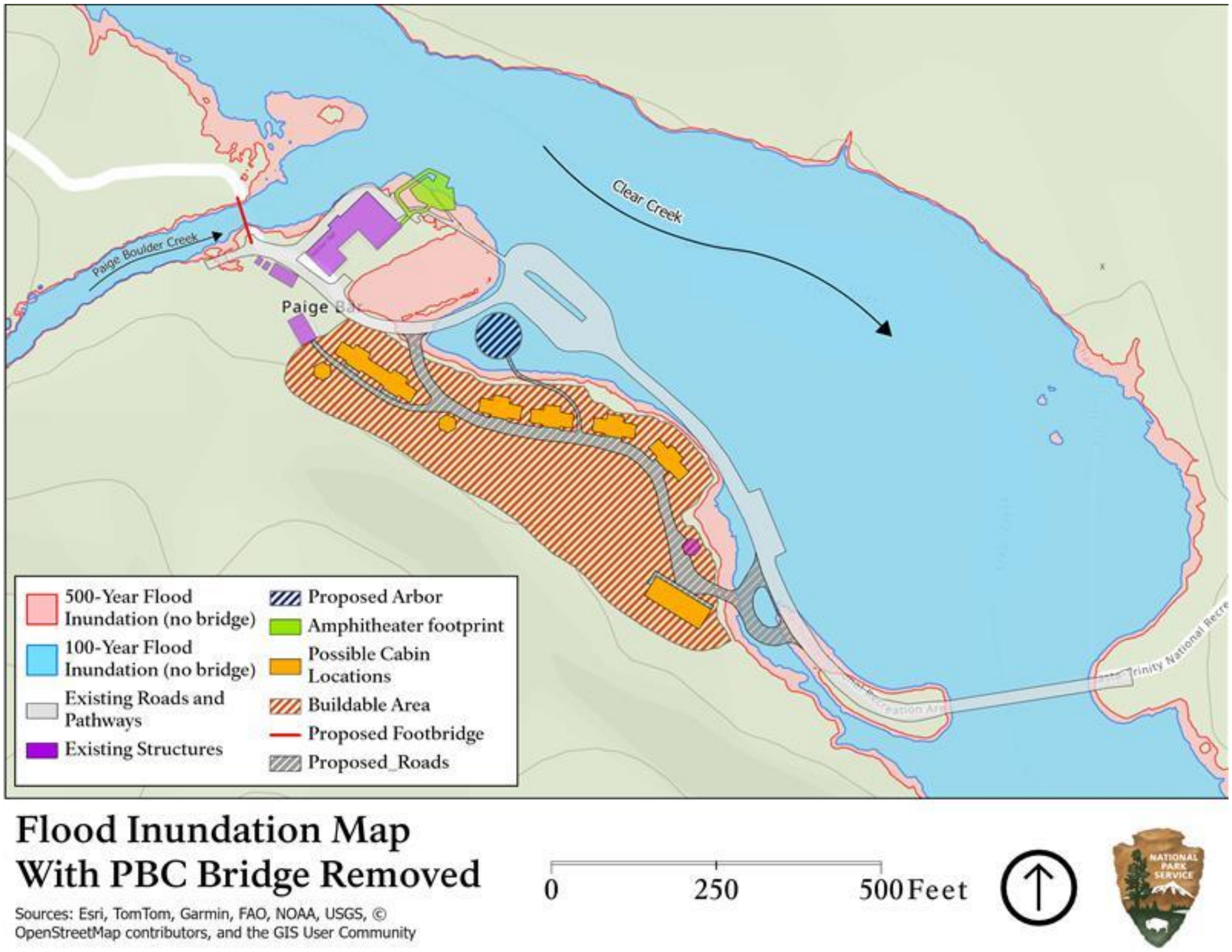

FIGURE 9. MAP REPRESENTING BOTH A 100-YEAR FLOOD AND A 500-YEAR FLOOD IN POST CARR FIRE CONDITIONS WITH THE PAIGE-BOULDER BRIDGE REMOVED.

Visitor (Student) Use and Experience

Affected Environment

WES provides students with a variety of opportunities to learn about the natural world, with real-life examples at the WES pond, Lower Clear Creek, and the network of trails around WES, including Martha's Ditch, Guardian Rock and Salt Creek Mine trails. Besides the abundant natural resource educational opportunities, WES often incorporates local history of the Gold Rush and Indigenous peoples into their curriculum. Many students emphasize the life-changing nature of outdoor education experiences at WES, allowing them to see nature and learning in an entirely new light.

Attendance has fluctuated since it was originally designated as a 'NEED Camp' in 1970. During a 27-year period from 1970-1997, program operators did not document student attendance at WES. As a result, SCOE has estimated the attendance for those years. SCOE estimates that 2,300 students attended the camp in the first year of operation. By 2006, visitation to WES was at its all-time peak of 4,922 students. There was an increase in popularity over time, with some fluctuation, possibly due to funding limitations. There was a stark drop in attendance in 2018, due to the camp closure during the Carr Fire, in which 1,866 students attended compared to 4,246 students in 2017. No students were able to attend WES after the Carr Fire in 2018 through 2020 due the risk of post-fire debris flows and repairs necessary to address safety concerns after part of the campus burned in the fire. In 2021 school groups were allowed to return to WES for half-day field trips. Details are outlined in Appendix C.

The analysis boundary for Visitor Use and Experience is the Orofino Gulch area and the WES site itself, about 83 acres in size, due to transportation needed for construction materials and other related activities. This area of the park may become congested due to construction, with trucks and people filtering in and out of the WES area.

Impact of No Action Alternative

Under the No Action Alternative, long term moderate adverse impacts would continue to occur to visitor (student) use and experience because the program would be missing the overnight experience element. The scope of the program would remain day use and not include the immersive experience of a week-long environmental educational program.

There would be minor short term adverse impacts from the demolition at the site including demolition of cabins and the amphitheater. Demolition would have limited timeframes and would not occur when students are present in order to avoid safety issues.

Conclusion – Under the No Action Alternative, the moderate long term adverse impacts to the WES program and the students it serves would continue and during construction there would be short term minor adverse impacts to visitor use and experience.

Impact of Action Alternative (Preferred Alternative)

Under the Action Alternative, there would be long term moderate beneficial impacts to visitor use and experience by the resumption of the overnight programs at WES. The project would allow for an expansion of the program, providing the region's children an opportunity for a safe educational experience.

During construction there would be short term minor adverse impacts to visitor use and experience because full campus closure would be necessary for the Action Alternative.

Conclusion –Under the Action Alternative, the immediate adverse impacts to visitor use and experience would be greater than those of the No Action Alternative because of the larger scope and longer duration of closure that would occur. The long-term beneficial impacts to visitor use and experience from resumption of the full WES program outweigh the short-term impacts.

Cumulative Impact

Regarding cumulative impacts of visitor use and experience under the No Action Alternative, there are several projects that are connected within the Orofino Gulch and WES area. The future replacement of Peltier Bridge would occur just upstream from WES on Clear Creek, and the combination of construction activities within the Orofino Gulch area may congest roadways and cause traffic delays within the area. Regarding cumulative impacts under the Action Alternative, there would be minor adverse impacts greater than the No Action Alternative because the period of campus closure would be longer.

Threatened and Endangered Species

Affected Environment

There are two listed species under the Federal Endangered Species Act (ESA, 16 U.S.C. §1531 et seq. (1973)) that reside within Lower Clear Creek and adjacent to the WES site. Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and California Central Valley steelhead trout (*Oncorhynchus mykiss*) are listed as Threatened under the ESA. Central Valley spring-run Chinook salmon are one of four distinct Chinook salmon runs in the Sacramento River Basin (Schaefer et al., 2023). This distinct population of salmon used to be widespread and has been reduced to a few remnant populations in the Sacramento River system due to overfishing, habitat destruction, and habitat loss due to dams and water diversions. The spring-run Chinook was originally listed in 1999 by the NMFS under the Federal ESA (64 FR 50394). The threatened status was reaffirmed in 2005 (70 FR 37159) following the NMFS hatchery listing policy and remains so after the most recent status review in 2016 (NMFS, 2016). The California Central Valley steelhead trout is one of 13 distinct populations of steelhead trout within the West Coast and Alaska (NOAA, n.d.). It was formally listed under the ESA in 1998 by NMFS (Schaefer, 2024) and the listing status was reaffirmed in 2011, following a five-year review. Within the California Central Valley, overfishing, mining operations, dam construction, and water diversion have contributed to decline of both species.

Since 1995, the Central Valley Project Improvement Act, Clear Creek Fish Restoration Program, and the California Ecosystem Restoration Program have done extensive anadromous salmonid habitat and flow restoration in Clear Creek (Schaefer et al., 2023). In September of 2005, Clear Creek was Designated as Critical Habitat and includes Clear Creek from the Sacramento River confluence to Whiskeytown Dam (50 CFR 226.211). The removal of the McCormick-Saeltzer Dam on Lower Clear Creek in fall of 2000 has allowed Central Valley steelhead and Central Valley spring-run Chinook to access the upper reaches of Lower Clear Creek. Restoration actions have included increased minimum instream flow, water temperature control, dam removal, largescale stream and floodplain restoration, and gravel augmentation. Specific actions regarding Clear Creek included flow, water temperature, and habitat management. The Red Bluff Fish and Wildlife Office has monitored spring-run Chinook salmon in Clear Creek since 1999 to assess population trends and evaluate impacts of restoration actions on their recovery. Starting in 2010, artificial stream flow fluctuations (pulse flows) have been released from Whiskeytown Dam, with the goal of attracting spring-run Chinook into Clear Creek while eliciting their movement to upstream habitats. Protection of riparian vegetation is a priority along Clear Creek as riparian vegetation provides shelter and multiple food sources (such as insects) for fry and juvenile salmonoids, which allows them to grow and increase chances of making it to the ocean and back for migration and subsequent spawning (NPS, 2024c). In addition to habitat restoration, lifecycle population monitoring is a key part of recovery actions. The Red Bluff Fish and Wildlife Office has conducted spawning surveys since 2003 to assess status, trends, and effects of restoration actions on spawning populations of adult Central Valley steelhead.

The migration timeline for Central Valley spring-run Chinook and California Central Valley steelhead varies by species, in which spring-run Chinook migrate, spawn, and rear from March to October, with peak spawning in September (Schaefer, 2024). Females deposit their eggs in nests in gravel-bottom areas of relatively swift water. After emerging, Chinook salmon fry tend to seek shallow, near-shore water habitat with slow water velocities. As they grow, they seek progressively deeper and faster water. Spring-run juveniles frequently reside in freshwater habitat for 12 to 16 months, but many young migrate to the ocean during the spring within five to eight months after hatching. Central Valley steelhead migrate, spawn, and rear from December to April. Juvenile steelhead typically rear for one to two years before migrating to the ocean, generally in the spring.

A variety of methods are utilized annually to monitor both steelhead trout and Chinook salmon on Clear Creek including whole creek kayak surveys, snorkel surveys, and video surveys at weirs. The surveys allow for observation of distribution and provide an index of abundance and critical information regarding spawning habitat parameters, including spawning success. Carcass counts are also conducted annually and provide key biological data and provide information about hatchery influence on the natural population (Bottaro, 2019). The total number of adult Chinook returning varies drastically from year to year, dependent on many conditions including drought, availability of food sources, wildfires, etc. Whole creek kayak surveys were conducted approximately every other week from December 2020 to April 2021 for Central Valley steelhead. Surveyors identified 371 *O. mykiss* redds (nests) over six survey periods. As seen in Figure 10 below, spring-run Chinook numbers vary from a high of 2,252 individuals in 2021 to 0 in 2023 (CDFW, 2024).

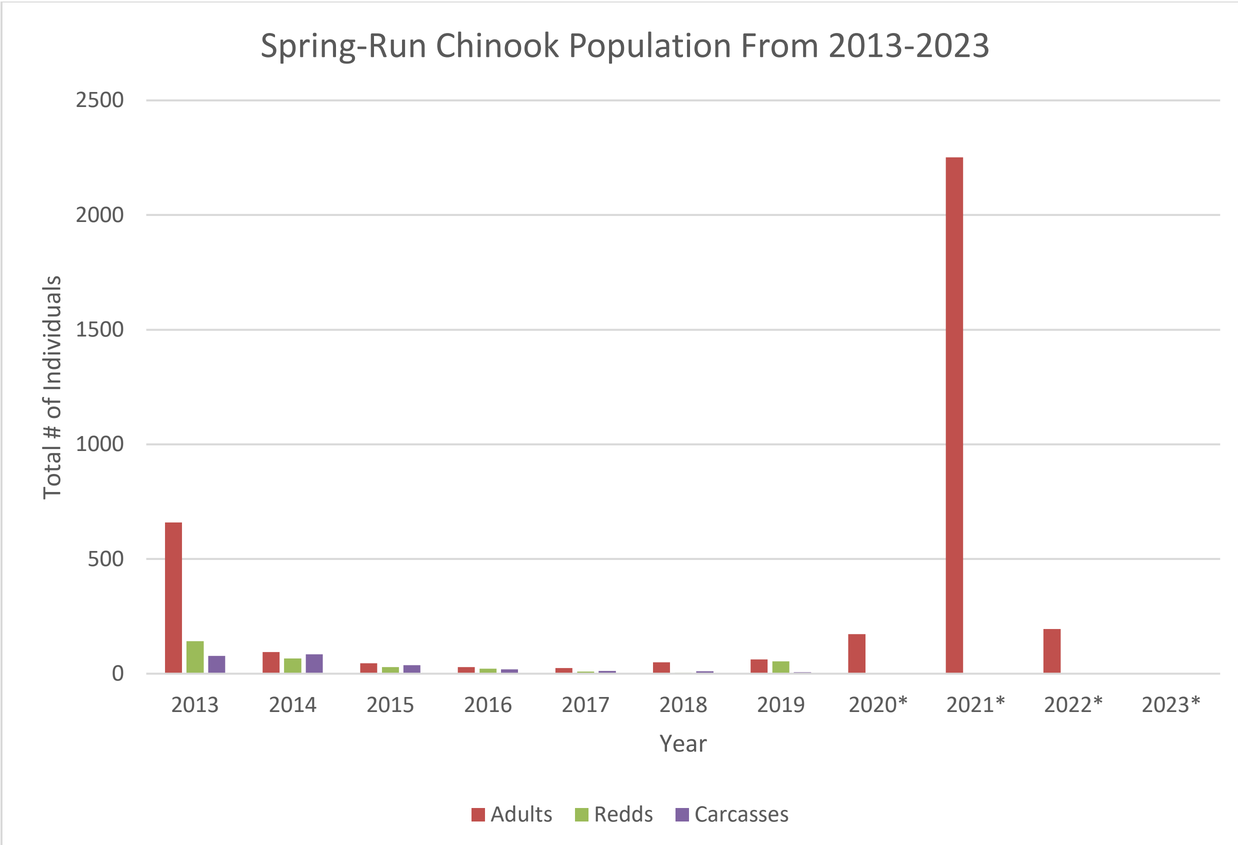

FIGURE 10. THE SPRING-RUN CHINOOK POPULATION OVER TIME, FROM 2013-2023. *NO REDD, CARCASS DATA AVAILABLE FROM 2020-2023.

The Northwestern Pond Turtle (*Actinemys marmorata*) is not currently listed under the ESA but is proposed for listing as a threatened species. In September 2023, the USFWS released a proposal to list both species of the western pond turtle, including the northwestern and southwestern pond turtle, as threatened under the ESA (USFWS, 2023a). Northwestern pond turtles use rivers, lakes, ponds, streams, other bodies of water, and terrestrial habitats during their lifespan. Currently, threats to both species include habitat loss and fragmentation, worsening drought conditions, and predation by invasive species, such as non-native bullfrogs. According to the USFWS, both species have an increasing risk of extinction due to population loss, subsequent decreased genetic diversity, and a reduced ability to adapt to a changing environment in the next half century (USFWS, 2023a). The proposed listing is accompanied by the proposed 4 (d) rule, which supports activities that incentivize conservation of both species, including habitat restoration, non-native species removal, and wildfire management. It is unclear when the final determination will be made for both species of the pond turtle, however, for the purposes of analysis for the EA, it is included as a species of concern that is proposed for federal protections. Surveys for northwestern pond turtles within WHIS and WES specifically occurred in 2004. During this effort, 114 turtles were trapped within the park, with 28 of those being trapped at the WES pond (Bury et al., 2004). Russell Weatherbee (Wildlife Biologist at WHIS) regularly observed northwestern pond turtles at the WES pond prior to the 2018 Carr Fire (NPS, 2024b). The pond is currently dry outside of the winter season and pond turtles have not been detected and have likely moved to nearby Paige Mill Creek; However, regardless of their current presence within WES, the pond presents suitable habitat for the Northwestern Pond Turtle when water is maintained in the pond.

There are other federally listed species within WHIS including the Monarch butterfly (*Danaus plexippus*) that has been proposed as a Threatened Species. There is no documented evidence of Monarch butterflies at WES, however breeding Monarchs have been seen elsewhere in WHIS in recent years and their host plant, milkweed (*Asclepias* sp.), is found in the vicinity of the project.

The federally threatened northern spotted owl (*Strix occidentalis caurina*) occurs at WHIS within higher elevation mixed conifer forests near the western boundary of the park. Suitable habitat does not occur within or near the WES project site and the proposed actions will not affect this species; therefore, further discussion and impacts to this species are not considered in this EA. While the Bald Eagle (*Haliaeetus leocuocephalus*) is not federally listed under the ESA, it is protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act (USFWS, 2021). The Bald Eagle is also listed as an Endangered Species by the State of California. There are Bald Eagles found near WES, with an historic nest near Peltier Bridge Campground in the late 1990s (Weatherbee, 2024). Although their main nesting and foraging areas are closer to Whiskeytown lake, they are known to also use Lower Clear Creek as a foraging area. Bald Eagles require perching areas and nesting sites, and they typically nest in large trees near rivers, lakes, and marshes.

There is one federally listed plant species known within WHIS, the Stebbins' morning glory (*Calystegia stebbinsii*). This species is not found at WES and is restricted to soils and habitat that does not occur in the vicinity surrounding WES. It is therefore dismissed from further analysis.

Impact of No Action Alternative

Under the No Action Alternative, there are no effects anticipated to federally protected species. The cabin and amphitheater demolition projects were determined to have no effect on these species with mitigations in place. The application of mitigation measures would minimize erosion and sedimentation in the limited scope of this alternative.

Conclusion – Under the No Action Alternative, it is anticipated that there would be no effect to the above listed species, or sensitive species. Other projects such as the cabin and amphitheater demolition would have no effect on these species due to mitigation measures to reduce erosion and sedimentation.

Impact of Action Alternative (Preferred Alternative)

The Action Alternative may affect but is not likely to adversely affect listed fish species because of the potential for an increase in erosion and sedimentation. The new cabin construction, pond restoration, and the bridge removal and replacement are key differences for the Action Alternative, since without mitigation these activities have the potential to negatively impact salmonids in Clear Creek and the northwestern pond turtle within the pond and Paige Boulder Creek. Impacts to monarch butterflies are negligible.

High levels of turbidity negatively impact sensitive salmonoid species, including Central Valley steelhead and California Central Valley spring-run Chinook salmon on multiple levels, including physiological, behavioral, and habitat (Bash et al., 2001). Sublethal impacts include tissue damage or alteration of physiology, which can be chronic and lead to population decline. For example, gill trauma due to suspended solids, and gill flaring in short-term sediment pulses, which in turn, creates behavioral changes such as avoidance in streams or rivers, and therefore causes a reduction in spawning habitat. Suspended solids are defined as fine particles dispersed in water (USGS, n.d.). Fish gills are delicate and easily damaged by abrasive silt particles, as sediments begins to accumulate in the filaments, salmonids excessively open and close their gills to expunge the silt (Bash et al., 2001). If irritation continues, mucus is produced to protect the gill surface, which may impede the circulation of water over gills and interferes with fish respiration.

Osmoregulation is also disrupted due to sediment, which causes territoriality, and has an effect on hyporheic upwelling (Bash et al., 2001). Disruptions of this process lead to osmotic imbalances and produce sublethal effects and eventual mortality. The presence of turbid water can disturb normal social interactions, increasing aggressive behavior. Typically, a dominant fish is positioned upstream and would consume the majority of the prey. However, with high turbidity, subordinate fish began capturing a greater proportion of the prey, which was most evident at 30 and 60 NTU.

Turbidity can also cause issues with blood chemistry, which then in turn influences foraging and predation, and spurs a reduction in habitat (Bash et al., 2001). More specifically, elevated blood sugars, plasma glucose, and plasma cortisol are all indicators of stress in fishes. Physiological stress in fishes may decrease immunological competence, growth, and reproductive success. Lastly, turbidity creates problems with reproduction and growth, which then causes homing and migration issues, which leads to damage to redds.

Mitigation measures are in place to reduce impacts to the spring-run Chinook salmon and California Central Valley steelhead and their Designated Critical Habitat. Implementation of Mitigation Measures such as BOI-7 includes measures to reduce soils exposed during construction activities and mitigate erosion and sedimentation due to soils moving off-site and into aquatic habitats during rain events. Timing of construction activities involving major soil exposure to occur outside of the rainy season will also minimize these impacts.

Removal of the vehicular bridge across Paige Boulder Creek, along with the existing concrete abutments, wing wall, and apron would occur within and adjacent to Paige Boulder Creek. Paige Boulder Creek is not designated as Critical Habitat for spring-run Chinook salmon or steelhead trout but is located approximately 100 meters upstream of Critical Habitat. Paige Boulder Creek is also considered Essential Fish Habitat. To mitigate potential impacts to listed fish species during this phase of the project, the work would be planned between June 1 – October 15, during periods of low flows. Vegetation removal along the stream banks would be minimized and the banks that would be exposed upon removal of the abutments would be replanted with local willow or alder cuttings to stabilize soils. Vegetation monitoring and management would occur for two to three years after the bridge removal. Rock slope protection (riprap) may be utilized to stabilize a short segment of steep slope where the current stream bank transitions to the existing retaining wall of the dining hall. The riprap, if necessary, would be limited to this location and would be located above the water level at normal flows. Additional mitigation measures would be utilized to prevent loose sediments from entering the stream. Additionally, existing roads and access points would be used, and spill remediation equipment would be on site in the event of a hazardous materials spill. Vehicle fueling and maintenance would occur at least 50 feet from water bodies and spills would be cleaned reported to NPS. The current concrete apron that inhibits fish passage would be removed by a long reach excavator or backhoe after being broken up into manageable sized pieces. If temporary diversion of portions of the creek is necessary, fish would be relocated. The new footbridge would be located in the same location as the present vehicular bridge but would be a clearspan design with abutments located at least 1.5X the width of the bank-full channel and would not impact or restrict flows or fish passage. The footbridge would also be narrower and allow increased area for riparian vegetation establishment. With the project design and planned mitigations, it is anticipated that this project may affect but is not likely to adversely affect the federally threatened spring-run Chinook salmon or steelhead trout. Additional consultation with the NMFS would occur during the permitting process with the Army Corps of Engineers, when a final design and scope for the bridge removal and new footbridge construction is anticipated.

Potential impacts to the Northwestern Pond Turtle may occur due to erosion and sedimentation of habitat as well as periodic disturbance from construction activities. Impacts associated with erosion and sedimentation would be reduced by utilizing mitigation measures in Appendix D. Timing of construction activities involving major soil exposure would also occur outside of the rainy season to minimize impacts. While northwestern pond turtles are not currently known to occur outside of the stream habitats present at and around the school, they once were abundant within the artificial pond prior to the Carr Fire. Once the pond is re-established, it is likely that turtles will once again colonize this area from nearby Paige Mill Creek. Northwestern pond turtles may also travel up to a half mile from water to nest, so potentially could occur within the construction area. Construction personnel would be instructed to check in and around their equipment and work areas daily before beginning work. If turtles are observed on site, NPS Resource Management staff would be contacted to ensure the turtle is either monitored and protected or allowed to traverse the site naturally. No known pond turtle nesting sites have been noted within the campus and there are no records of pond turtles outside of the aquatic habitats of the streams and pond. Visual Encounter Surveys would be performed in the vicinity of the bridge removal project prior to construction activities occurring within the stream banks. Located turtles would either be monitored on site or allowed to traverse out of the work site naturally. With these mitigations in place, there would be minimal effects on the northwestern pond turtle. In the event that the turtle is listed under the ESA prior to the project occurring, consultation with the USFWS would be initiated.

While Bald Eagles do forage relatively close to WES, no historic nesting sites are located within one mile of the site. Though disturbance to nest sites from construction related activities is unlikely to occur, impacts to Bald Eagles would be avoided by monitoring for new nest sites around the WES area. Similarly, no Monarch butterflies have been documented in WES, but to ensure impacts on the species are mitigated, regular monitoring of on-site occurrences of milkweed (*Asclepias* sp.) would be done to ensure impacts to the larval development stage do not occur.

Conclusion – Under the Action Alternative, impacts to listed species are minor. There are several listed species or sensitive species considered in the analysis above. Sedimentation could result in potential short-term minor to moderate negative impact. With mitigation measures in place in multiple areas in and around WES, adverse impacts will be reduced to minor to moderate levels and essential habitat for these species will be protected.

Cumulative Impacts

Regarding cumulative impacts, there have been multiple prior Clear Creek habitat restoration projects that have injected spawning size gravel into the creek system since 2008 to enhance habitat for Spring-run Chinook Salmon and Central Valley Steelhead. These gravel injection projects have occurred at multiple sites along Clear Creek and are replenished annually or as needed. Mitigations are in place to ensure no adverse impacts to these listed species during these projects, including strict timing of gravel injection projects to avoid in-stream work during critical life stages, washing of gravels, limitations on removal of riparian vegetation, and regular turbidity monitoring during project implementation. Activities related to the Trails Management Plan are also ongoing around the WES area, and an EA and associated agency consultations were completed (NPS, 2022a) to ensure no adverse effects to listed species with standard mitigations in place for erosion control and limiting work during critical time periods. There are several future projects planned in the WES area, including additional gravel augmentations at multiple locations along Lower Clear Creek over the next decade. The Peltier Bridge replacement is also planned for future construction, and consultation on that project will occur with the NMFS when there is a final proposed design for the new bridge to ensure all necessary mitigations are in place to protect listed fish species.

Wildlife

Affected Environment

Mammal Species

A diverse range of wildlife occupies the area in and around WES (See Appendix B). This is attributed to the mixture of habitat types available at the site, including riparian, artificial wetland pond habitat, natural and human-made clearings and grassland, mixed oak, mixed conifer, and oak chaparral. The most common mammals living in and around the current campus include smaller mammals such as western gray squirrels (*Sciurus griseus*), California ground squirrels (*Otospermophilus beecheyi),* ringtails (*Bassariscus* astutus), and larger mammals such as the Columbian black-tailed deer (*Odocoileus hermionus columbianus)*, mountain lions (*Puma concolor*), grey foxes (*Urocyon cinereoargenteus*), river otters (*Lontra* canadensis), coyotes (*Canis latrans*), and American black bears (*Ursus americanus*). There are numerous accounts of mountain lion observations in person or via trail camera at WES (NPS, 2024b). Mountain lions are likely attracted to WES due to the numerous deer that graze on the campus lawns and use the riparian habitat adjacent to campus. Black bears have also been occasionally attracted to campus if trash is not stored properly.

WHIS is home to a wide array of bat species as well. This includes the Mexican Free-tailed Bat (*Tadarida brasiliensis*), Pallid Bat (*Antrozous pallidus*), Big Brown Bat (*Eptesicus fuscus*), Silver- haired Bat (*Lasionycteris noctivagans*), Red Bat (*Lasiurus blossevillii)*, Hoary Bat (*Lasiurus cinereu*s), California Myotis (*Myotis californicus*), Long-eared Myotis (*Myotis evotis*), Little Brown Myotis (*Myotis lucifugus*), Fringed Myotis (*Myotis thysanodes*), Long-legged Myotis (*Myotis volans*), Yuma Myotis (*Myotis yumanensis*), and Townsend's Big-eared Bat (*Plecotus corynorhinus*). Several bat species use the WES area for foraging and some buildings are used for roosting.

Bird Species

Many bird species can be found in the WES area, including songbirds, raptors, woodpeckers, game birds, wading birds, ducks, geese, and even shorebirds, such as the Spotted Sandpiper *(Actitis macularius)* and the Killdeer *(Charadrius vociferus)*. See Appendix B for a comprehensive list of bird species. Many of these species can nest in and around the WES area on the ground, in low vegetation and in trees, and mitigations are in place to protect this nesting habitat (see Appendix D). Many of these birds are protected by The Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712), which prohibits the take (including killing, capturing, selling, trading and transport) of protected migratory bird species (USFWS, n.d.)

Amphibian Species

The area around WES is also home to several native amphibians and one invasive amphibian species. The Pacific Giant Salamander (*Dicamptodon tenebrosus)*, Pacific Chorus Frog (*Pseudacris regilla*) and Western Toad (*Bufo boreas*), are present within Clear Creek and Paige Boulder Creek. Western toads have been documented throughout the area, and foothill yellow-legged (*Rana boylii*) frogs occur within Paige Boulder Creek upstream of the WES Camp site. The invasive American bullfrog (*Lithobates catesbeianus*) was prevalent within the pond prior to the Carr Fire but has not been observed since the pond dried up after the fire.

Certain populations of the Foothill Yellow-Legged Frog (*Rana boylii)* were listed as endangered or threatened by the USFWS in August of 2023 (USFWS, 2023b). However, the distinct population segment that occurs in Whiskeytown is not listed as threatened or endangered. Although there have not been sightings of the frog within the WES campus, there have been numerous sightings in Paige Boulder Creek next to WES and also recent sightings in Lower Clear Creek near WES (Weatherbee, 2024). The frog is closely associated with streams and is rarely observed far from the water's edge (USFWS, n.d.). Breeding stream habitat is typically shallow, rocky, and at least partially exposed to direct sunlight (USFWS, n.d.).

Reptile Species

Reptiles that are common in the WES Camp area include the Western Fence Lizard (*Sceloporus occidentalis*), Western Skink (*Eumeces skiltonianus*), Northern Alligator Lizard (*Elgaria coerulea*), Southern Alligator Lizard (*Elgaria multicarinata),* Western Rattlesnake (*Crotalus viridis*), Gopher Snake (*Pituophis catenifer*), Sharp-tailed Snake (*Contia tenuis*), Aquatic Garter Snake (*Thamnophis couchii*), and Common Kingsnake (*Lampropeltis getula*). Rattlesnakes are of particular concern due to the potential for venomous bites. The non-native Red-eared Slider (*Trachemys scripta*) was documented to exist in the pond prior to the Carr Fire. The Northwestern Pond Turtle was discussed in the Threatened and Endangered Species section, as it is currently a candidate for federal listing.

Impact of No Action Alternative

Under the No Action Alternative, impacts to wildlife would be minimal and would be mostly limited to disturbance impacts from human activity that would be expected while the camp continues to be operated as a day-use only facility.

Under the No Action Alternative, impacts to wildlife from construction would be minimal because there would be minimal sedimentation and habitat disturbance and noise from demolition and construction. Over the long-term, empty buildings will fall into further disrepair, providing additional habitat for bat colonies and mammals or reptiles. This would also likely result in additional conflicts from human/wildlife interactions due to overlap in the use of the facility.

For bat species, a concern is the removal of buildings currently used by roosting bats. To help mitigate this issue, demolition of cabins known to contain roosting bats would not occur during the maternity season. Outside of the maternity season, if bats are known to be roosting in a cabin slated for removal, exclusion netting would be installed after an outflight before the cabin is to be torn down. Furthermore, bat boxes are planned to be installed on campus to provide alternative bat roosting habitat.

For bird species, potential direct adverse impacts would be the disturbance of nesting activities. Noise due to cabin demolition and rehabilitation of the amphitheater may cause birds and especially nesting birds to abandon nesting sites or nesting habitat. Mitigations include scheduling work outside of the nesting season when possible. For any activities scheduled during the nesting season, pre-construction nest surveys would be conducted and areas for avoidance would be flagged.

For amphibian species, the major concern is sedimentation of habitat, which can negatively impact numerous species during aquatic life stages. Including erosion control and water quality mitigation measures would reduce this impact to minor levels.

Reptile species may be negatively impacted from disturbance during demolition activities, construction material placement, and overall foot and vehicle traffic. However, reptiles are well adapted to a wide range of habitats available in the area. Therefore, this impact is considered to be negligible.

Conclusion – Under the No Action Alternative, short-term adverse impacts to wildlife would be minimal and long-term impacts would include both beneficial and adverse minor impacts. Potential negative impacts to wildlife would result from short term disturbance associated with construction noise, potential loss of bat habitat due to cabin demolition, and sedimentation in waterways due to construction. With mitigations in place, such as installing bat boxes, mufflers on construction equipment, not performing the cabin demolition when breeding bats are present and using erosion control and water quality BMPs, it would reduce impact levels to minor.

Impact of Action Alternative (Preferred Alternative)

The Action Alternative would present direct short-term impacts to wildlife. Construction activities would alter habitat for species within the project footprint.

For small and large mammals, disturbance from an increase in noise may disrupt natural processes for animals and cause changes in behavior. However, standard mitigations include the use of mufflers on construction and heavy equipment and timing activities outside of critical periods for wildlife.

There would be renovation of existing buildings, including Hatcher Hall and the existing administration structures which has the potential to disturb existing bat colonies if present in work areas. Disturbance of bat habitat can lead to the abandonment of breeding sites, which can be permanent and lead to population decline. To mitigate this potential impact, preconstruction bat surveys would be conducted prior to siding renovation or replacement on existing buildings. Any identified roost sites within buildings would have exclusion netting installed following an outflight and construction activities would occur outside of the maternity season if bat colonies were identified within structures.

For nesting birds, disturbance of nests from physical damage or noise pollution can lead to the abandonment of nests. Standard mitigation includes the use of mufflers on equipment. Surveys for active nests would also occur if vegetation removal were required during the nesting season.

For reptile species, impacts would primarily be related to short-term disturbance from construction activities. These impacts would be minor due to the amount of suitable habitat adjacent to the areas that would be disturbed by construction activities.

Adverse short-term Impacts to aquatic and amphibious species are possible from sediment run-off and bridge removal and reconstruction. Mitigations for such impacts include reducing the footprint of construction disturbance to the immediate area that would be altered, installing sediment and erosion mitigation measures, timing work outside of critical life-cycle periods, and reducing noise pollution on-site (see Appendix D).

Over the long-term, there would be minor to moderate beneficial impacts to wildlife from the Action Alternative including improvements to both natural and created habitats that, taken together, will enhance wildlife sustainability at WHIS. Remodeling buildings would keep wildlife out, preventing further human/wildlife use conflicts. Removing the bridge from Paige Boulder Creek would return the stream to its natural condition, facilitating habitat for aquatic and amphibious species and improve fish passage. Reconstructing the pond would provide habitat for northwestern pond turtles and other native amphibians such as pacific chorus frogs and aquatic garter snakes. A remodeled campus would increase visitation rates and expand stewardship education activities, presenting opportunities for school kids to improve wildlife habitat through hands-on projects like bat box construction and installation.

Conclusion – While the Action Alternative would produce direct short term adverse impacts to wildlife, these impacts can be largely mitigated to negligible or minor levels by following mitigations outlined in Appendix D. The overall long-term impacts of the Action Alternative will be beneficial to wildlife.

Cumulative Impacts

Regarding cumulative impacts, the previously mentioned Clear Creek habitat restoration projects along Clear Creek and the Peltier Bridge replacement project are not anticipated to affect many of the wildlife species at WES. These projects could adversely affect aquatic and amphibious species from sediment run-off. However, mitigations are in place to ensure there are minimal adverse impacts to these species from these projects. These mitigations include strict timing of gravel injection projects to avoid in-stream work during critical life stages, washing of gravels, limitations on removal of riparian vegetation, and regular turbidity monitoring during project implementation. For land-dwelling wildlife, the trail work included in the Trails Management Plan may cause short-term disturbance in the WES area, but mitigations included in the EA will be followed to limit adverse effects (NPS, 2022a).

Cultural Resources

Affected Environment

Whiskeytown NRA is the ancestral home of the Wintu People, and the Redding Rancheria is identified as the culturally associated Federally Recognized Tribe within the WHIS area. Numerous Federally and non-federally recognized Native American Tribes are also affiliated with WHIS, including the Nor-Rel-Muk Wintu Nation, the Wintu Tribe of Northern California, Winnemem Wintu Tribe, Greenville Rancheria, Quartz Valley Indian Community, and the Shasta Indian Nation. In the past and present, the Wintu and their ancestors use acorns, salmon, deer, and other plants and animals to sustain their way of life over thousands of years. The discovery of gold nearby in 1848, only months after it was found farther south at Sutter's Mill, brought fortune hunters known as "49ers" to the region. This discovery was shortly followed by an end to traditional lifeways for Native Californians. Today, the Wintu People remain active participants with WHIS as stewardship partners for the management and preservation of WHIS cultural resources.

Currently, approximately 63% of WHIS is archaeologically inventoried with more than 400 archeological sites identified (precontact and historic). The majority of recorded precontact sites lie between 1000 and 2000 feet in elevation, although this may reflect survey coverage rather than actual settlement preferences. One archaeological site is known within the WES area and is determined eligible for the NRHP. Archeological investigations at Whiskeytown have revealed Native American occupation spanning at least 8,000 years (Bevill and Nilsson 2001) with one precontact archeological district within park boundaries, the 64-acre Soo-Yeh-Choo-Pus Archaeological District, listed on the National Register in 1985.

Precontact archeological sites at Whiskeytown consist almost exclusively of habitation sites and artifact scatters. Habitation sites represent long-term seasonal or permanent homes and villages while artifact scatters are typically comprised of flaked stone tools, waste flakes, and ground stone that resulted from one or more occupational episodes. The Wintu People generally lived in villages along Clear Creek and its tributaries in the winter and retreated to higher elevations during the summer (Avery Historical Consulting, 2022). Indigenous staple foods, such as salmon, acorns, pine seeds, buckeye, berries and fruit from various traditional plants were and continue to be procured from mountainsides and streams at the park. Artifact and site types show commonalities with those from other parts of Northern California, suggesting broader integration into economies, social networks, and cultural traditions known throughout the region (Deur et al., 2020).

Historic-era archeological sites identified within Whiskeytown largely revolve around the history of ore mining in the region. This extraction work was initially fueled by the discovery of gold and is reflected by activities that date primarily to the Gold Rush period (1848–1853), the hydraulic mining period (late 1800s), the copper mining period (1884–1919), Great Depression era occupation and mining (1930s), and late historic-period occupation (1940–1960s). The park currently has 216 known mines with hundreds of individual mine features.

Clear Creek became the heart of placer mining, resulting in numerous abandoned mining sites, including shafts and platforms, isolated cabins, trash scatters, historic roads and trails, waste rock piles and cuts, prospect holes, and portions of water ditch systems (Johnson et al., 1974). According to Judge Eaton, hundreds of people came through the WES area to mine from 1849 to 1856 (Johnson et al., 1974). In

1873, Elkanah Richardson obtained a federal land patent and engaged in small-scale mining (Avery Historical Consulting, 2022). The parcel was originally a ranch as well, set up to feed miners using a garden where the lawn is now (Johnson et al., 1974). In 1897, the Santa Clara Mining Company bought the property, and likely built the two, now decommissioned, mine adits that are found near the site (Avery Historical Consulting, 2022). Nathan Dickey bought the property in 1909 and owned the land until 1919; his successor then owned the land until 1930, in which it was sold to C.L. and Sarah Jane Allen (Johnson et al.,1974). Sarah inherited the land after her husband's death and leased the property to Pastor Royal Blue in 1962 (Avery Historical Consulting, 2022). The site became the Vision Valley Youth Camp, part of a “back to nature” movement reflecting on postwar life and urbanization (Avery Historical Consulting, 2022). The camp operated until 1969, when Sarah sold the land to the National Park Service, for incorporation into the pa rk’s newly dedicated recreation area (Avery Historical Consulting, 2022).

The mine adits, documented as site P45-02711, are located at the base of the slope along the western edge of the camp terrace. The mine consists of two mine adits excavated into the hillside. The lower adit is secured by a steel door and regularly drains water. A seven-foot-high cyclone fence surrounds the second, upper adit and is gated to prevent entry. This mine site was determined not eligible under the NRHP in 2023 and is scheduled for closure with the installation of two bat gates to allow for water and wildlife ingress/egress.

There are historic ditches near WES, including the Clear Creek Canal, Princess Ditch (also known as Martha’s Ditch), and numerous short ditch segments that once fed the mines operating in the area. Both Matha’s Ditch and the Clear Creek Canal are utilized as park trails with additional short ditch segments and abandoned roads also serving as park trails.

Impact of No Action Alternative

Under the No Action Alternative, continuous management, as defined under this alternative, would not require further review under Section 106 of the National Historic Preservation Act (NHPA). For recent projects at WES, the NPS consulted with SHPO and Tribes regarding the proposed cabin demolition and amphitheater rehabilitation, resulting in a finding of no adverse effect to historic properties with approved mitigation measures for this work. Tribal monitors provided monitoring services during ground disturbing activities related to the removal of Cabin 717 (CA OHP # NPS_2024_0111_001). Both the WES facility and the abandoned mine (P45-02711) were determined not eligible for the NRHP in 2023 (CA OHP # NPS_2023_0112_001).

A third site, a precontact archaeological habitation, requires mitigation measures to ensure no adverse effects to the site occur due to activities under this alternative. Ground disturbing activities require compliance with Section 106 of the NHPA and tribal monitoring may be required for activities that have the potential to effect historic properties.

Conclusion – For Alternative A, the effects to cultural resources would remain the same as described in the affected environment. The current resource threats and impacts to cultural resources would continue to occur where ground disturbance is proposed or expected. Additional compliance with Section 106 of the NHPA is not required under the defined No Action alternative.

Impact of Action Alternative (Preferred Alternative)

Under the Action Alternative, the proposed actions identified in this alternative represent undertakings subject to compliance with Section 106 of the NHPA. The WES facility and site P45-002711 were determined not eligible for the NRHP (CA OHP # NPS_2023_0112_001). An archeological site located within the study area is determined eligible for the NRHP (CA OHP # NPS890804A). While direct impacts to cultural resources from this proposed alternative would be avoided, indirect WES facility use impacts (e.g., trampling and collecting artifacts) within the WES facility and associated trail areas could potentially increase due to the increased use. The use of heavy equipment to assist with the construction of new facilities may also result in adverse impacts to archeological resources. Mitigations are proposed to reduce or eliminate adverse effects to cultural resources (See Appendix D).

Conclusion –New facility construction and development under the action alternative would avoid direct adverse impacts to historic properties. Proposed undertakings under the Action Alternative would have no effect to cultural resources determined not eligible for the NRHP. Historic Properties that are determined eligible for the NRHP would require consultation, mitigations, and monitoring of action implementation to avoid adverse effects to historic properties. Ground disturbing activities would be monitored and mitigations put in place in the case of unintended discovery of archeological resources (See Appendix D) in consultation with Tribal Partners.

Chapter 4: Consultation and Coordination

List of Federally and Non-federally recognized Tribes

Greenville Rancheria

Nor-Rel-Muk Wintu Nation

Quartz Valley Indian Community

Redding Rancheria

Shasta Indian Nation

Winnemem Wintu Tribe

Wintu Tribe of Northern California

List of Agencies for Consultation

U.S. Fish and Wildlife Service – Yreka Fish and Wildlife Office

National Oceanic and Atmospheric Administration, National Marine Fisheries Service, West Coast Region – California Central Valley Area Office

California Office of Historic Preservation

California Native American Heritage Commission

List of Preparers

Whiskeytown National Recreation Area

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Laura Shaskey – Division Lead, Resource Management and Interpretation

Glendee Ane Osborne – Cultural Resources Program Manager

Russell Weatherbee – Wildlife Biologist

Daniel Sedgwick – Environmental Protection Specialist

Christopher McCarron – Vegetation Ecologist

Pacific West Regional Office – San Francisco

Sarah Raube – Architect/Landscape Architect

Jonathan Gervais- Environmental Protection Specialist

Gaelle Glickfield – Environmental Protection Specialist

The Great Basin Institute

Sarah Aguiar – Environmental Protection Specialist

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Appendix B:
Comprehensive Wildlife Species List at Whiskeytown Environmental School

Wildlife species expected to be found in the vicinity of Whiskeytown Environmental School:

Birds

Acorn Woodpecker (*Melanerpes formicivorus*)
American Dipper (*Cinclus mexicanus*)
American Goldfinch (*Carduelis tristis*)
American Robin (*Turdus migratorius*)
Anna's Hummingbird (*Calypte anna*)
Ash – throated Flycatcher (*Myiarchus cinerascens*)
Band-tailed Pigeon (*Columba fasciata*)
Barn Swallow (Hirundo rustica)
Belted Kingfisher (*Ceryle alcyon*)
Bewick's Wren (*Thryomanes bewickii*)
Black-headed Grosbeak (*Pheucticus melanocephalus*)
Black-throated Gray Warbler (*Dendroica nigrescens*)
Brewer's Blackbird (*Euphagus cyanocephalus*)
Brown-headed Cowbird (*Molothrus ater*)
Bullock's Oriole, Baltimore (Northern) Oriole (*Icterus galbula*)
Bushtit (*Psaltriparus minimus*)
California Quail (*Callipepla californica*)
California Towhee, Brown Towhee (*Pipilo crissalis*)
Canada Goose (*Branta Canadensis*)
Cassin's Vireo (*Vireo cassinii*)
Chipping Sparrow (*Spizella passerine*)
Common Merganser (*Mergus merganser*)
Common Raven (*Corvus corax*)
Cooper's Hawk (Accipiter cooperii)
Dark-eyed Junco (*Junco hyemalis*)
Downy Woodpecker (*Picoides pubescens*)
European Starling (*Sturnus vulgaris*)
Golden-crowned Sparrow (*Zonotrichia atricapilla*)
Great Blue Heron (*Ardea herodias*)
Great Horned Owl *(Bubo virginianus*)
Green Heron (*Butorides virescens*)
Hairy Woodpecker (*Picoides villosus*)
Hermit Thrush (*Catharus guttatus*)
House Finch (*Carpodacus mexicanus*)
House Sparrow (*Passer domesticus*)
House Wren (*Troglodytes aedon*)
Killdeer (*Charadrius vociferous*)
Lazuli Bunting (*Passerina amoena*)
Lesser Goldfinch (*Carduelis psaltria*)
Mallard (*Anas platyrhynchos*)
Mountain Quail (*Oreortyx pictus*)
Mourning Dove (*Zenaida macroura*)
Northern Flicker (*Colaptes auratus*)
Northern Pygmy Owl (*Glaucidium gnoma*)
Northern Rough-winged Swallow (*Stelgidoptreyx serripennis*)
Nuttall's Woodpecker (*Picoides nuttallii*)

Oak Titmouse, Plain Titmouse (*Baeolophus inornatus*)
Orange-crowned Warbler (*Vermivora celata*)
Red-winged Blackbird (*Agelaius phoeniceus*)
Red-breasted Sapsucker (*Sphyrapicus rubber*)
Red-tailed Hawk (*Buteo jamaicensis*)
Ruby-crowned Kinglet (*Regulus calendula*)
Rufous-sided (Spotted) Towhee (*Pipilo maculates*)
Sharp-shinned Hawk (*Accipiter striatus*)
Song Sparrow (*Melospiza melodia*)
Spotted Sandpiper (*Actitis macularia*)
Steller’s Jay (*Cyanocitta stelleri*)
Turkey Vulture (*Cathartes aura*)
Violet-green Swallow (*Tachycineta thalassina*)
Western Bluebird (*Sialia mexicana*)
Western Screech Owl (*Otus kennicottii*)
Western Scrub Jay (*Alphelocoma californica*)
Western Tanager (*Piranga ludoviciana*)
Western Wood Pewee (*Contopus sordidulus*)
White-breasted Nuthatch (*Sitta carolinensis*)
White-crowned Sparrow (*Zonotrichia leucophrys*)
Wild Turkey (*Meleagris gallopavo*)
Wood Duck (*Aix sponsa*)
Wrentit (*Chamaea fasciata*)
Yellow-breasted Chat (*Icteria virens*)
Yellow-rumped Warbler (*Dendroica coronata*)
Yellow Warbler (*Dendroica petechia*)

Mammals

Black-tailed Deer (*Odocoileus hemionus*)
Coyote (*Canis latrans*)
Gray Fox (*Urocyon cinereoargenteus*)
Bobcat (*Lynx rufus*)
Mountain Lion (*Puma concolor*)
Striped Skunk (*Mephitis mephitis*)
Spotted Skunk (*Spilogale putorius*)
River Otter (*Lontra canadensis*)
Fisher (*Martes pennanti*)
Mink (*Mustela vison*)
Ringtail (*Mustela vison*)
Raccoon (*Procyon lotor*)
Black Bear (*Ursus americanus*)
Brazilian Free-tailed Bat (*Tadarida brasiliensis*)
Townsend’s Big-eared Bat (*Corynorhinus townsendii*)
Pallid Bat (*Antrozous pallidus*)
Big Brown Bat (*Eptesicus fuscus*)
Red Bat (*Lasiurus borealis*)
Hoary Bat (*Lasiusus cinereus*)
Canyon Bat (*Parastrellus Hesperus*)

Silver-haired Bat (*Lasionycteris noctivagans*)
California Myotis (*Myotis californicus*)
Long-eared Myotis (*Myotis evotis*)
Fringed Myotis (*Myotis thysanodes*)
Yuma Myotis (*Myotis yumanensis*)
Virginia Opossum (*Dideophis virginiana*)
Black-tailed Jack Rabbit (*Lepus californicus*)
Brush Rabbit (*Sylvilagus bachmani*)
Beaver (*Castor canadensis*)
Dusky-footed Woodrat (*Neotoma fuscipes*)
Brush Mouse (*Peromyscus boylii*)
Deer Mouse (*Peromuscus maniculatus*)
Botta's Pocket Gopher (*Thomomys bottae*)
House Mouse (*Mus musculus*)
Western Gray Squirrel (*Sciurus griseus*)
California Ground Squirrel (*Spermophilus beecheyi*)
Douglas' Squirrel (*Tamiasciurus douglasii*)
Allen's Chipmunk (*Tamias senex*)
Shrew Mole (*Neurotrichus gibbsii*)
Broad-footed Mole (*Scapanus latimanus*)

Reptiles and Amphibians
Northern Alligator Lizard (*Elgaria coerulea*)
Southern Alligator Lizard (*Elgaria multicarinata*)
Racer (*Coluber constrictor*)
Sharp-tailed Snake (*Contia tenuis*)
Ring-necked Snake (*Diadophis punctatus*)
Common Kingsnake (*Lampropeltis getula*)
California Mountain Kingsnake (*Lampropeltis zonata*)
Striped Racer (*Masticophis lateralis*)
Gopher Snake (*Pituophis catenifer*)
Aquatic Garter Snake (*Thamnophis couchii*)
Terrestrial Garter Snake (*Thamnophis elegans*)
Common Garter Snake (*Thamnophis sirtalis*)
Western Fence Lizard (*Sceloporus occidentalis*)
Western Skink (*Eumeces skiltonianus*)
Western Rattlesnake (*Crotalus viridis*)
Western Pond Turtle (*Actinemys marmorata*)
Western Toad (*Bufo boreas*)
Pacific Chorus Frog (*Pseudacris regilla*)
Foothill Yellow-legged Frog (*Rana boylii*)
Bullfrog (*Lithobates catesbeianus*)
Pacific Giant Salamander (*Dicamptodon ensatus*)
Ensatina (*Ensatina eschscholtzii*)

Appendix C: Whiskeytown Environmental School Attendance Data & Curriculum

Whiskeytown Environmental School attendance data from the Shasta County Office of Education:

Year	5th & 6th Grade	Clear Creek Field Lab K-6 (spring)	Clear Creek Field Lab K-6 (fall)	Clear Creek Field Labs K-4	Spring and Summer Camps	Totals per year
1970-1997 (27 years x 2300 per year*)						62,100
1997-98	2,519					2,519
1998-99	2,521					2,521
1999-00	2,444					2,444
2000-01	2,884					2,884
2001-02	2,452					2,452
2002-03	2,579					2,579
2003-04	2,420					2,420
2004-05	2,245			2,209		4,454
2005-06	2,080			2,193		4,273
2006-07	3,325			1,597		4,922
2007-08	3,026					3,026
2008--09				1,756		1,756
2009-10	2,229			925		3,154
2010-11				1,624		1,624
2011-12	1,749			1,556	165	3,470
2012-13	1,545			1,580		3,125
2013-14*	1,540			1,550		3,090
2014-15	2,060			2,460	300	4,820
2015-16	1,830			2,000	300	4,130
2016-17	1,927			2,000		3,927
2017-18	1,950			2,296		4,246
2019 Lassen Pines**	1,866					1,866
2021-2022		561	1,230		721	2,512
2022-2023		772	1,588		1,553	3,913
2023-2024		497	2,038			2,535
Estimated Totals	107,291	1,830	2,818	23,746	3,039	138,724

** Estimated*

*** Camp held at Lassen NP due to Carr Fire*

Kindergarten – Patterns of Survival: Students capture aquatic organisms and observe terrestrial forest organisms. Students find patterns that allow organisms to survive such as food, light, and water.

First Grade – Evidence of Heredity: Students compare adult and immature organisms they capture in a creek ecosystem and try to match baby and mature plants in the forest.

Second Grade – Habitat Diversity and Seed Engineering: Students compare the diversity of habitats and how plant reproduction plays a vital role by modeling seed dispersal through an engineering activity.

Third Grade – Modeling Life Cycles and Evidence of Inheritance: Students discover similar and different life cycles in the stream and on land. They analyze and interpret data to discover variations within plant and animal populations.

Fourth Grade – The Gold Rush, Weathering, and Dam Engineering: Students examine the ecological footprint of historical gold mining including providing evidence of erosion and constructing models of dams.

Fifth Grade – Fire Ecology and "Trees Matter": Students discover how trees use matter to grow, how fires model the interaction among atmosphere, biosphere, hydrosphere, and geosphere, and have a review of adaptations in creek organisms.

Sixth Grade - Adaptive Behaviors & Structures and Watersheds: Students explore the specific behaviors and physical adaptations of creek organisms and then look at the ecological role (niche) of terrestrial organisms. The watershed engineering lesson applies context.

Seventh and Eighth Grades - Ecosystems, Nutrient Cycles, and Engineering: Students explore the connections of creek organisms to nearby terrestrial areas and then look at the elements and processes of decomposition, culminating in designing a composting system that could be used at home.

Appendix D: Mitigation Monitoring and Reporting Program

The following Mitigation Monitoring and Reporting Program identifies the Mitigation Measures that will be implemented as part of the Whiskeytown Environmental School Project. The National Park Service (NPS) or its Contractors under the supervision of the NPS will be responsible for implementing the following measures. The NPS will be responsible for monitoring to ensure the following measures are effectively implemented to reduce impacts to less-than-significant levels.

	Mitigation, Avoidance, and Minimization Measures	Implementation Timing	Implementation & Verification Responsibility	Legal Authority for Mitigation
Air Quality				
Mitigation **AQ-1**	**Mitigation Measure AQ-1: Implement Construction Mitigation Measures** The following applicable Construction Mitigation Measures shall be implemented by construction contractors to reduce emissions of fugitive dust and equipment exhaust: • Exposed surfaces including parking areas, staging areas, soil piles, graded areas, and unpaved access roads shall be watered two times per day when conditions are dry.	Prior to and during construction	NPS/ Construction Contractor & NPS Contracting Officer Representative (COR)	Clean Air Act of 1967 42 USC 7401–7671q
AQ-2	• Haul trucks transporting soil, sand, or other loose material off site shall be covered.	During construction	NPS/ Construction Contractor &COR	
AQ-3	• Visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day.	During construction	NPS/ Construction Contractor & COR	
AQ-4	• Vehicle speeds on unpaved roads shall be limited to 15 mph within the project area.	During construction	NPS/ Construction Contractor & COR	
AQ-5	• Roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.	During construction	NPS/ Construction Contractor &COR	
AQ-6	• Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at access points.	During construction	NPS/ Construction Contractor & COR	
AQ-7	• Construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. Equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.	During construction	NPS/ Construction Contractor & COR	

	Mitigation, Avoidance, and Minimization Measures	Implementation Timing	Implementation & Verification Responsibility	Legal Authority for Mitigation
Biological Resources				
BIO-1 **General Construction**	• A qualified biologist will provide Worker Environmental Awareness Training to field management and construction personnel. Communication efforts and training will take place during preconstruction meetings so that construction personnel are aware of their responsibilities and the importance of compliance. Training will identify the types of sensitive resources located in the project area and the measures required to avoid impacts. Materials covered in the training program will include environmental rules and regulations for the specific project and requirements for limiting activities to the construction right-of-way and avoiding demarcated sensitive resource areas. • If new construction personnel are added to the project, the contractor will ensure the new personnel receive training before starting work. A sign-in sheet of those contractor individuals who have received the training will be maintained by the NPS COR. A representative will be appointed during the training to be the contact for an employee or contractor who might inadvertently kill or injure a listed species or who finds a dead, injured, or entrapped individual. • Outdoor food storage will adhere to park policies already in place to ensure no unattended food sources are available to wildlife. This includes the daily removal of trash and food wastes from the work site. • Contractors and employees will be given orientation and education about working in black bear country and briefed on proper food storage and safety measures. Orientation will include information about park regulations regarding food storage, disposal of garbage, and other bear attractions, safety measures, and approaching or harassing wildlife. • If individuals of listed wildlife species may be present and subject to potential injury or mortality from construction activities, a qualified biologist will conduct preconstruction surveys. If a listed wildlife species is discovered, construction activities will not begin in the immediate vicinity of the individual until NPS is contacted and the individual has been allowed to leave the construction area.	Prior to construction	NPS/ Qualified Biologist/construction Contractor & NPS COR	NPS Organic Act of 1916 (16 U.S.C. § 1)

	Mitigation, Avoidance, and Minimization Measures	Implementation Timing	Implementation & Verification Responsibility	Legal Authority for Mitigation
Biological Resources				
	• Minimum qualifications for a qualified biologist will be a four-year college degree in biology or related field and demonstrated experience with the species of concern.			
BIO-2: Northwestern Pond Turtle	• Prior to construction, training will be provided to construction personnel to conduct daily surveys around construction equipment and work sites to check for the presence of northwestern pond turtles that may be traversing the site. In the event a turtle is located, park natural resource staff will be notified and will monitor the turtle until it has moved beyond the construction area. • Preconstruction surveys for northwestern pond turtle shall be conducted by a qualified biologist prior to clearing and grubbing, equipment staging, excavation or other construction-related activity or vegetation management activities requiring the use of heavy equipment. Preconstruction surveys shall be conducted within 5 days prior to, and again immediately prior to construction activities to identify the presence of northwestern pond turtle. • The artificial pond on site will be protected by temporary fencing during construction • Consultation with USFWS may be necessary to determine additional mitigation measures, and consultation may be needed to comply with Section 7 of the ESA if the species is formally listed under ESA before or during the implementation of the project.	Prior to and during construction	NPS COR/ Qualified Biologist & NPS COR	Proposed for Listing under the Endangered Species Act of 1973 U.S.C. §1531 et seq. (1973)

	Mitigation, Avoidance, and Minimization Measures	Implementation Timing	Implementation & Verification Responsibility	Legal Authority for Mitigation
Biological Resources				
BIO-3: Nesting Birds	• Vegetation removal such as clearing and grubbing, vegetation management activities requiring heavy equipment, tree removal, or tree trimming shall be performed outside of the bird nesting season (February 1st through August 31st) to avoid impacts to nesting birds; if these activities must be performed during the nesting bird season, a qualified biologist shall conduct a pre- construction survey for nesting birds and verify the presence or absence of nesting birds no more than 5 calendar days prior to vegetation removal. Surveys shall be performed in order to locate active passerine (perching bird) nests and to locate active raptor nests. If nesting birds and raptors do not occur within 250 and 500 feet of the area, then no further action is required if construction begins within 5 calendar days. • If active nests are located during the pre-construction bird nesting surveys, no-disturbance buffer zones shall be established around nests, with a buffer size established by the qualified biologist. Typically, these buffer distances are between 50 feet and 250 feet for passerines and between 300 feet and 500 feet for most raptors, and 0.25 to 0.5 miles for eagles. These distances may be adjusted depending on the level of surrounding ambient activity and if an obstruction, such as a building or structure, is within line-of-sight between the nest and construction. Reduced buffers may be allowed if a full-time qualified biologist is present to monitor the nest and has authority to halt construction if bird behavior indicates continued activities could lead to nest failure. Buffered zones shall be avoided until young have fledged or the nest is otherwise abandoned.	Prior to construction	NPS COR/ Qualified Biologist & NPS COR	Migratory Bird Treaty Act of 1918 16 U.S. Code § 703 Bald and Golden Eagle Act of 1940 (16 U.S.C. 668-668d)

	Mitigation, Avoidance, and Minimization Measures	Implementation Timing	Implementation & Verification Responsibility	Legal Authority for Mitigation
Biological Resources				
BIO-4: Special Status Fish Species	• Implement water quality mitigation measures identified in Mitigation Measure Stormwater-1 to reduce the potential for impacts to Clear Creek from construction. • No lights will be used within the vicinity of Clear Creek. If lighting is needed, it will be shielded from the creek. • In consultation with NOAA Fisheries, and to the furthest extent possible, conduct construction outside of spawning and rearing periods to minimize potential disturbance. Central Valley spring-run Chinook typically migrates, spawns, and rears from March to October. • In consultation with NOAA Fisheries, and to the furthest extent possible, conduct construction outside of Steelhead spawning and rearing periods to minimize potential disturbance. Their typical spawning period is from December to April. • No construction will occur in Clear Creek.	Prior to and during construction	Construction Contractor/NPS Biologist & NPS COR	Endangered Species Act of 1973 U.S.C. §1531 et seq. (1973) Federal Water Pollution Control Act (Clean Water Act) of 1972 33 USC 1251–1387
BIO-5: Monarch Butterfly	• Before construction starts, butterfly surveys will be conducted, specifically looking for monarch butterflies. If monarchs are found, their habitat will be clearly flagged, and the WHIS Vegetative Ecologist and the Wildlife Biologist will be notified for next steps. • Consultation with USFWS may be necessary to determine additional mitigation measures, and consultation may be needed to comply with Section 7 of the ESA if the species is formally listed under ESA before or during the implementation of this project.	Prior to and during construction	Construction Contractor/NPS Biologist & NPS COR	Endangered Species Act of 1973 U.S.C. §1531 et seq. (1973)

	Mitigation, Avoidance, and Minimization Measures	Implementation Timing	Implementation & Verification Responsibility	Legal Authority for Mitigation
Biological Resources				
BIO-6: Vegetation	• Prior to commencing site-specific activities associated with construction, a botanical survey of the site will be completed. The survey will include areas that will be directly and indirectly impacted. The survey will include mapping of plant communities including sensitive plant species and invasive species. • If sensitive plant species occur within the project work limits, then the biologist will establish an adequate buffer area for each plant population to exclude activities that directly remove or alter the habitat of, or result in indirect adverse impacts on, sensitive plant species. If avoidance is not possible, the NPS will determine the best course of action to avoid or minimize impacts, such as transplantation. • A revegetation plan will include collecting seed from nearby areas where possible, monitoring of invasives prior to and after construction, salvaging native topsoil and plant materials during construction, and monitoring the revegetated area, with maintenance and replacement as needed. • Tree trimming will be completed using accepted arborist techniques that minimize long-term impacts to trees. • Retaining as much riparian vegetation as possible is a priority for the bridge removal, with restoration of the site(s) affected as needed. • Invasive plant monitoring and treatment will be conducted prior to and following construction, and native topsoil and plant materials would be salvaged and reused, where possible, during construction. • Equipment entering the park will be cleaned and pressure washed to remove foreign soil and non-native vegetation, seeds, and other materials that may contain nonnative seeds or vegetation. • The introduction of exotic plant species shall be avoided through physical or chemical removal and prevention. Measures to prevent the introduction of exotic plants into the project site via vehicular sources shall include cleaning of vehicles coming to the site and leaving the site. Earthmoving equipment shall be cleaned prior to transport to the project area. Weed-free rice straw or	Prior to construction	COR and Qualified Biologist	NPS Organic Act of 1916 (16 U.S.C. § 1) and Federal Noxious Weed Act (7 U.S.C. § 2801 et seq.)

	Mitigation, Avoidance, and Minimization Measures	Implementation Timing	Implementation & Verification Responsibility	Legal Authority for Mitigation
Biological Resources				
	other certified weed-free straw shall be used for erosion control.			
BIO-7 Wetlands/ Floodplains	• Construction activities shall be implemented in full compliance with Section 401 and 404 of the Clean Water Act, and in consultation with the U.S. Army Corps of Engineers. The requirements will include measures to prevent or control spills of fuels, lubricants, or other contaminants from entering nearby waterways. Appropriate erosion and siltation controls will be maintained during construction and exposed soil, or fill will be stabilized and maintained. When possible, excavated materials will be stored at an upland site or when not practicable, placed on filter cloth, mats, or other semipermeable surface to protect wetlands. Runoff from stockpiled material will be controlled by silt fencing, filter cloth, coir wattles, or other appropriate means to prevent impacts to wetlands. Temporary stockpiles in wetlands will be removed as soon as practicable and temporary disturbance will be returned to pre-existing elevations, soil hydrology, and native vegetation communities must be restored. Revegetation of disturbed soil areas should be facilitated by salvaging and storing existing topsoil and reusing it in restoration efforts in accordance with NPS policies and guidance. Topsoil storage must be for as short a time as possible to prevent loss of seed and root viability, loss of organic matter, and degradation of the soil microbial community. Heavy equipment use will be avoided in wetlands, will avoid creating ruts, and will use mats or other measures to minimize soil and plant disturbances to preserve preconstruction elevations. • Project activities will avoid impacts to wetlands to the extent possible. The wetlands located near the construction area are freshwater forested/shrub wetlands with sections of estuarine wetland, such as near Clear Creek Bridge. Wetlands will be protected with high visibility fencing to ensure that inadvertent damage does not occur.	Prior to construction	NPS and Qualified Biologist & NPS COR	Federal Water Pollution Control Act (Clean Water Act) of 1972 33 USC 1251–1387

	Mitigation, Avoidance, and Minimization Measures	Implementation Timing	Implementation & Verification Responsibility	Legal Authority for Mitigation
Biological Resources				
BIO-8: Bat Species	• To avoid adverse impacts to bats, particularly during the maternity season, rehabilitation of existing buildings will not occur from March 15th to July 31st unless a pre-construction bat survey is conducted. • If bats are discovered or disturbed during construction, work will stop immediately and the WHIS Biologist will be notified. • As the renovation and demolition of buildings will cause loss of habitat for bat colonies, bat boxes will be installed to provide additional habitat. • Buildings with known bat roosts will have exclusions applied after an outflight prior to work requiring siding removal or replacement. This work will not occur during the maternity season (March 15th to July 31st).	Prior to and during construction	COR and Construction Contractor & NPS COR	NPS Organic Act of 1916 (16 U.S.C. § 1)

	Mitigation, Avoidance, and Minimization Measures	Implementation Timing	Implementation & Verification Responsibility	Legal Authority for Mitigation
Cultural Resources				
CUL-1	• Prior to authorization to proceed, a Secretary of the Interior-qualified archaeologist will conduct a training program for construction and field workers involved in site disturbance. On-site personnel shall attend a mandatory pre-project training that will outline the general archaeological sensitivity of the area and the procedures to follow in the event archaeological resources and/or human remains are inadvertently discovered.	Prior to construction	Secretary of the Interior-qualified archaeologist & NPS COR	National Historic Preservation Act of 1966 54 USC 300101 et seq
CUL-2	• Park managers shall consult with Federally Recognized Native American tribes and may consult with non-federally recognized tribes to ensure that the proposed undertakings are conducted in a way that respects the beliefs, traditions, and other cultural values of the Native People who have ancestral ties to park lands. Tribal Monitors may be required for proposed undertakings in consultation with the park's Tribal Partners. • If prehistoric or historic-era archaeological resources or tribal cultural resources are encountered by construction personnel during project implementation, construction activities within 200 feet shall halt and the contractor shall notify the WHIS Cultural Resource Program Manager or onsite Agency/Tribal Monitor. Prehistoric archaeological materials might include obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or toolmaking debris; culturally darkened soil ("midden") containing heat-affected rocks, artifacts, or shellfish remains; and stone milling equipment (e.g., mortars, pestles, handstones, or milling slabs); battered stone tools, such as hammerstones and pitted stones. Historic-era materials might include stone, concrete, or adobe footings and walls; filled wells or privies; and deposits of metal, glass, and/or ceramic refuse.	Prior to construction During Construction	Secretary of the Interior-qualified archaeologist, and Construction Contractor & NPS COR Secretary of the Interior-qualified archaeologist, and Construction Contractor &NPS COR	National Historic Preservation Act of 1966 54 USC 300101 et seq National Historical Preservation Act of 1966 54 USC 300101 et seq
CUL-3	• The Secretary of Interior-qualified archaeologist will inspect the findings within 24 hours of discovery. If it is determined that the project could damage	During construction	Secretary of the Interior-qualified archaeologist,	National Historic Preservation Act of 1966

	Mitigation, Avoidance, and Minimization Measures	Implementation Timing	Implementation & Verification Responsibility	Legal Authority for Mitigation
Cultural Resources				
	a historical resource as defined by NHPA, construction shall cease in an area determined by the archaeologist until a mitigation plan has been prepared and implemented to the satisfaction of the archaeologist. In consultation with the Native American representative if the resources are prehistoric, the archaeologist shall determine when construction can commence. • The mitigation plan shall recommend preservation in place, as a preference, or, if preservation in place is not feasible, data recovery through excavation. If preservation in place is feasible, this may be accomplished through one of the following means: (1) modifying the construction plan to avoid the resource; (2) incorporating the resource within open space; (3); or capping and covering the resource before building appropriate facilities on the resource site. If preservation in place is not feasible, a qualified archaeologist shall prepare and implement a detailed treatment plan to recover the scientifically consequential information from and about the resource, which shall be reviewed and approved by the NPS and Native American representative prior to excavation at the resource. Treatment for most resources would consist of (but would not necessarily be not limited to) sample excavation, artifact collection, site documentation, and historical research, with the aim to target the recovery of important scientific data contained in the portion(s) of the resource to be impacted by the project. The treatment plan shall include provisions for analysis of data in a regional context, reporting of results within a timely manner, curation of artifacts and data at an approved facility, and dissemination of reports to local and state repositories, libraries, and interested professionals. Work shall be completed in accordance with pertinent laws and regulations, including the stipulations of the 2008 Programmatic Agreement Among the National Park Service, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers.		and construction contractor	54 USC 300101 et seq

	Mitigation, Avoidance, and Minimization Measures	Implementation Timing	Implementation & Verification Responsibility	Legal Authority for Mitigation
Cultural Resources				
CUL-4:	• In the event that human remains are discovered, work shall cease immediately within 200 feet of the find and the Contractor shall immediately contact WHIS Dispatch and the WHIS Cultural Resource Program Manager. The find shall be secured and protected in place. Provisions outlined in the Native American Graves Protection and Repatriation Act (25 USC § 3001 - 3013) of 1990 and related implementing regulations at 43 CFR will be followed (National Archive, 2024 and Government Publishing Office, 2022). The park will notify the appropriate law enforcement official(s) for further investigation and to secure the site. If it is determined that the remains are Native American, the Contractor or other entity shall work with the park to ensure compliance with NAGPRA. It is the park's responsibility to comply with NAGPRA.	During Construction	Secretary of the Interior-qualified archaeologist, construction contractor, & NPS COR	Native American Graves Protection and Repatriation Act 25 USC § 3001 - 3013
CUL-5	• There are three historic apple trees, and one historic cherry tree present at WES. Each historic tree will be marked for avoidance with protective fencing installed around them at the drip line to avoid damage to their root systems during construction. Pruning will be part of the mitigation measures associated, including other protection measures as identified by a qualified arborist.	During Construction	Secretary of the Interior-qualified archaeologist and construction contractor	National Historic Preservation Act of 1966 54 USC 300101 et seq

	Mitigation, Avoidance, and Minimization Measures	Implementation Timing	Implementation & Verification Responsibility	Legal Authority for Mitigation
Hazards and Hazardous Materials				
HAZ-1	• Hazardous materials will be stored in a location where there is no potential to enter waterways, such as Clear Creek. Hazardous materials will be stored in secondary containment, such as in a prefabricated temporary containment mat, a temporary earthen berm, or other measure, and will be covered when rain is forecast or during wet weather. • To the greatest extent possible, refueling of vehicles and equipment will occur 50 feet from waterways, to prevent pollutants from entering waterways, mainly Clear Creek. • Because the work area is larger than one acre, the project contractor will be required to prepare a Stormwater Pollution Prevention Plan (SWPPP) for construction activities according to the National Pollutant Discharge Elimination System (NPDES) Construction General Permit requirements. The objectives of the SWPPP will be to (1) identify pollutant sources associated with construction activity and project operations that may affect the quality of stormwater and (2) identify, construct, and implement stormwater pollution prevention measures to reduce pollutants in stormwater discharges during and after construction. The NPS contractor(s) will develop and implement a spill prevention and control plan as part of the SWPPP to minimize effects of spills of hazardous, toxic, or petroleum substances during construction of the project. Implementation of this measure will comply with state and federal water quality regulations. The SWPPP will be kept on site during construction activity and during operation of the project and will be made available upon request to representatives of the Regional Water Quality Control Board (Regional Water Board). The SWPPP will include but is not limited to:	Prior to and during construction	Construction Contractor & NPS COR	Federal Water Pollution Control Act (Clean Water Act) of 1972 33 USC 1251–1387

SW-1	• A description of potential pollutants to stormwater from erosion. • Management of dredged sediments and hazardous materials present on site during construction (including vehicle and equipment fuels). • Details of how the sediment and erosion control practices comply with state and federal water quality regulations. • A description of potential pollutants to stormwater resulting from operation of the project.	Prior to and during construction	Construction Contractor &NPS COR	Federal Water Pollution Control Act (Clean Water Act) of 1972 33 USC 1251–1387

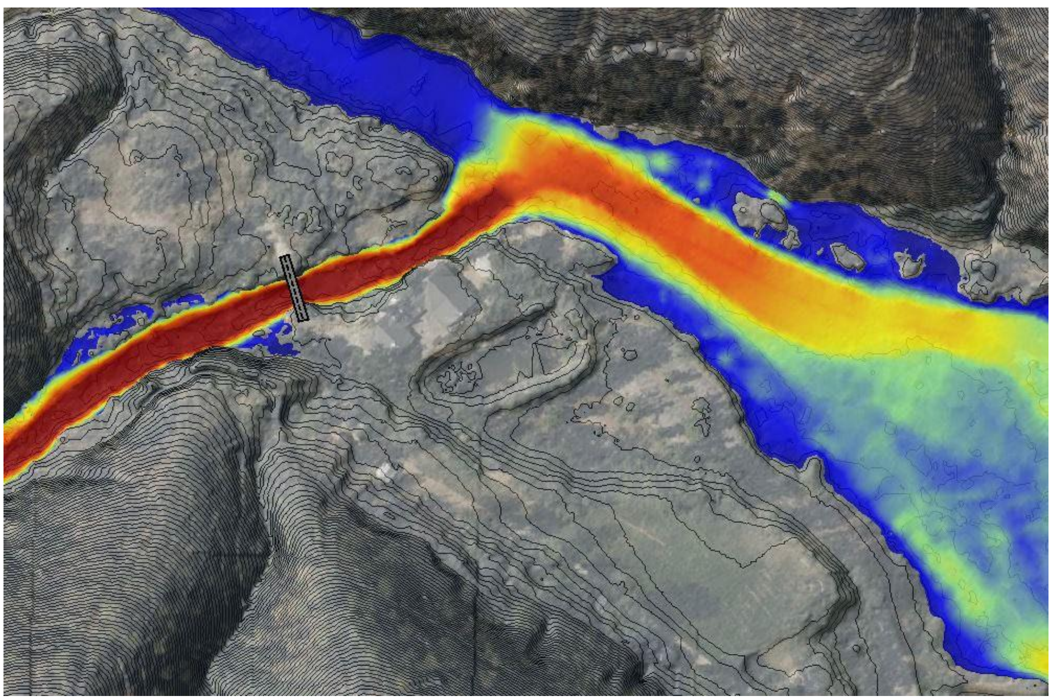
Appendix E: Paige Boulder Creek and WES Camp Flood Risk Evaluation

Whiskeytown

National Park Service
U.S. Department of the Interior

Paige-Boulder Creek & WES Camp

Flood Risk Evaluation



August 2022

Whiskeytown National Recreation Area
P.O. Box 188
Whiskeytown , CA 96095

Whiskeytown NRA ♦ National Park Service ♦ U.S. Department of the Interior

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Acronyms And Abbreviations

BAER	Burned Area Emergency Response
BF	Bulking Factor
BSF	Burn Severity Factor
CFS	Cubic Feet per Second
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
LiDAR	Light Detection and Ranging
NPS	National Park Service
USFS	U.S. Forest Service
USGS	U.S. Geologic Survey
WES	Whiskeytown Environmental School
WHIS	Whiskeytown National Recreation Area

Background

In 2018 the Carr Fire burned approximately 39,000 acres within Whiskeytown National Recreation Area (WHIS). One of the areas impacted was the Whiskeytown Environmental School (also known as WES Camp or previously NEED Camp). WES Camp is an environmental learning center that prior to the Carr fire offered a variety of environmental focused activities for school age children including overnight lodging and meal service. WES Camp is owned by the National Park Service (NPS) but is operated by the Shasta County Office of Education through a cooperative agreement. The camp consists of approximately 16 overnight lodging cabins, restroom facilities, four support buildings (included a main lodge with commercial kitchen), and associated utilities, roads, and parking areas.

As a result of the Carr Fire there was damage to several of the buildings and four cabins were burned. Following the fire, the facility was closed due to the damages and remaining on-site hazards. In 2022 the facility was partially reopened for day-camp actives. However, the facility has not been fully reopened and many of the services previously provided are not currently available. The camp partners are now examining alternatives to fully reopen the facility. At a project working group meeting held on March 11th, 2022, the group identified that one of the main obstacles to reopening the camp is the inability to use Hatcher Hall which serves as the main lodge and commercial kitchen. Hatcher Hall is the centerpiece of the camp and represents most of the infrastructure in terms of cost. The facility is located at the north end of the camp and is adjacent to Paige-Boulder Creek. The facility did not receive direct damage from the fire; however, the Paige-Boulder Creek watershed was extensively burned. Shortly after the fire a U.S Forest Service (USFS) Burned Area Emergency Response (BAER) team identified an increased risk to the camp, and in particular Hatcher Hall, from flooding and debris flow because of the altered watershed conditions. (Holbeck et al., 2018). The BAER report recommended that the camp be closed for a period of no less than three years.

In April 2019, WHIS requested technical assistance from the National Park Service Geologic Resources Division to further investigate the debris flow hazard to the WES camp. (Bilderback, E. 2020). This investigation looked at hazards primarily from a geologic perspective. The report examined the prevalence of past debris flows and examined the facility with respect to geomorphic position. The general conclusion of this report was that the facility is located in an area that could experience flooding and debris flow, however the likelihood and frequency of such events were not determined. This report also made a series of recommendations, including the recommendation to consider relocating the kitchen facility.

Somehow, the combination of stated increased risk and subsequent recommendations led to the general understanding that Hatcher Hall was no longer usable. The currently held perspective by some is that the facility is at such extreme risk that it either must be relocated, or that a project to construct a large flood diversion is required. Either alternative represents a significant cost and thus far has proven challenging in terms of funding. Neither the NPS nor the camp partners have been able to successfully fund either project. Without a working kitchen, the facility cannot fully reopen, and this issue presents a serious challenge to the long-term future of the camp.

This report challenges the currently held belief that the facility is no longer usable. In particular, the interpretation and conclusions derived from the prior assessments is not correct. This report reexamines the conclusions and recommendations that were previously presented. This report also assesses the situation from an engineering perspective and includes a detailed hydraulic analysis of the project area, where previously there was none. The goal is to provide documentation that the project partners can use to make informed decisions moving forward.

Establishment of Baseline Hydraulic Model

There are no known existing flood models or published flood hazard or flood risk maps for Paige- Boulder Creek. The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) (Appendix A) only shows approximate, Zone A, flood hazard zones for nearby Clear Creek, of which Paige-Boulder Creek is a tributary. The FEMA FIRM for Clear Creek was published in 2011 and is based on relatively low-quality topographic data when compared to today's LiDAR derived topographic data. With the recent acquisition of LiDAR, it is possible to more accurately map the existing floodplain of both Paige-Boulder Creek and Clear Creek. For the purposes of this study, a hydraulic analysis was completed using a 2D-modeling approach with HEC-RAS software. The model domain included Paige-Boulder Creek extending approximately 1,700 feet upstream of the confluence, and the portion of Clear Creek extending approximately 500 feet upstream of the confluence and 1200 feet downstream.

Flow rates for the baseline assessment ($Q_{preburn}$) were obtained from StreamStats, which is based on USGS regression equations. (Gotvald 2012). According to the BAER Report these are thesame base flow rates that were used for their analysis. Table 1 shows the peak discharge rates from Stream Stats.

Table 1: Base Model Discharges ($Q_{preburn}$)

Event	Peak Discharge (cfs)
Q2 (50% Annual Chance)	483
Q5 (25% Annual Chance)	857
Q10 (10% Annual Chance)	1120
Q25 (4% Annual Chance)	1460
Q50 (2% Annual Chance)	1720
Q100 (1% Annual Chance)	1990
Q500 (0.2% Annual Chance)	2240

The downstream boundary condition for the analysis was an intersecting reach of Clear Creek. Paige-Boulder Creek discharges into Clear Creek and the water surface elevation in Clear Creek influences the flood model upstream through Paige-Boulder Creek. Clear Creek is primarily regulated by Whiskeytown Dam and does not experience rapid variations in flow. Mean daily discharge rates vary throughout the year (USGS, Gage 11372000). It is reasonable to assume that any runoff event that would cause a flood or debris flow along Paige-Boulder Creek would not simultaneously cause a flood downstream of the dam. The dam regulates discharge and the response time for the watershed upstream of the dam is significantly longer than that for Paige- Boulder Creek. For the purposes of this analysis a flow rate of 600 cfs was selected as the boundary condition on Clear Cleek as it represents the extreme upper end of average daily flow rates. In other words, this model assumes that a flood occurs when the flow is high on Clear Creek.

The goal of establishing the base model is not necessarily to produce a FEMA level flood map, nor is it the goal of this study to fully describe the flood modeling process. Rather, the goal is to establish a working model that includes many of the same assumptions presented in previous work so that comparisons can be made.

Figure 1 shows the mapped flood inundation area for the baseline 100-year flood. It can be seen from the model results that the existing facility is located outside of normal 100-year floodplain. Keep in mind that these results are for normal (pre-burned) conditions. Further discussion of post fire and debris flow conditions is presented below.

Flood Risk

Flood risk can be assessed in a variety of ways. One common method of assessing risk is to multiply the inundation depth by the velocity. The idea behind the approach is that the deeper and faster the water, the more likely it is that a person could be swept away or that there would be damages to facilities beyond shallow/superficial water damage. Table 2 is from FEMA's Guidance for Flood Risk Analysis and Mapping. The table quantifies the associated risk based on the combination of depth and velocity.

Table 2: Flood Risk Rating

Flood Severity Category	Depth * Velocity Range (ft^2/sec)
Low	< 2.2
Medium	2.2 – 5.4
High	5.4 – 16.1
Very High	16.1 – 26.9
Extreme	> 26.9

Figure 1A shows the mapped flood risk for the base flood model. There is no risk to the structure for this scenario as the flood level does not reach the building. However, this approach is used throughout to visually depict relative risk from other scenarios.

Referenced Text

The paper Sediment/Debris Bulking Factor and Post-Fire Hydrology for Ventura County was referenced in the BAER report and is used extensively throughout this analysis. This report provides a highly detailed explanation of various techniques used to estimate post fire runoff. It also better explains many of the concepts that are applicable to this site. It is recommended that the reader review this report along with this analysis. A copy of the report is attached (Appendix B) for reference. Throughout this text this report is referred to as the WEST report. (Gusman 2011).

Prior Assessment

When a watershed is burned the characteristics of the watershed change. The lack of vegetation and the burned soil profile result in increased runoff from a rainfall event when compared to pre-fire conditions. The watershed also becomes more susceptible to erosion, and the likelihood of debris and/or mud flows in steep mountainous areas can increase dramatically.

When it comes to modeling post-fire hydrology engineers will often apply what is known as a Bulking Factor (BF) to account for increased runoff and/or high concentrations of sediment entrained within the flow. There are numerous methods of estimating bulking factors, and some methods directly estimate increased runoff whereas others only estimate volumetric increases due to entrained sediment. Regardless of the method, the BF essentially equates to a factor of safety for estimating, and subsequently mapping, impacted areas. This approach has often been used in the past because there were limited numerical methods available to directly model debris flow. The use of a bulking factor allowed engineers to use existing tools (models) to analyze these types of post-fire impacts.

The use of a BF however does not imply a linear relationship that can be applied to all pre-fire runoff events. For example, a bulking factor of 1.5 cannot be applied universally to all pre-fire rainfall-runoff events in any given watershed. To understand this one must understand the differences between various types of runoff events. The WEST Report explains the difference between a debris flow, mud flow, hypercontracted flow, and normal flow. Most debris flows are triggered by short duration, high-intensity events. In some parts of the country these events may be described as cloud-bursts. A short duration high intensity event may produce a corresponding runoff (i.e. debris flow) that is multiple orders of magnitude larger than the same event would produce under prefire conditions. For example, short-duration high intensity storm (2-year, 15- minute for example) could conceivably result in a runoff event that would inundate an area that would otherwise be inundated from corresponding 10-year 24-hour prefire rainfall event. Under such a scenario, the bulking factor would be very high. Correspondingly a 100-year 24-hour rainfall event will produce much more water from a volumetric standpoint. While the event certainly could trigger large debris flows (typically on the leading edge) the corresponding peak discharge occurs later in time and consists of relatively clean water under normal flow conditions. At that point the water will have diluted the entrained concentration of sediment/debris and the corresponding bulking factor will be significantly lower, even though the peak discharge is considerably higher. In other words, at that point it’s no longer a debris flow, but rather it’s a flood. This has important implications when understanding risk as well. Debris flows move fast and contain a great deal of energy due to the moving solids. Any area or structure impacted (inundated) by a debris flow is likely to experience significant damage. A flood on the other hand, perhaps not so such. A few feet of water inundation, while damaging to the structure, is unlikely to present a significant safety risk, especially if the velocities are low. Therefore, when using bulking factors, it must be understood under what conditions the factors are intended to be used.

The BAER report examined the Paige-Boulder Creek Watershed and presented an estimated bulking factor of 1.44. However, this statement must be taken in context that it was intended. Their assessments were generally referenced based on a ≤ 10-year runoff event, and only applicable to immediate post-fire conditions. (Section 5.9 of the WEST report describes how the 44% increase was estimated using an empirical equation based on burn intensity.) It would be incorrect to apply this bulking factor across the full spectrum of design rainfall events, especially for design purposes. It would also be incorrect to apply this factor to events several years after the fire took place. Indeed, that's not what the BAER team did. The BAER report was primarily concerned with the increased potential for debris flow and increased runoff shortly after the fire. The event selected (i.e., the 10-year event) represents somewhat of a worst-case combination of flow, bulking factor, and corresponding sediment concentration to cover the inherent unknowns of the situation at the time. Indeed, lesser events likely have a much higher bulking factor, but the corresponding flow rates are low enough such that the inundated area is relatively small. Correspondingly, larger events likely have a smaller bulking factor. But while these events will inundate a larger area, the resulting flow will unlikely be laden with enough sediment and debris to cause the types of damages that one could expect from a true debris flow. What the BAER Team did not do is provide a long-term assessment of risk for the site nor did they make any long- term recommendations for the future of the camp or its buildings.

Modeling Scenarios

Scenario 1: Immediate Post Fire

The scenario looks directly at the results from the BAER report. From a timeline perspective there may be little use for this analysis since it's been nearly four years since the fire occurred these conditions are no longer applicable. The intent of this exercise is to examine what the BAER team may have concluded if this had been done immediately following the fire.

From direct comparison to the base flood model alone, it can be seen that the increased flow as estimated in the BAER report would not impact the existing structure. If one were to apply a bulking factor from the BAER report of 1.44 to the 10-year runoff event the result would be:

$$1120 \times 1.44 = 1{,}613 \text{ cfs}$$

This flow rate is less than the normal 100-year event established in the baseline model. This would suggest, that based on the BAER analysis, the building would not be subject to direct debris flow damage, provided that a series of assumptions were properly applied.

The BAER report did not directly quantify the expected increase in peak discharge rates beyond the 10-year event. Even if the conclusion of the BAER report were misinterpreted, and the estimated peak discharge for the 100-year event was increased by same bulking factor of 1.44 (2865 cfs), the result would be that the flood elevation just reaches the building (Figure 2). Even in this extreme scenario, the inundated depth of Hatcher Hall is less than 6" and the water velocity is less than 1 ft/s against the building, making the relative risk low (Figure 2A). To reiterate, this level of increase would not be anticipated for large runoff events and in the BAER assessments these factors were only limited to a ≤ 10-year event.

The BAER team assessment did not include any hydraulic modeling to map areas that could potentially be inundated by post fire flow of any type. The report acknowledged the uncertainty of the approach and thus recommended the temporary closure of the facility, presumably out of an abundance of caution. The BAER report also recommended a series of protective measures to mitigate potential impacts from flood events, including the installation of HESCO barriers and sandbags. The BAER report describes the added protective measures as protection for “nuisance” flooding, which is consistent with the results from the model.

Scenario 2: Design Basis - Ventura County Method

It’s been almost four years since the Carr fire and Paige-Boulder Creek watershed has begun to recover. However, it should be acknowledged that this facility is located in an area that is susceptible to frequent wildfires. As a result, the area is subject to the full range of flow types ranging from debris flows to increased clean-water runoff events. Scenario 1 examined impacts from debris and mudflows. The baseline model examined the base-flood (100-year event) using normal parameters. This scenario utilizes a more conservative design level approach for examining the base-flood event that incorporates the likely increased runoff resulting from burned conditions. In other words, the purpose of this scenario is to examine the site as if it were undeveloped prior to future development. Thus, the results could be used for the basis of future decision making, similar to existing FIRM maps used elsewhere around the country. This scenario utilizes the methods outlined in the WEST report for design level analysis. This method utilizes both a Bulking Factor (BF) and Burn Severity Factor (BSF) to derive a combined factor of safety that is applied on top the normal clean water conditions (baseline model hydrology). The BSF accounts for the increased runoff resulting from burned conditions, and the BF accounts for entrained sediment and debris. The BF in this method is similar in concept to the BF used in the BAER report, but the two should not be considered equivalent as they come from different methods. The equations are as follows:

$$Q_{design} = Q_{burn} * BF$$

Where

$$Q_{burn} = Q_{preburn} * BSF$$

From the process flow charts in the WEST report the BF is 1.2, and the BSF is 1.1 Therefore:

$$Q_{burn} = 1990 * 1.1 = 2{,}189 \text{ cfs}$$

and

$$Q_{design} = 2189 * 1.2 = 2{,}627 \text{ cfs}$$

The results of this analysis are shown in Figure 3 and Figure 3A. It can be seen that results are similar to those shown in Figure 2 and Figure 2A. One observation to note is that at this flow rate the bridge adjacent the Hatcher Hall acts as a restriction and forces the water to overflow the banks upstream of the bridge. The result is minor flooding along the west side of the building. This consistent with historical observations.

The results of this scenario show that if this were an undeveloped site some precautionary measures may be put in place to prevent superficial damages to the building. For example, the building might be shifted slightly to the east, or raised by 12 to 24 inches to elevate the floor slab above the floodplain. However, there is nothing in these results that would limit the development of the site similar to how it is now. The edge of the building barely intersects the floodplain and both depth (~0.1 feet) and velocity (~0.2 ft/s) are minimal. In other words, the normal flood risk at this site is low.

Scenario 3: Impacts from Debris & Bridge Plugging

When examining this site for assessment purposes it becomes necessary to apply engineering judgement as to which scenarios, or combination of scenarios to consider for modeling beyond the base modeling. From a probabilistic standpoint, the results from Scenario 1 showed that the existing building is not in the direct path of most debris flows and the facility is more likely to experience damages from a large flood event. Should a debris flow occur it is unlikely to carry enough volume to directly impact the facility. As shown through the results of the baseline model and Scenario 2, Hatcher Hall sits on top of the stream bank and is outside of the base 100-year floodplain, and barely intersects the more conservative design level floodplain that considers periodic burned conditions in the watershed. For most areas of the country, and under most jurisdictions, this analysis alone would indicate that the risk to locating a building here his acceptable.

Based on the combined results of Scenarios 1 and 2, the worst-case scenario for this site is likely a debris flow that's initiated on the leading end of a large flood. One can imagine a scenario where a first flush of debris (primarily woody debris) plugs a portion of the channel (i.e. bridge restriction) and the following flood is exasperated as the normal conveyance route is restricted. It is extremely difficult to estimate how likely such an event is to occur. There are relatively few guidelines for the consideration of debris and plugged structures when mapping floodplains. In general, this type of analysis is left to judgement and experience.

The purpose of the scenario is to examine potentially worst-case conditions. For this scenario the existing bridge was 80% "plugged" by adding an obstruction to model under the existing bridge deck. The obstruction represents the impacts from a leading-edge debris flow and assumes that larger woody debris collects and subsequently restricts flow. Then the 100-year design flood was applied. As previously stated, it is difficult to estimate how likely such an event would be. The design of the existing bridge is such that there are no piers which is where most debris collection typically occurs. It's safe to assume that based on the combination of scenarios that such an event is likely to have less than a 1% annual chance of occurrence. Through iterative comparison using the model from Scenario 2, similar results were observed around 3,000 cfs for non-plugged conditions.

The result from this scenario shows that if a debris flow were to plug the existing bridge, and a large flood were to follow, that the building would likely experience significant flood damages. (Figure 4). A restriction at the bridge forces discharge out of the channel and into the adjacent floodplain. However, even under these conditions the resulting depth (~1 ft) and velocity (~3 ft/s) does not place this facility in a high-risk category. Figure 4A shows the relative risk according to Table 2. The relative risk at the west side of the building is classified as medium. Under such a scenario, the building would likely experience damages, but most of the damage would be limited to the west side. Furthermore, there would likely be adequate time to evacuate the building, and there are safe holding areas to the north and east. To reiterate, this scenario has a low probably of occurrence, and even if it did occur the associated risks, in terms of life and safety, are minimal for most of the structure.

Scenario 4: Bridge Removal

The combined results of Scenarios 2 and 3 demonstrate that the existing bridge near Hatcher Hall acts a restriction, which under extreme circumstances, could contribute to moderate flooding or damages to the building. A recent survey of the site found that the existing bridge is in poor condition and the right abutment has failed. Therefore, the bridge will need to be repaired or replaced soon.

This scenario examines the impacts of removing the existing bridge to limit the potential for restrictions from accumulated debris. Woody debris tends to float, and most debris accumulations occur where floating debris gets caught on structures such as piers and bridge decks. Without a bridge in place the concern of plugging from woody debris decreases dramatically as most debris will pass through.

This scenario removed the bridge from the model and ran a series of iterations at progressively higher discharge rates. Figure 5 shows the results from 100-year design event with the bridge removed. Figure 6 shows the results using a flood discharge rate of 5,000 cfs, which is considerably higher than the 500-year event in Table 1. Under both conditions, there is no impact to the existing building. At 5,000 cfs we can see discharge just beginning to overtop the bank on the right-hand side.

The results from this scenario show that risks to the facility, while currently low, could be even further reduced if the existing bridge, and associated restriction were removed.

Other Considerations

Streambank Erosion

As previously noted, Hatcher Hall is located on top of the right stream bank of Paige-Boulder Creek. This analysis primarily examined flooding impacts from inundated areas shown through hydraulic modeling. The results from the analysis also show that during high flow situations, the velocity downstream of the bridge is relatively high. For example, the velocity during the 100-year design event is over 10 ft/s. For perspective, this flow velocity could easily move 6 to 9-inch rocks.

While there may be relatively minor risk to the structure from flooding, there may be risk to the structure from erosional undermining. This is particularly true at the north end of the building where the structure is closest to the bank. This type of risk is unlikely to pose risk to life or safety as the erosion failures typically occur gradually and give the occupants enough time to exit. However, erosional risk could pose a threat to the structural integrity of the building. Future consideration should be given to streambank protection and armoring in this area.

Alternative Adaptive Management Strategy

The results from the modeled scenarios indicate that the risk to Hatcher Hall is very low, and that the risk can be further reduced by removing the existing bridge. Never-the-less, there will always be a risk to the facility from debris flow, even if that risk is extremely small. This report attempts to quantify that risk and relate it to levels of risk that are generally considered acceptable elsewhere. Ultimately, what is considered an acceptable level of risk is a management decision. To further reduce risk (or even the perceived risk) the park may want to consider an adaptive management strategy where the facility is only operated during periods when large rainfall events are less likely. From historical records it can be seen that large rainfall events capable of producing debris flows typically occur from December through February. Closing the facility during these months could further reduce the likelihood of a debris flow occurring while the facility is occupied.

Conclusion

The work of the prior assessments, especially that of the BAER team, was focused on the immediate aftermath of the fire. The BAER report presented estimates of possible increases in post-fire runoff, including debris flows, using empirical methods. These methods, while appropriate, were only intended to be applied to flood events up to and including the 10-year, 24- hour event. Furthermore, the prior assessments are generally only applicable for three to four years following a fire. It's been approximately four years since the fire occurred and the soonest that normal operations could resume is the summer of 2023. By that time, it will have been 5 years since the fire and the probability of increased runoff and debris flow will have significantly abated when compared to immediate post fire conditions.

While prior assessments did attempt to quantity the potential increases in flow, they did not establish a solid baseline condition by which to assess risk. They only stated that the potential for significantly increased runoff and debris flow existed and provided a factor of safety by which to estimate by. Using the same methods that the BAER Team used to assess the watershed in 2018, it can be shown through hydraulic modeling that the level of risk to these facilities, even in the immediate aftermath of the fire, is generally within what would normally be considered acceptable.

Prior investigations did not assess the long-term viability of the WES Camp or Hatcher Hall. It is acknowledged that WES Camp, and in particular Hatcher Hall, is located near the outlet of the Paige-Boulder Creek watershed which is subject to reoccurring fire conditions. As a result, normal flood hydrology evaluation procedures for design purposes are likely not conservative enough. Throughout the normal lifespan of the structure there are likely to be fire events that will alter the watershed and result in periods of increased runoff and increased danger from debris and mud flows. Using an approach outlined in the WEST report a more conservative baseline flood model was developed that included factors where burned conditions were applied. Even with these considerations in place, the results of the modeling effort show that Hatcher Hall is not at risk of significant inundation.

Under the scenarios modeled, the primary risk to the building occurs when the adjacent bridge spanning Paige-Boulder Creek becomes plugged with debris and is followed by a large flood event. During this scenario the flood water discharges over the banks of the creek and is directed towards the west side of the building. The likelihood of these simultaneous conditions occurring are very low, less than a 1% annual chance. But even under these extreme conditions the risks associated to life and safety are minimal. From the results of the various hydraulic models, it can be seen that the existing bridge adjacent to Hatcher Hall acts a restriction and could contribute to flooding of the building under extreme conditions. These conditions include plugging and hydraulic restriction during large flood events. The existing bridge has partially failed and needs repair or replacement. Various flood models were ran that examined the site with the bridge removed. The results of the analysis show that with the bridge removed the risk to Hatcher Hall will be significantly reduced from already low levels. If the primary concern of the project partners is perceived risk to the building, it is recommended that consideration be given to removing the existing bridge rather than repairing or replacing it.

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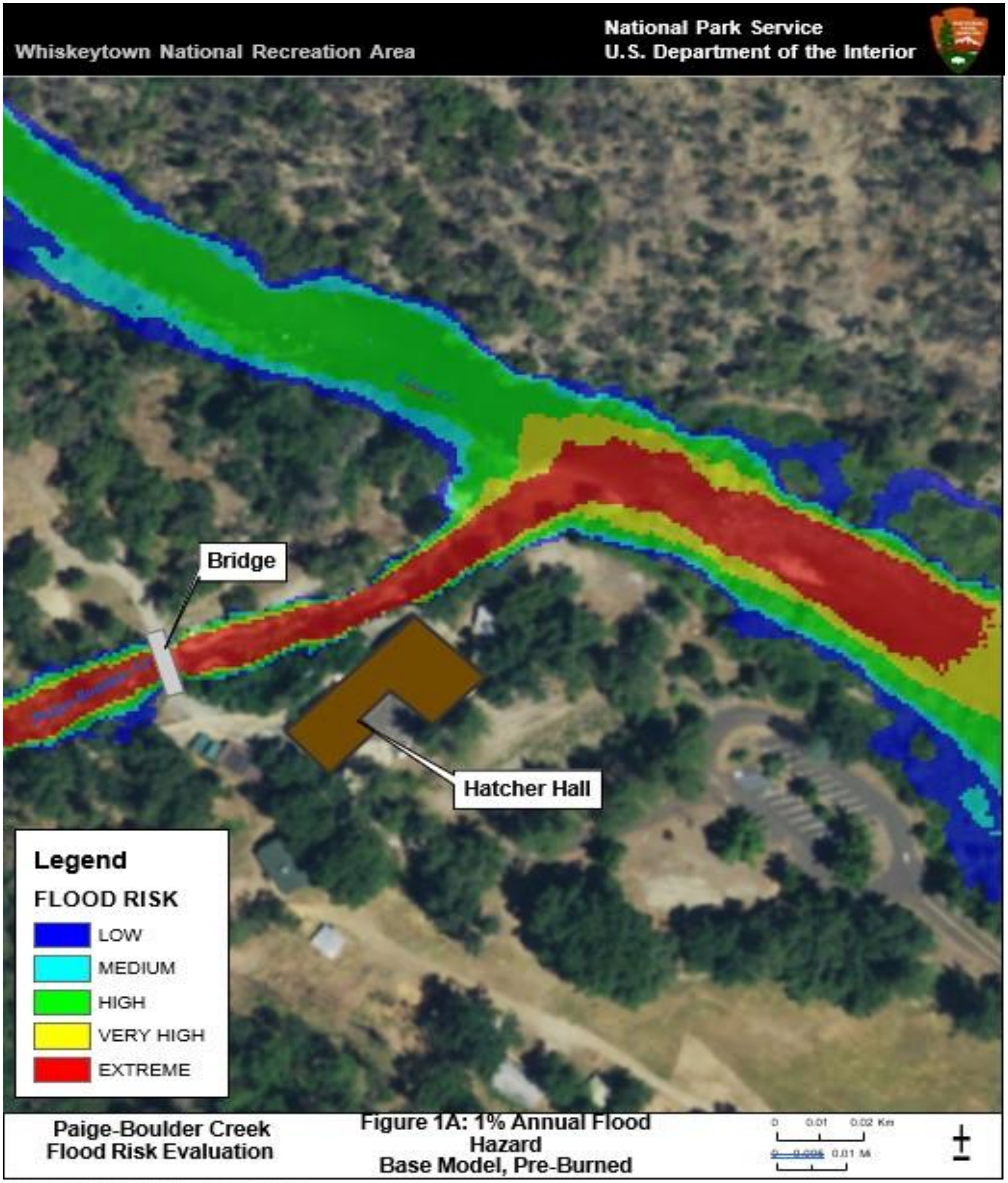
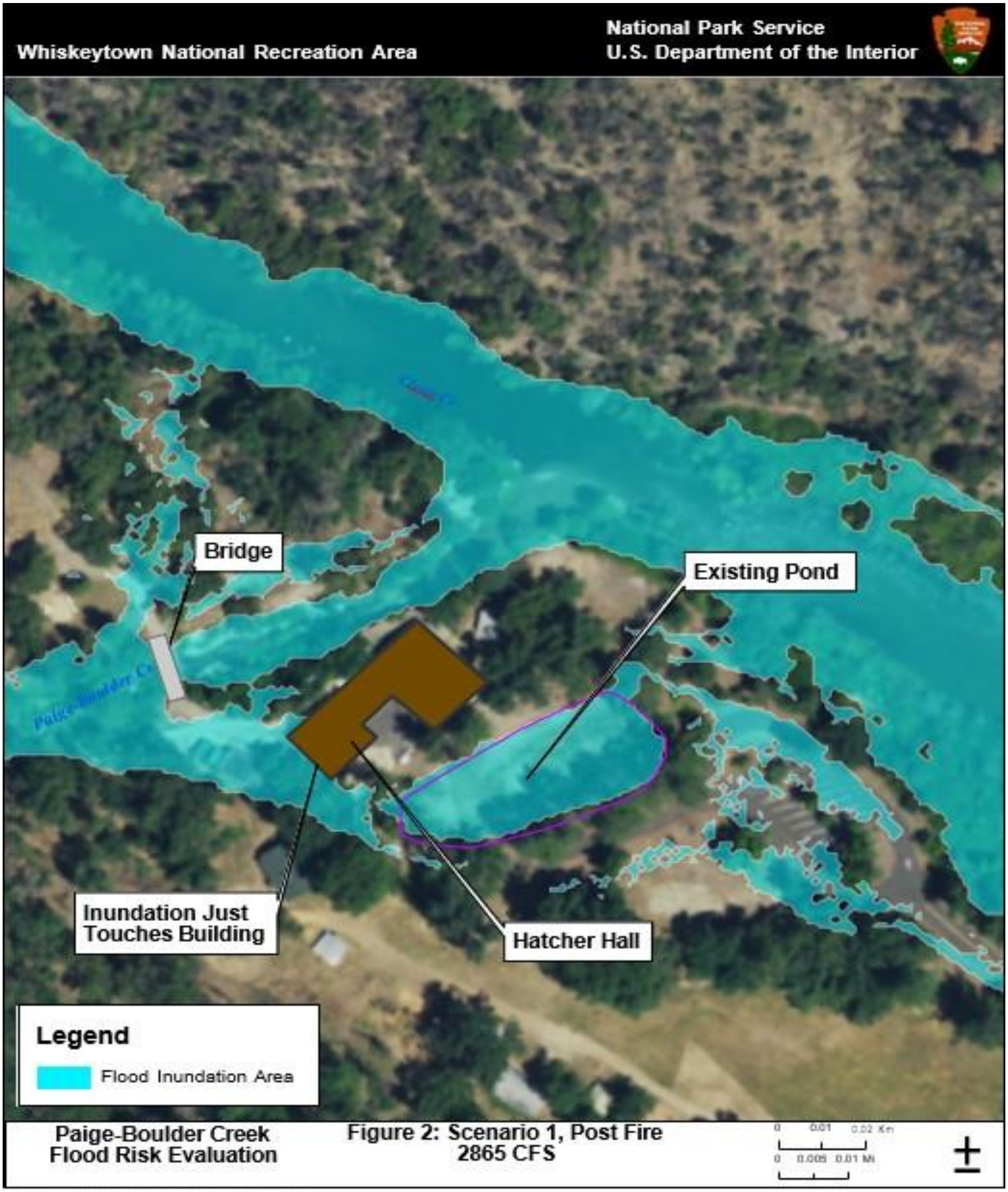
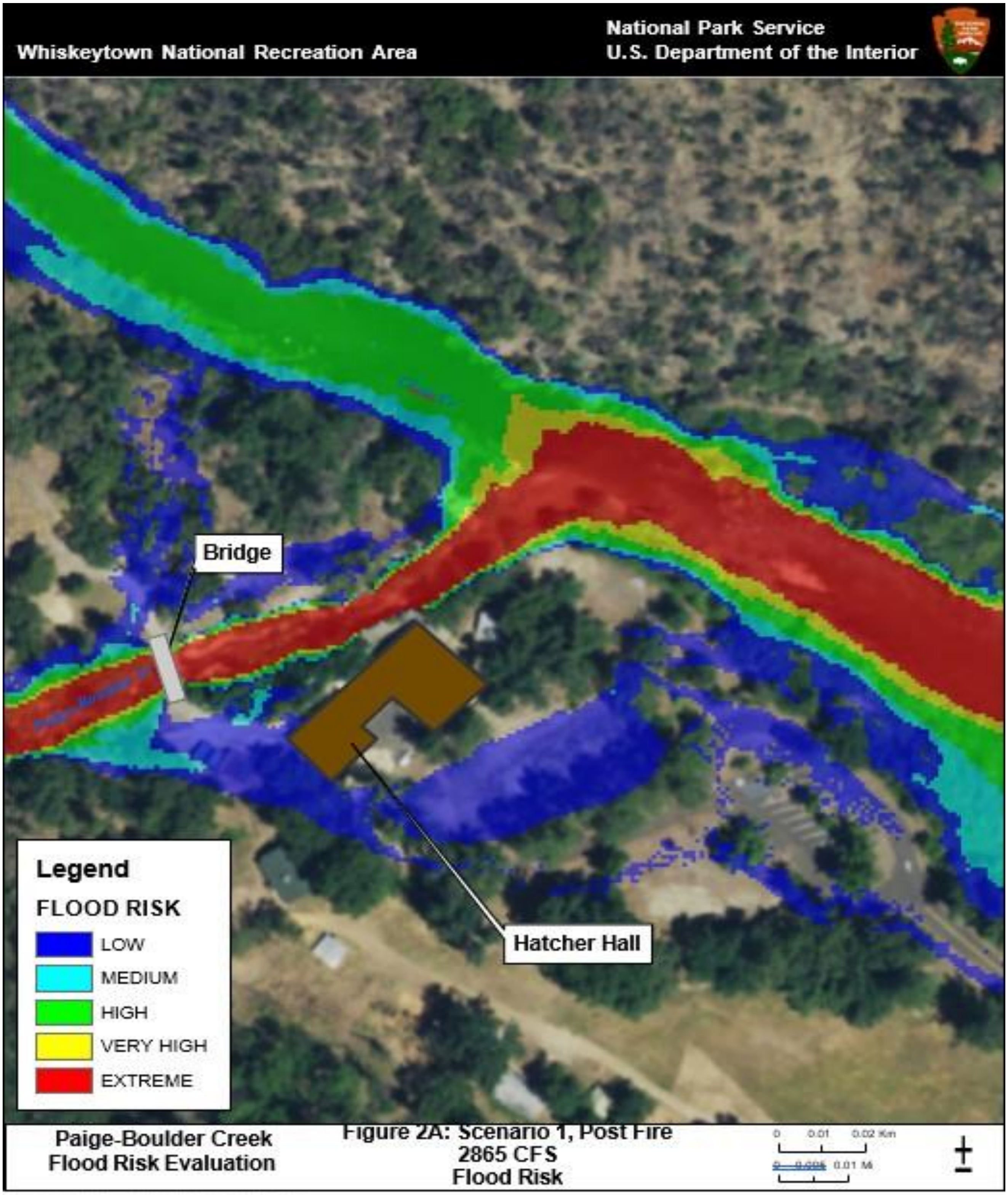
Figures


Whiskeytown National Recreation Area
National Park Service
U.S. Department of the Interior
Bridge
Hatcher Hall
Legend
Flood Inundation Area
Paige-Boulder Creek
Flood Risk Evaluation
Figure 1: 1% Annual Flood Hazard
Base Model, Pre-Burned
0 0.01 0.02 Km
0 0.005 0.01 Mi



Whiskeytown National Recreation Area
National Park Service
U.S. Department of the Interior
Bridge
Hatcher Hall
Legend
FLOOD RISK
LOW
MEDIUM
HIGH
VERY HIGH
EXTREME
Paige-Boulder Creek
Flood Risk Evaluation
Figure 1A: 1% Annual Flood Hazard
Base Model, Pre-Burned
0 0.01 0.02 Km
0.01 Mi


Whiskeytown National Recreation Area
National Park Service
U.S. Department of the Interior
Bridge
Existing Pond
Inundation Just Touches Building
Hatcher Hall
Legend
Flood Inundation Area
Paige-Boulder Creek Flood Risk Evaluation
Figure 2: Scenario 1, Post Fire 2865 CFS


Whiskeytown National Recreation Area
National Park Service
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Bridge
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FLOOD RISK
LOW
MEDIUM
HIGH
VERY HIGH
EXTREME
Paige-Boulder Creek
Flood Risk Evaluation
Figure 2A: Scenario 1, Post Fire
2865 CFS
Flood Risk

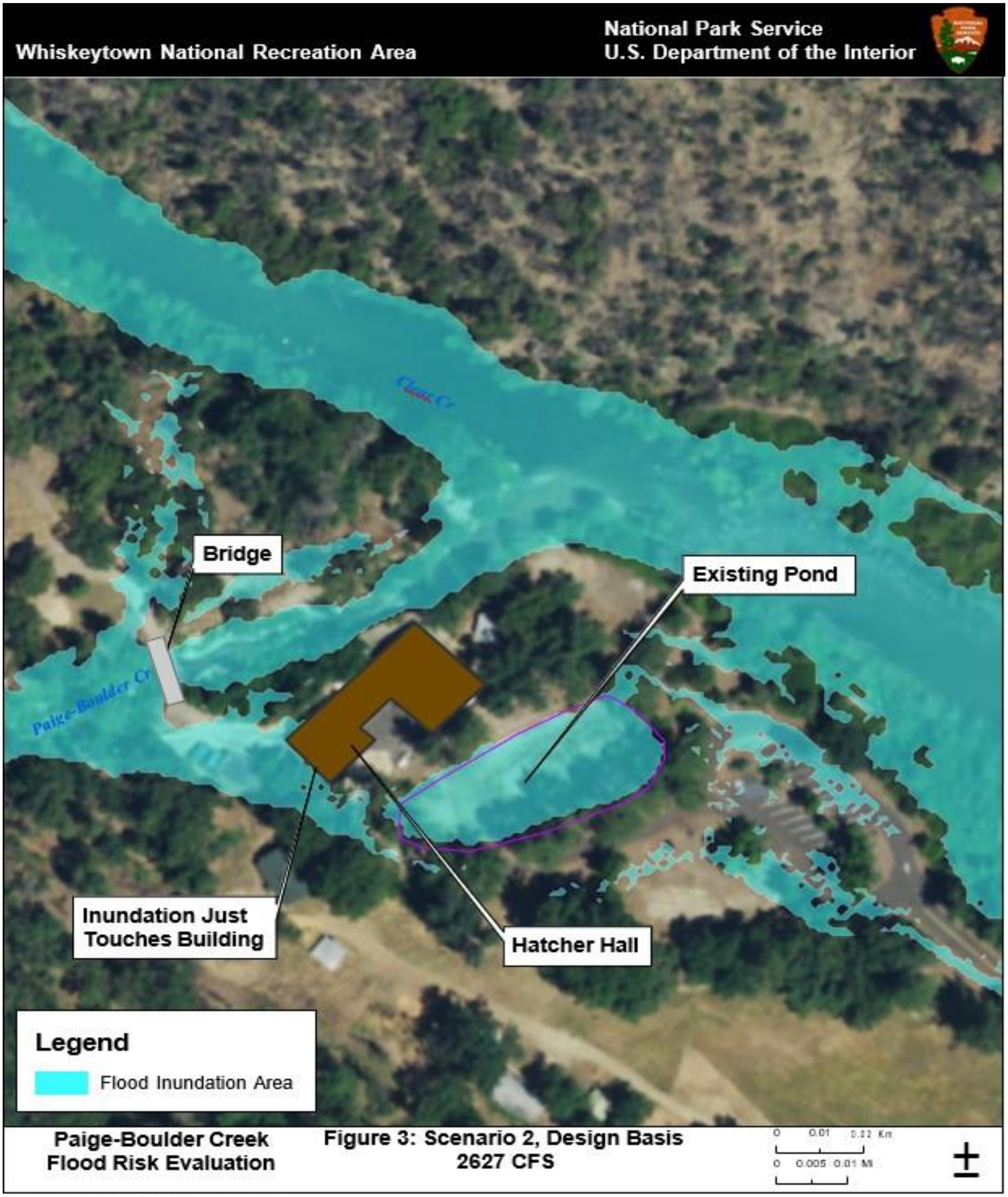

Figure 3: Scenario 2, Design Basis
2627 CFS

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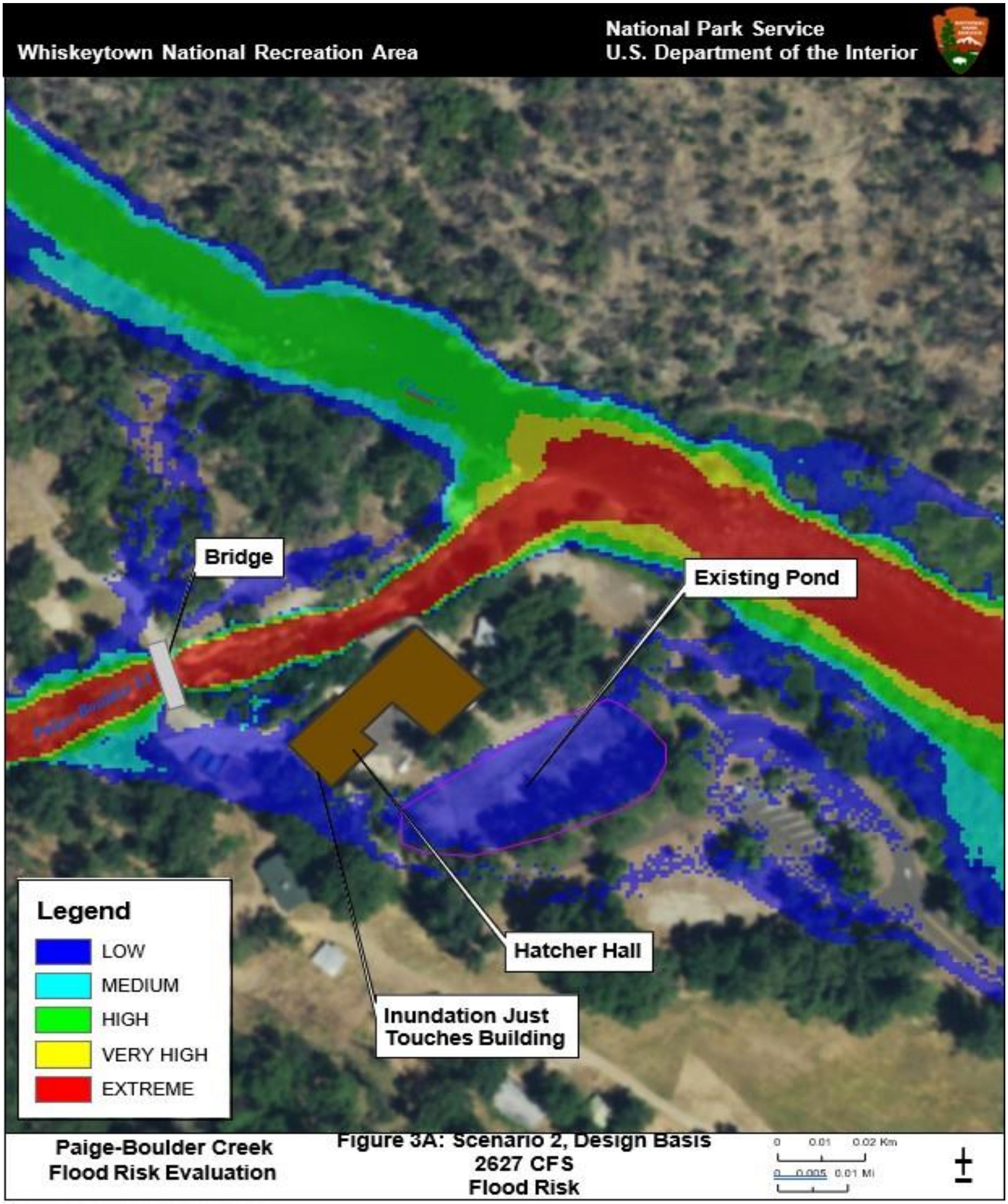

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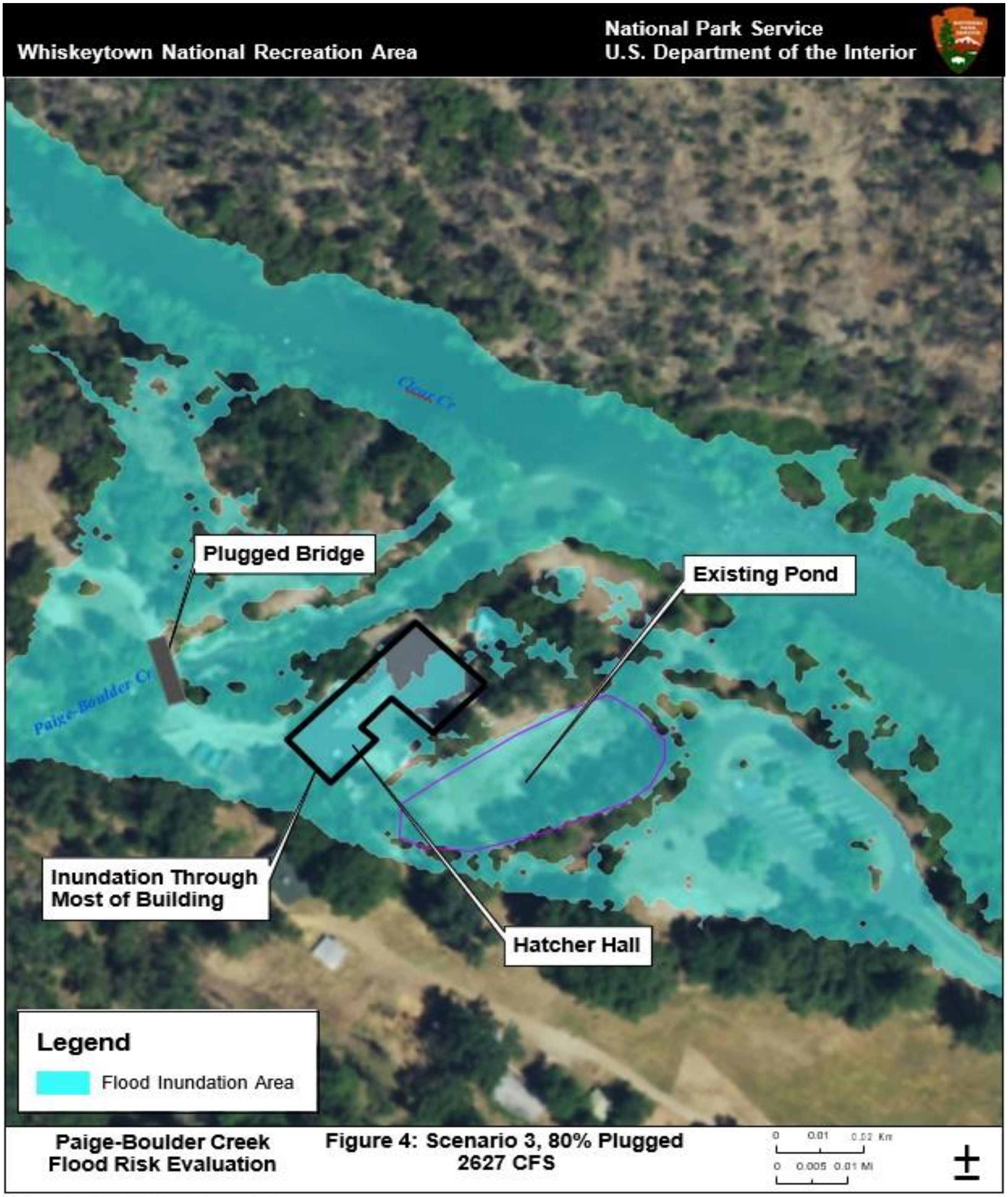

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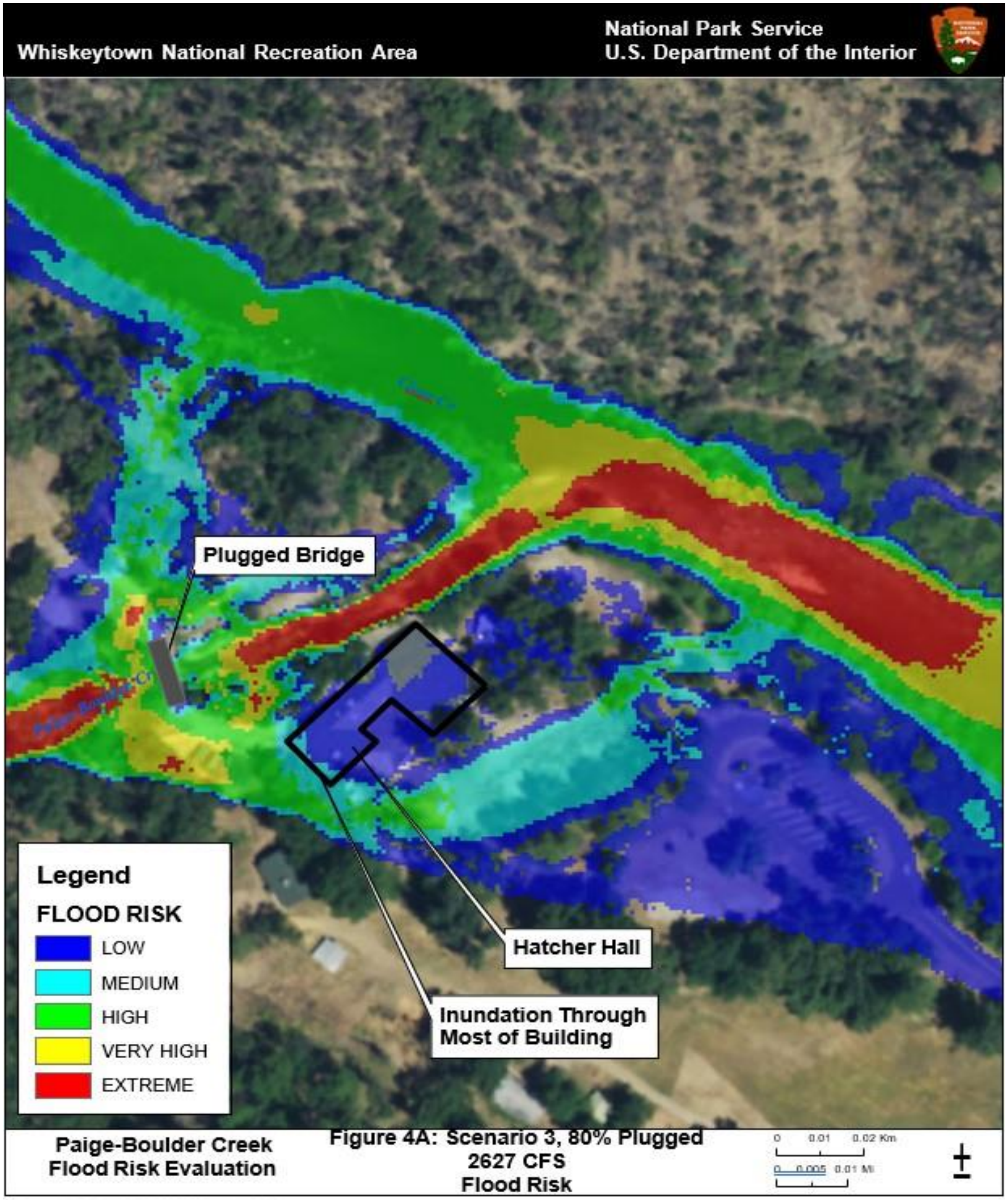

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Figure 5: Scenario 4, Bridge Removed
2627 CFS

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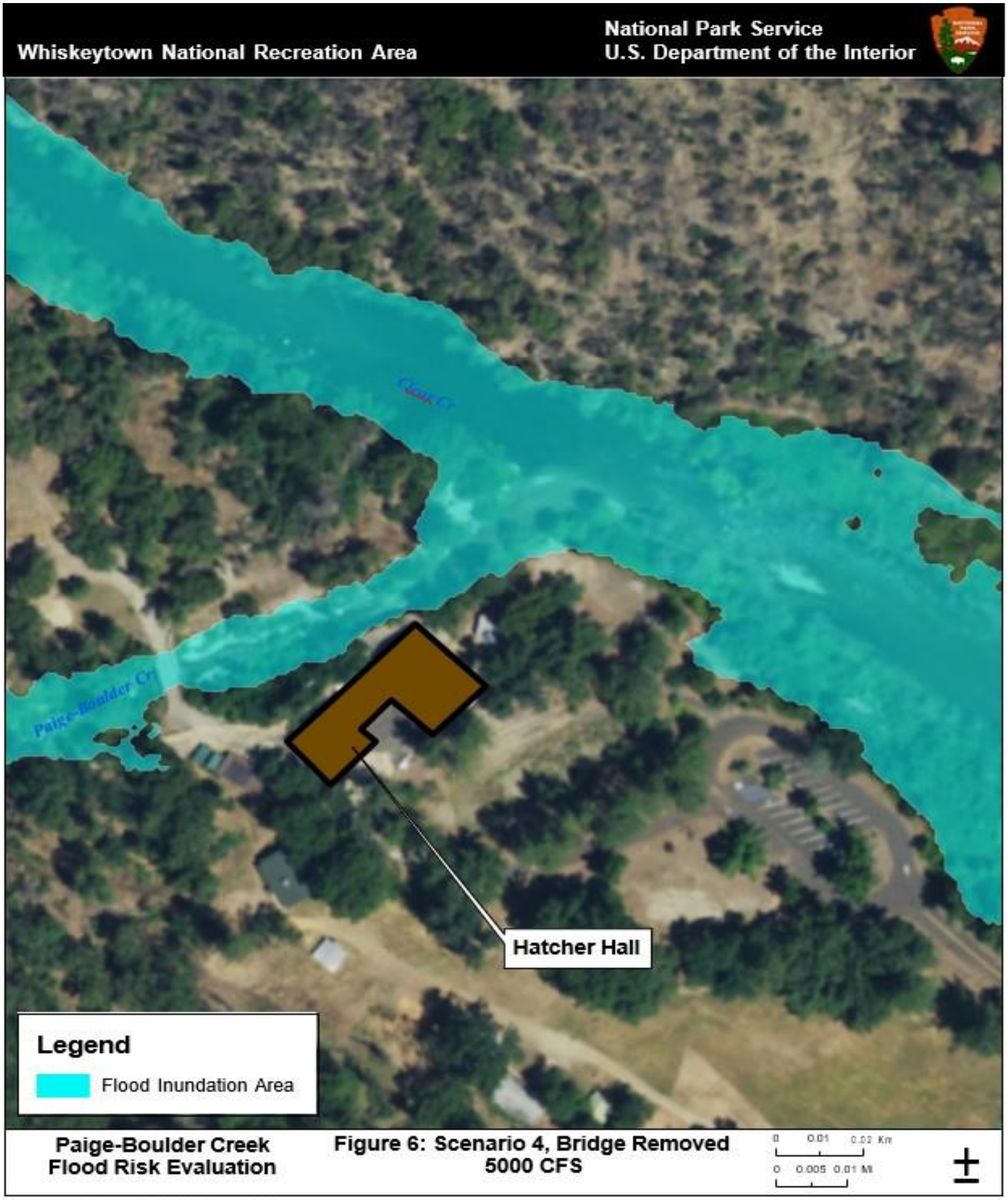

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Appendix F: Floodplain Statement of Findings

Whiskeytown Environmental School Rebuild

Whiskeytown National Recreation Area

Floodplain Statement of Findings

PEPC # 116125

Recommended:

Josh Hoines Superintendent	Date
Superintendent, Whiskeytown National Recreation Area	

Certified for Technical Adequacy and Servicewide Consistency:

Terry Fisk	Date
Acting Chief, Water Resources Division	

Approved:

Randy Lavasseur	Date
Acting Regional Director, NPS Regions 8, 9, 10, 12	

Table of Contents

1 INTRODUCTION

Executive Order (EO) 11988, *Floodplain Management,* requires the National Park Service (NPS) and other federal agencies to evaluate the likely impacts of actions in floodplains. The objective of EO 11988 is to avoid, to the extent possible, the long-term and short-term adverse impacts associated with occupancy, modification, or destruction of floodplains and to avoid indirect support of development and new construction in such areas wherever there is a practicable alternative. The National Park Service administers floodplain policy through Director's Order 77-2: *Floodplain Management* (DO 77-2) and Procedural Manual 77-2 *Floodplain Management* (PM 77-2). The National Park Service also complies with departmental guidance outlined in 520 DM 1, *Floodplain Management and Wetlands Protection Policy and Responsibilities*, and 520 DM 1, *Floodplain Management and Wetlands Protection Program Requirements*.

It is NPS policy to preserve floodplain functions and values and minimize potentially hazardous conditions associated with flooding, including threats to human health and safety, risk to NPS capital investment, and impacts on natural and beneficial floodplain values. If a proposed action is found to be in, or possibly affecting a floodplain, and relocating the action to a non-floodplain site is considered not to be a viable alternative, then a formal Floodplain Statement of Findings (FSOF) must be prepared unless the action is considered excepted. The FSOF must (a) describe the rationale for selection of a floodplain site, (b) disclose the amount of risk associated with the chosen site (with respect to human life, health, and safety, resource protection, and capital investment), and (c) explain strategies for mitigation of flood risk. The FSOF will be available for public review and comment in coordination with the National Environmental Policy Act (NEPA) and other compliance procedures, as applicable. If public review is not provided through the NEPA process (e.g. environmental assessment), another opportunity for public review is required.

This FSOF provides:

A detailed justification for selecting a proposed action that would adversely impact the Federal Flood Risk Management Standard (FFRMS) floodplain (Section 2).

A detailed and comprehensive description of the flood hazard and risk associated with implementation of the proposed action (Section 3).

A thorough description of mitigation measures chosen to eliminate, to the extent possible, adverse floodplain impacts associated with the proposed action(s) (Section 4).

1.1 PREPARER

In accordance with DO 77-2 and PM 77-2, we, John Wooster, Hannah Karlsson, Sarah Aguiar and Daniel Sedgwick, the authors of this FSOF, affirm we are hydrologists and environmental protection specialists and are technically qualified to prepare this document.

1.2 LOCATION

The Whiskeytown Environmental School (WES) Rebuild is located at 10106 Paige Bar Road in Shasta County, California. It is located within the Whiskeytown National Recreation Area (WHIS), in the Southern section of the park (Figure 1).

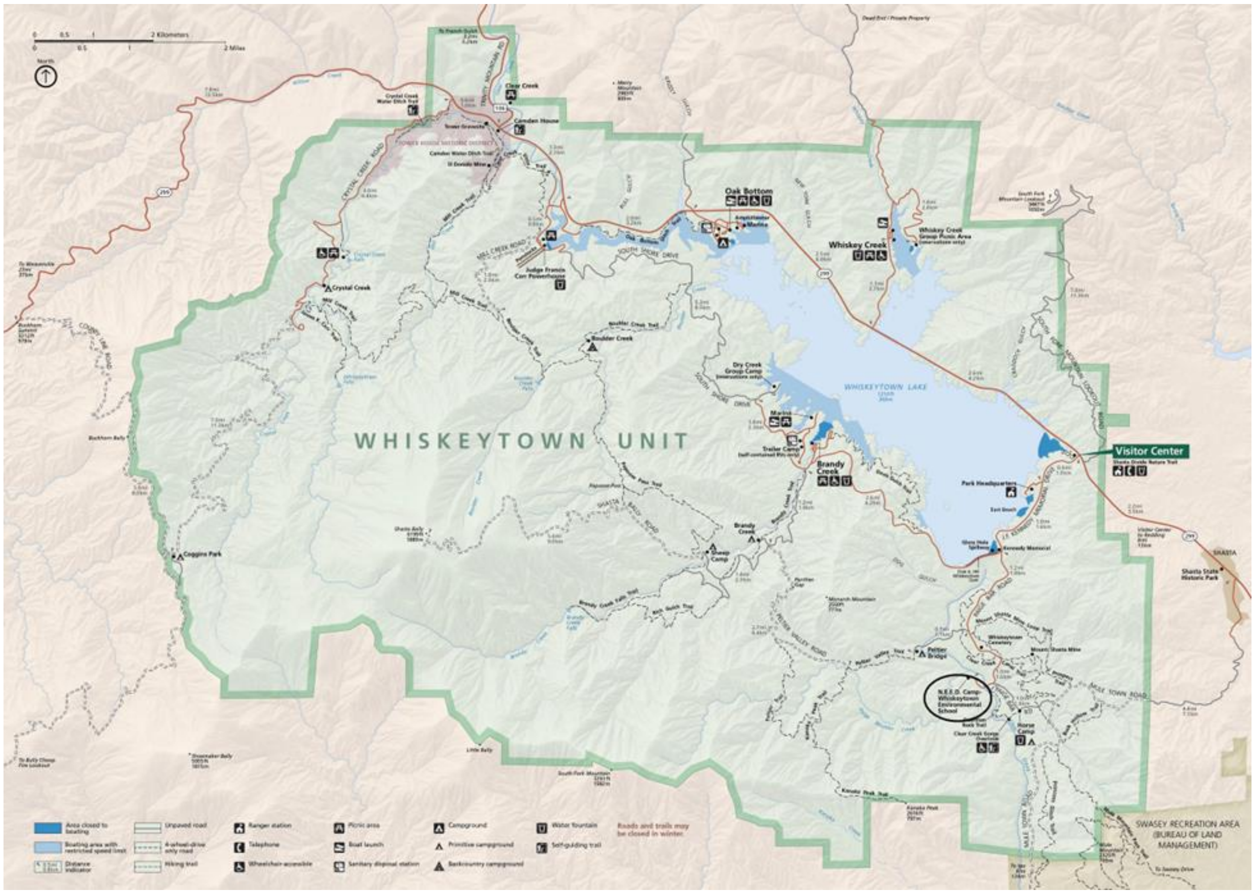

Figure 1. Location of WES at the Whiskeytown National Recreation Area. WES is represented by a hollowed out black circle.

WES is located on a terrace / historic floodplain of Clear Creek immediately downstream of the confluence with tributary Paige-Boulder Creek (PBC). Clear Creek is primarily regulated by Whiskeytown Dam, an earthen dam located approximately 2 miles upstream of WES. Whiskeytown Dam significantly regulates the flow in Clear Creek, with average daily discharge rates varying seasonally, and a typical maximum daily flow rate of 600 cubic feet per second (cfs) (Anderson, 2022). Whiskeytown Dam, completed by the Bureau of Reclamation (BOR) in 1963, alters the timing, frequency, and magnitude of flood flows in Clear Creek through infrequent spill events. Based on an analysis with other nearby stream gages on unregulated streams, Whiskeytown spills and annual Clear Creek high flows coincide about 50% of the time with regional flood flows. The differences are likely attributable to BOR operations at Whiskeytown and the large Central Valley Water Project. Spill events occur through the glory hole spillway and are typically known well in advance by BOR as part of their operations and forecasting for the Central Valley Project (federal water project in California).

The PBC watershed is a 4.8 mi^2 drainage that extensively burned in the 2018 Carr fire. Shortly after the fire, a U.S Forest Service Burned Area Emergency Response team identified an increased risk to the camp, and in particular Hatcher Hall, from flooding and debris flow because of the altered watershed conditions. Anderson (2022) focused on modeling flood and debris flow scenarios for PBC using multiple burn severity and bulking factor adjustments to characterize post-fire impacts to the watershed. However, Gusman et al. (2011) found the burn severity factor typically declines to zero within 7.5 years post-fire; thus, given the timeline for implementation of this project, the PBC hydrology was not adjusted for fire impacts in the modeling presented in the FSOF. Annual high flows on Clear Creek appear to coincide about 50% of the time with nearby Cow Creek (unregulated basin directly to the south); a similar relationship is assumed with PBC and Clear Creek/Whiskeytown spills but unconfirmed due to no available gage data on PBC. For modeling scenarios presented in this FSOF, peak flows in PBC and Clear Creek were assumed to occur simultaneously to provide conservative estimates of flood inundation and backwater extents.

1.3 PROPOSED ACTION

The WES was greatly damaged by the Carr Fire in 2018. The proposed rebuild is needed to restore functionality and capacity to WES. WES is operated by the Shasta County Office of Education (SCOE) in cooperation with the NPS and the non-profit Whiskeytown Environmental School Community (WESC). The school provides environmental education programs for K-8 students in Shasta County and the neighboring counties, and it is a cornerstone of multiple communities, providing a multi-generational impact for Shasta County residents and beyond. Currently, the school is only open for day-use. There are no residential and overnight opportunities due to the damage sustained by the Carr Fire. The purpose for the project is to preserve and restore programs at WES and create a new campus that would serve the community through interpretation, research, and partnerships. Project funding is expected in phases from several funding sources, including Repair/Rehabilitation, Cyclic Maintenance, Centennial Challenge, Federal Lands Recreation Enhancement Act, and external donations.

The need for the project is to restore and rebuild the fire damaged WES campus where structures were lost, others were severely damaged and are not safe for use by the public. There are currently no habitable cabins for overnight use by students. Along with rebuilding the cabins, an overall rehabilitation of the campus would bring other facilities up to code and improve functionality. Under the Action Alternative, the campus would be rebuilt in the same area as the current WES site (Figure 2). The Action Alternative encompasses:

1. Removal of PBC bridge
2. Renovation of Hatcher Hall
3. Construction of double/quad residential cabin buildings
4. Convert existing administration building into field instructor housing
5. Construction of new administrative building, teacher housing, and pavilions
6. Construction of new arbor
7. Expansion of parking
8. Upgrades to utilities
9. Construction of fire access road
10. Renovation of educational pond

11. Regrading roads and outsloping banks on roads and near new buildings
12. Rebuilding an amphitheater in the footprint of the old amphitheater

The final locations of some of the proposed cabins and buildings are still pending, primarily due to additional planning needed related to the sewer lines and leach fields. However, all buildings would be located within the "proposed buildable zone" polygon depicted in Figure 2. This plan could support up to 192 occupants. The project is also needed to bring the facilities up to modern code and standards including updating the dining hall (Hatcher Hall) and commercial kitchen, making facilities universally accessible and ABAAS compliant, expanding parking, regrading land surface contours, upgrading utilities, and removing an old vehicle bridge over PBC (Figures 2, 3, and 4). The old bridge over PBC will be replaced with a modern footbridge as part of a separate project and is not evaluated as part of this FSOF. In addition to the projects associated with the proposed action, the WES Rebuild project seeks to:

- Provide a school facility that is a model of sustainability and ecological sensitivity that protects park resources, encourages responsible interaction with the environment, and exemplifies WES vision and goals.
- Provide a safe and universally accessible place to learn and work by integrating accessibility throughout the project. Implement safety plans to address flooding and enhance structural resilience to wildfire through modern building materials and current building codes, making the site safer and more resilient.

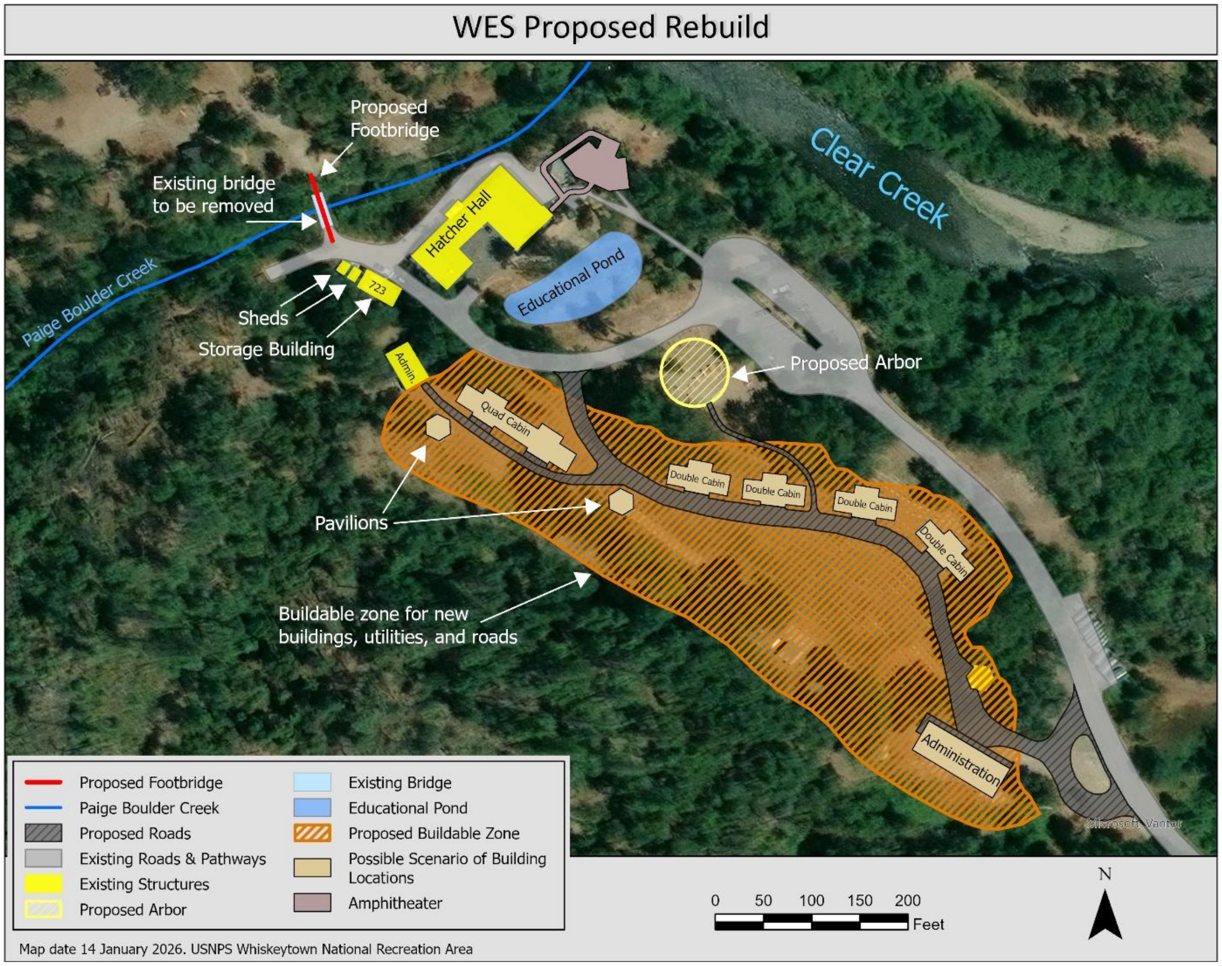

Figure 2. A visual representation of the proposed WES Rebuild, with the existing structures shown in yellow and a possible configuration for most of the new structures shown in tan. Exact locations of buildings, utilities, and roads may vary within the buildable zone shown in hashed orange. The proposed bridge over Paige Boulder Creek is not evaluated as part of this FSOF.

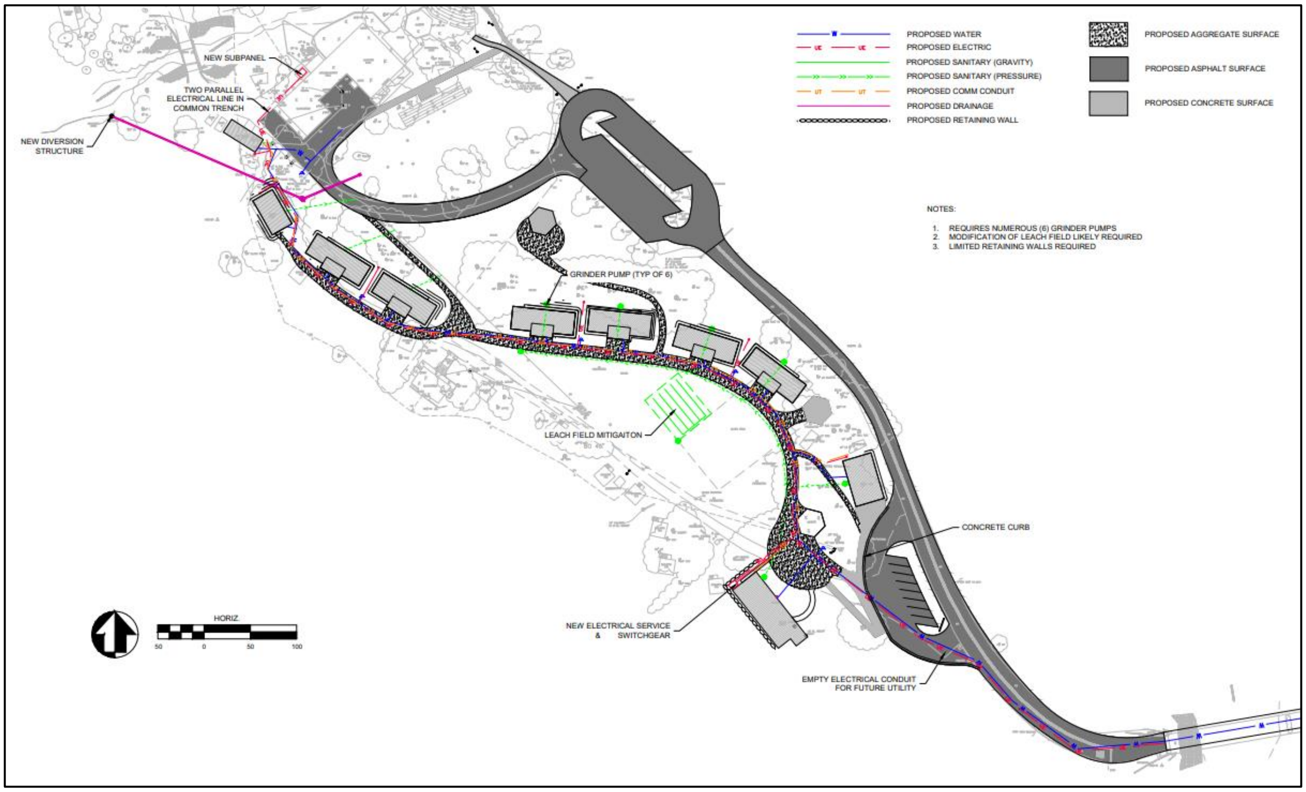

Figure 3. Conceptual schematic of proposed utility and road development site plan for WES.

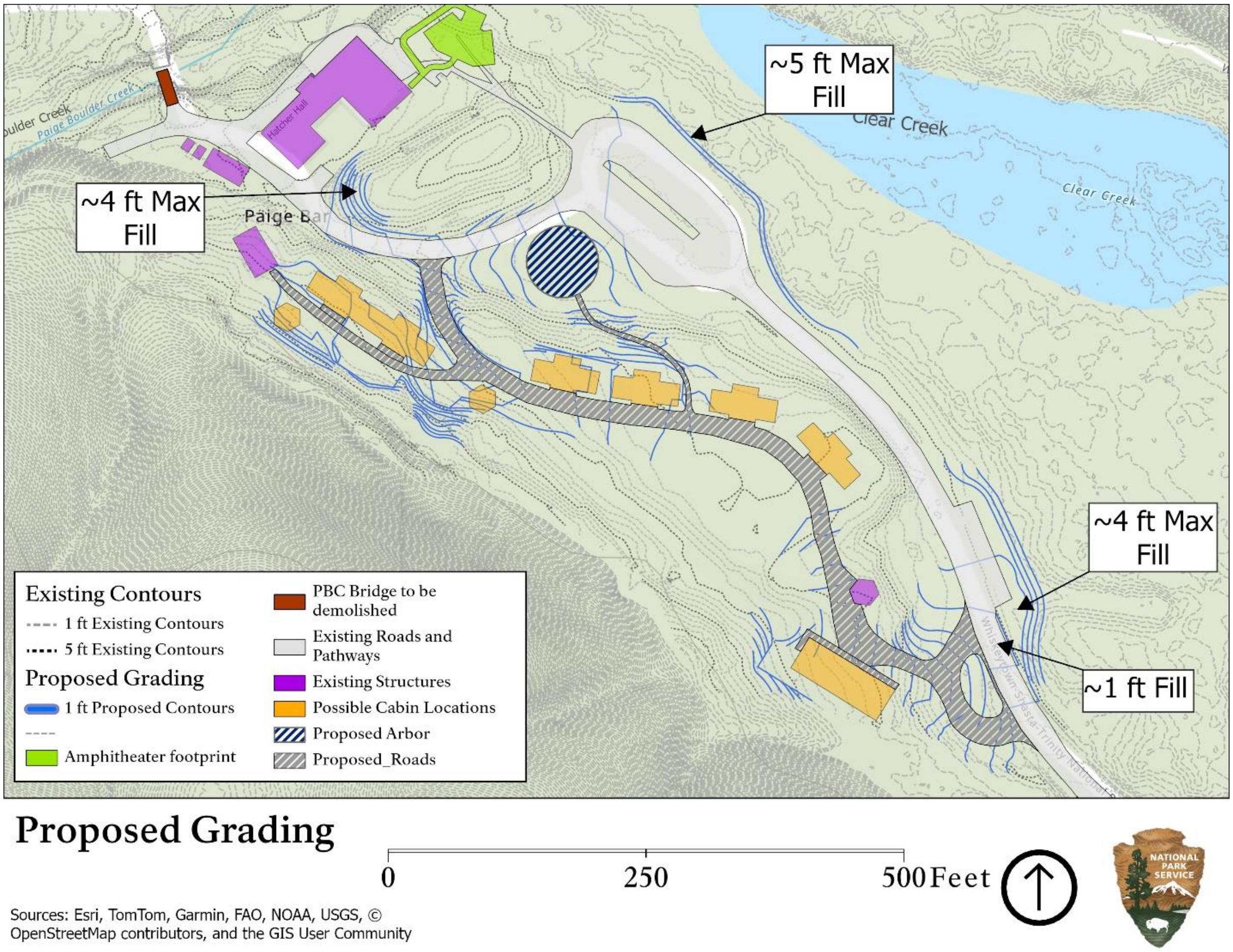

Figure 4. Proposed Contours for regrading roads and outsloping banks on roads and near new buildings.

1.4 DETERMINATION OF ACTION CLASS AND REGULATORY FLOODPLAIN

Following PM 77-2, three action classes were considered when establishing the regulatory floodplain:

1. Class I Actions (i.e., non-critical actions) include location or construction of administrative, residential, warehouse, and maintenance buildings; non-excepted parking lots; or other man-made features, which by their nature entice or require individuals to occupy the site, are prone to flood damage, or result in impacts to natural floodplain values.

Class II Actions (i.e., critical actions) include any activity for which even a slight chance of flooding is too great, such as construction of schools, medical facilities, emergency services, hazardous material storage, and records/collections storage.

Class III Actions include any action that involves human occupation or substantial human exposure in high hazard areas, such as drainages subject to flash flooding.

The majority of proposed project activities, and overall intent of the project meets the definition of a Class II Action, the construction of an environmental school that includes overnight facilities for students and facilitators. However, some project components, including road / bank regrades, pavilions, arbor, parking lots, roads, pond rehabilitation, and bridge removal (non-essential location for emergency egress) would meet the definition of a Class I non-critical action.

Proposed actions that involve federal capital investment must comply with FFRMS for new construction, substantial improvement, or repairing substantial damage. Per departmental guidance, agencies may select one of three approaches to implement flood resiliency measures:

Climate-Informed Science Approach (CISA) – The elevation and flood hazard area that result from using the best-available, actionable hydrologic and hydraulic data and methods that integrate current and future changes in flooding, including climate change and other physical processes (e.g. land-use change).

Freeboard Value Approach (FVA) – The elevation and flood hazard area that result from adding an additional 2 feet to the base flood elevation (BFE) for non-critical actions and by adding an additional 3 feet to the BFE for critical actions.

0.2% Annual-Chance Flood Approach (0.2PFA) – The area subject to flooding by the 0.2% (500-year) annual-chance flood.

A 0.2% Annual Chance Flood Approach establishing FFRMS flood elevations is employed for this proposed action. Therefore, the regulatory floodplain for the proposed action is the 0.2% annual chance (500-year) flood elevation, or approximately 927.7 feet.

The hydraulic model and flood inundation map were developed by refining a previously established U.S. Army Corps of Engineers Hydraulic Engineering Center River Analysis System (HEC-RAS) Version 6.6 two-dimensional (2D) model. Anderson (2022) developed the initial model used for the Flood Risk Evaluation Report focused on flood hazard analysis at WES, specifically evaluating flood risk from PBC, a tributary of Clear Creek. NPS' Water Resources Division (WRD) adapted the hydraulic model developed for the Flood Risk Evaluation Report (Anderson, 2022) to determine the 100- and 500-year flood inundation areas at the Project site. Specific model parameters, methods, and results for the updated model are detailed in Karlsson and Wooster (2025): available as an addendum to this FSOF, as well as an addendum to the Anderson (2022) report.

A key component of the proposed project is the removal of PBC bridge. To assess the flood hazard improvements resulting from the bridge removal, the 100- and 500-year flood events were modeled for both pre- and post-project conditions—both with and without the PBC bridge.

A summary of the floodplain compliance condition for each of the 12 project elements (Section 1.3) is provided in Table 1. In general, the elements of WES within the FFRMS floodplain include: proposed amphitheater, portions of the access roads and parking spaces, the proposed arbor, and the pond. The majority of WES and its primary structures are outside the regulatory floodplain, including the entire potential "buildable area" polygon (Figures 5 and 6).

The portion of the "buildable area" polygon proximal to Clear Creek and flood inundation limit was delineated using hydraulic model results and followed contours such that the polygon is about 2 feet higher (freeboard) than the 500-year flood stage.

Table 1. Floodplain Compliance Condition for Elements of Proposed Action.

Proposed Action*	Regulatory Status
1 - Removal of Paige Boulder Creek bridge	PM 77-2 **not applicable:** no new flood risk
2 - Renovation of Hatcher Hall	
4 - Convert existing administration building into field instructor housing	
10 - Renovation of educational pond	
8 - Upgrades to utilities	**Excepted** under PM 77-2
3 - Construction of double/quad residential cabin buildings	**Outside regulatory floodplain**: no compliance required
5 - Construction of new administrative building, teacher housing, and pavilions	
6 - Construction of new arbor (Figure 2)	**Inside regulatory floodplain**: floodplain compliance required
7 - Expansion of parking	
9 - Construction of fire road – stubs/connectors in regulatory floodplain (Figure 5)	
11 - Regrading roads and outsloping banks on roads and near new buildings (Figure 4)	
12 - Construction of new amphitheater (Figure 2)	

*Items numbered as shown in Section 1.3

Proposed action elements listed in Table 1 as not applicable, excepted, or outside the regulatory floodplain are not required to be discussed further in this document; however, in cases where implementation of an element may change (reduce) flood risk, discussion is included (e.g., Removal of Page Boulder Creek bridge).

2 JUSTIFICATION FOR USE OF THE FLOODPLAIN

2.1 INVESTIGATION OF ALTERNATIVE SITES

Following significant impacts from the 2018 Carr Fire, SCOE investigated 32 potential sites within Shasta County and beyond for rebuilding the school, including alternate, non-floodplain sites. The 32 sites included state and national parks, existing retreat centers, decommissioned schools, retired and current camps, retired and current campgrounds, and many locations on public land.

The following criteria were used to select possible locations:

- Distance from Redding. Redding-district schools are accustomed to traveling no more than 90 minutes, though students come from all over
- Emergency service availability. Fast access to emergency services is critical.
- Access. Paved access to support bus transit.
- Potential for snow in the winter. According to SCOE, there were other sites that may have been acceptable, but were located along transportation corridors that close frequently due to snow.
- Elevation. Sites at elevations with moderate temperatures during the school year were preferred.
- Size (acres). 10+ miles of hiking trails permit six trail groups of 20 kids to spread out.
- Power and water access. Existing power and water systems was also of high importance, as the cost of developing new utilities would be too great.
- Cost and ownership. Support from NPS for maintenance keeps costs low.
- Water access. Proximity to water was of great concern, as access to streams/ponds/lakes is a cornerstone of the educational programs and is extremely valuable for students' experience.

2.2 JUSTIFICATION FOR FLOODPLAIN LOCATION

Based on the factors listed above, the existing WES site was identified as the ideal location for rebuilding the school, despite its location within and adjacent to a floodplain. These factors highlight the distinctive location, diverse mix of habitats, and rich history of the WES site creating an overall unique experience for students, teachers, researchers, and visitors. The NPS also evaluated other sites within WHIS and found that there is no other comparable site within the park that could serve as a residential outdoor education campus. Therefore, no practicable non-floodplain sites for the WES campus were identified.

3 DETAILED FLOOD HAZARD AND FLOOD RISK ANALYSIS

3.1 DESCRIPTION OF SITE-SPECIFIC FLOOD HAZARD

Clear Creek is primarily regulated by Whiskeytown Dam, which was constructed by the Bureau of Reclamation between 1960 and 1963. The nearest historic gage to the project site was USGS Gage 11372000, located on Clear Creek near Igo, CA. This gage collected discharge and peak streamflow records for 84 years from 1941 thru 2024. The gage is located approximately five river miles downstream from the Project site. The project site on Clear Creek is approximately two miles downstream of Whiskeytown Dam. Data from the regulated flow record (1963 to 2024) was used to calculate the 100- and 500-year return periods flows, employing the Log Pearson III distribution.

The highest recorded instantaneous peak flow at this gage, post-dam construction, occurred on March 3, 1983, with a flow of 18,400 cfs. The 100- and 500-year flows calculated at this site were 18,100 and 26,600 cfs, respectively. Tributary contributions between the project site and the gage location are small and often do not sync with the primary floods released from Whiskeytown Dam. Therefore, the peak flows recorded at the gage are considered a conservative representation of the potential flood flows at the project site. Peak flow statistics for the PBC tributary were estimated using the USGS StreamStats tool, which applies regional regression estimate methods (Gotvald et al., 2012) to provide streamflow estimates at ungaged sites in California. The 100- and 500-year flood flows for Clear Creek and PBC are summarized in Table 2. The maximum design discharge at Whiskeytown Dam is 28,650 cfs (BOR 2008), which is slightly more than the estimated 500-year flood flow in Clear Creek.

Table 2. Flood Flow Magnitudes used for FSOF and Hydraulic Modeling.

Annual Exceedance Probability	Return Periods (years)	Clear Creek at Project Site (cfs)	Paige-Boulder Creek at Project Site (cfs)
1.0%	100	18,100	1,990
0.2%	500	26,600	2,570

Modeled inundation extents for the 100 and 500-year flood flows are presented below in Figure 5 with PBC bridge in place and in Figure 6 with PBC bridge removed. Flow depths for the Regulatory Flood (500-year flow) with PBC bridge removed are shown in Figure 7 and Table 3 along with Regulatory Flood velocity. Additional model results including 100-year flow depths (with and without PBC bridge), 100-year flow velocities (with and without PBC bridge), and 500-year flow velocities (with and without PBC bridge) are available in the addendum to this FSOF.

As described in Table 1, modeling results indicate that the majority of the new proposed buildings are outside of the NPS regulatory floodplain (i.e., 500-year flood extent), including all the double cabins, the quad cabin, and the new administrative building. The two exceptions would be the proposed arbor near the primary parking lot and the proposed amphitheater rebuild. Hatcher Hall, an existing building proposed for renovation, is outside the 500-year inundation extent; but the scenario with PBC bridge in place shows flow immediately along the building's footprint (Figure 5). By removing the PBC bridge, the inundation in the immediate vicinity of Hatcher Hall is largely eliminated (Figure 6). Similarly, existing building 723 and two nearby sheds are inundated at the 500-year flow with PBC bridge in place but are not inundated when the PBC bridge is removed. The proposed new footbridge (to be constructed as part of a future project) is intended to have a soffit above the 500-year flood stage and should influence PBC hydraulics similar to the "without bridge" scenarios modeled in the addendum and shown in Figures 6 and 7.

The existing road and primary parking area are mostly inundated at a 100 and 500-year flow level, with the exception being a stretch of road near the southern end that connects to the bridge over Clear Creek. The Fire Road, located behind (upslope) the new cabins and buildings, is not inundated, and should provide egress from Hatcher Hall and the cabins to the Clear Creek bridge during extreme flood flows.

Flow depths along the inundated portion of the existing road at a 500-year flow are generally over 3 ft and peak at 5 ft. Flood flow velocities along one stretch of the existing road appear to be anomalously high (> 12 ft/s, Attachment A). Interpreting model output with the existing topography indicates that flow entering the WES pond and primary parking area subsequently flows out of this area in a concentrated manner along the existing road with elevated depths and velocities; regrading to slopes required for accessibility and fire apparatus, widening and paving this area with proper outsloping should allow the flow to mix with the other overbank flow from Clear Creek and approach depths and velocities similar to the adjacent overbank areas (Figure 4 and Addendum). A summary of modeled water depths and velocities anticipated for the Proposed Action elements within the Regulatory Floodplain is provided in Table 3.

Table 3. Anticipated Water Depth and Velocity at the Regulatory Flood for the Proposed Action

Proposed Action Element*	Modeled Water Depth (feet)	Modeled Water Velocity (ft/s)
6 - Construction of new arbor	Up to 5	< 1
7 - Expansion of parking	Up to 5	Up to 5
9 - Construction of fire road – stubs / connectors in regulatory floodplain	Up to 5	Up to 5
11 - Regrading roads and outsloping banks on roads and near new buildings	Up to 10	Up to 5
12 - Construction of new amphitheater	Up to 4	Up to 3

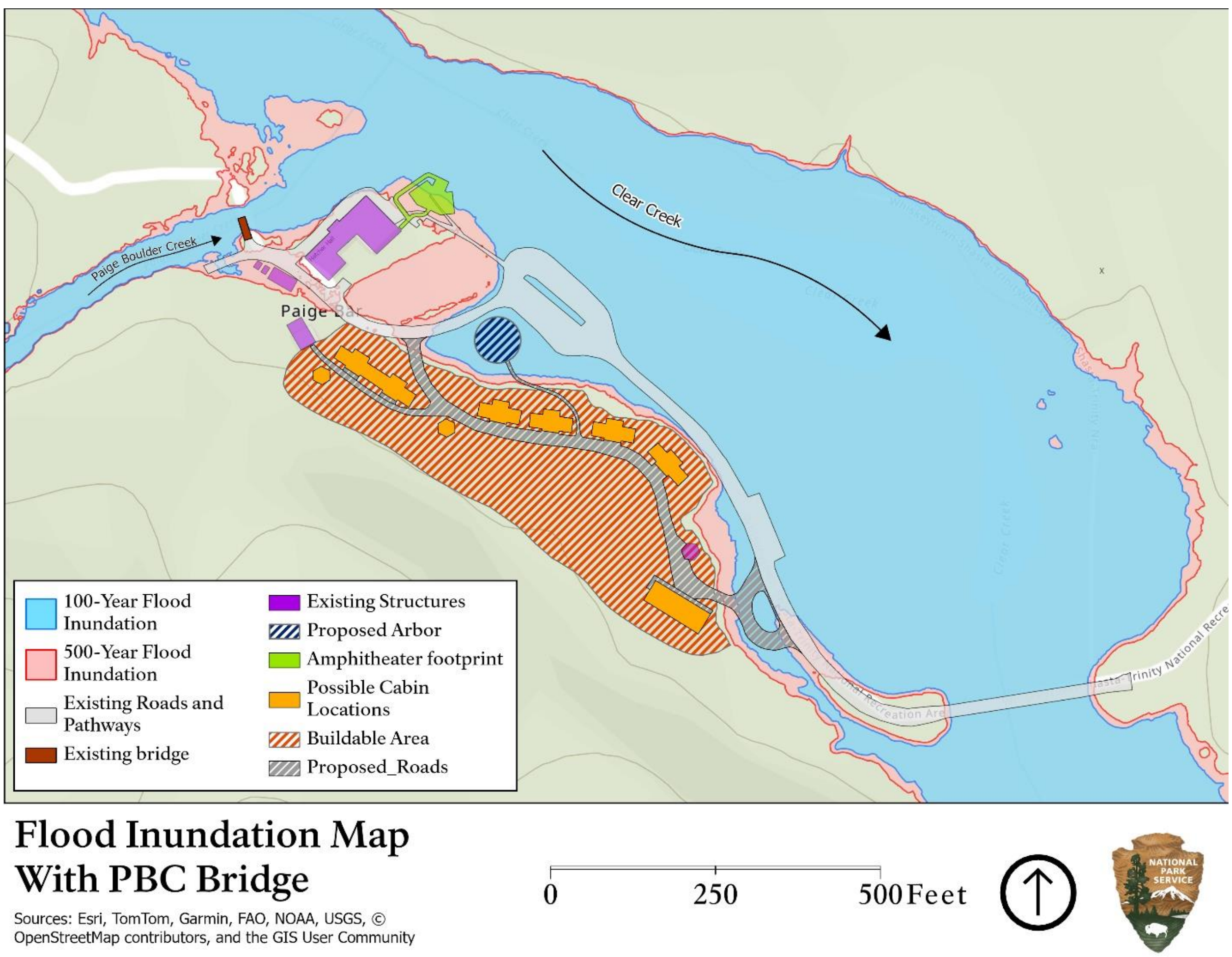

Figure 5. 100- and 500-Year Flood Inundation Areas with PBC Bridge in Place.

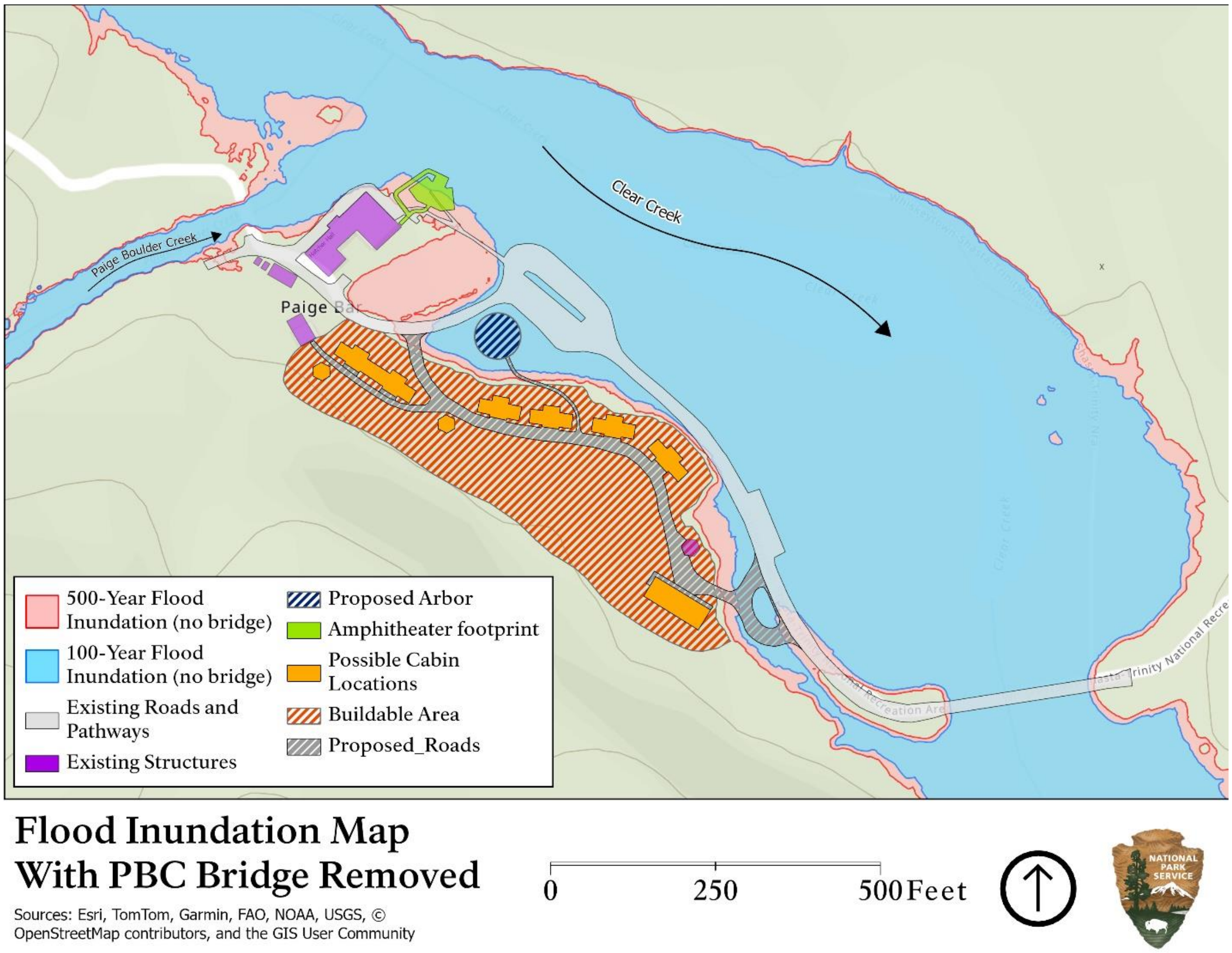

Figure 6. 100- and 500-Year Flood Inundation Areas with PBC Bridge Removed.

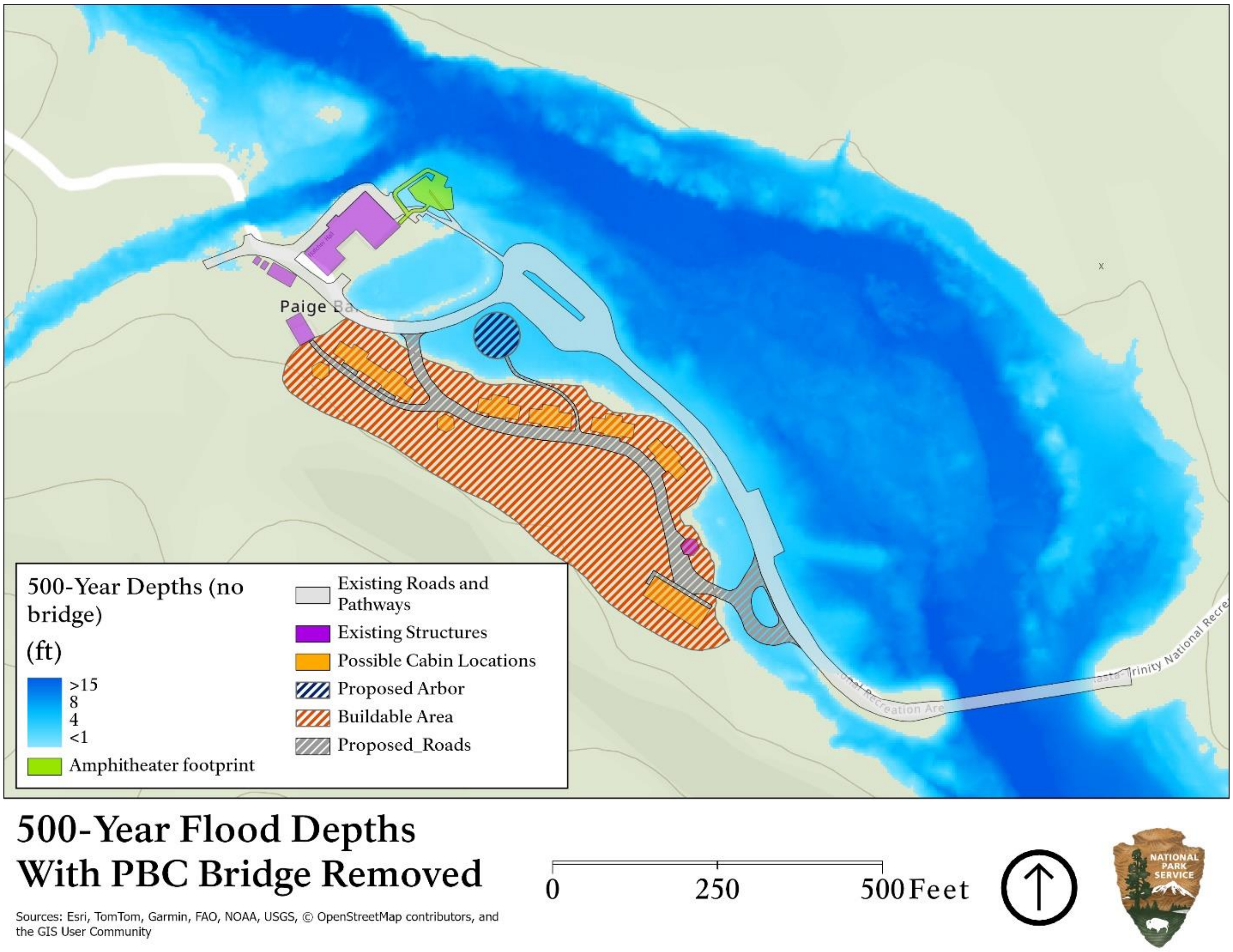

Figure 7. 500-Year Flow Depths with PBC Bridge Removed.

3.2 DESCRIPTION OF SITE-SPECIFIC FLOOD RISK

The majority of the WES footprint is outside the 500-year inundation extent and thus the impact to floodplain, geomorphic, and hydrologic processes is generally considered minimal. The preponderance of proposed, new construction is outside the 500-year footprint and would not impact physical processes beyond the existing, baseline conditions. At extreme flows the existing road and parking lot have the potential to capture and channelize flow into a narrower flowpath, which could potentially exacerbate erosion along the road and nearby banks. Flow depths and velocities along the road are expected to decrease relative to model results after the proposed regrade and widening of the road and outslope banks (Figure 4). The existing and new proposed roads are being widened/constructed to a minimum of 20-feet to accommodate fire apparatus, and the regrade will meet slope requirements for accessibility and fire. Proposed regrade contours were not incorporated into the hydraulic model and a quantitative assessment of changes in flow depth and velocity post-regrade is not available. However, road improvements are expected to decrease flow concentration along the road as illustrated in model output and allow for increased mixing with other Clear Creek overbank flood areas. This should lead to decreased flow depths and velocities along the road and have minimal change to hydraulics within Clear Creek and adjacent overbank areas.

The risk to property, infrastructure, and buildings is minimal as the majority are outside the 500-year floodplain, particularly with the removal of the PBC bridge and reducing overbank flow near building 723 and Hatcher Hall. There may be risk to Hatcher Hall from stream bank erosion along PBC. Bank armor and stream bank stabilization are currently being evaluated as an option for additional protection.

The infrastructure most at risk during an extreme flood are the existing road, proposed amphitheater and proposed arbor – class I actions. Regrading the road and outsloping the banks should help minimize flood damage, but it is reasonable to expect some erosion and damage to the existing road at a 500-year flow event. The arbor is expected to withstand mild flood pressure due to its open-air construction without walls or other building elements readily damaged by water. Furthermore, the arbor would be a relatively low-cost element to repair or replace if damaged in a large flood. The pond, which is proposed for some renovation and recontour (including steeping the bank and increasing the overflow elevation near the west edge towards the buildings), is predicted to connect to flood flows in Clear Creek at a 500-year event (but not at a 100-year flow). Depths and velocities of flows connecting to the pond are low, and potential impacts to the pond other than egress of aquatic organisms and nutrients with Clear Creek are deemed minimal.

The proposed amphitheater and approach paths are in the footprint of an old concrete amphitheater that was significantly deteriorated and demolished in 2024. This footprint is located entirely in the 500-year floodplain and partially in the 100-year floodplain (Figures 5 and 6). A suitable alternative location for the amphitheater is not available on the WES grounds. The entire amphitheater structure and pathways are proposed to be constructed with concrete, with metal railings along the paths and stairs. The concrete structure is expected to largely withstand the predicted flow depths (<1 to 4 ft) and velocities (<1 to 3 ft/s) of a 500-year flow event and present minimal risk of requiring repair beyond cleaning up debris and sediment deposited from flood flows. The proposed amphitheater more or less follows grade of the terrace bank extending from Clear Creek, thus it does not protrude excessively above ground as the higher elevation seats move further up the bank. The existence of a concrete structure within the floodplain would impose a similar geomorphic impact to the river bank as hardening or armoring with rock, at a bank elevation between the 100-year and 500-year inundation stages. The proposed amphitheater has shape similar to a trapezoid like footprint, increasing in width with distance away from the river channel and stage. At its narrowest point and closest proximity to the river channel, the proposed amphitheater would armor about 40 feet of bankline and at its widest point (furthest away from the channel) about 100 feet of bank would be hardened. The impacts of this bank hardening are expected to influence localized scour and erosion in the immediate vicinity of the amphitheater, but are not expected to influence rates of migration or scour along the broader 1,400 ft long meander bend on clear Creek that forms the terrace and floodplain where WES is located.

Primary buildings serving WES, including Hatcher Hall, kitchen facilities, sleeping cabins, and administration buildings are outside both the 100 and 500-year floodplains. Thus, the immediate human health and safety risk is minimal. Since the majority of structures at WES are above the 500-year flood level, people would generally not be forced to evacuate during a flood; although, they likely would have evacuated long before Whiskeytown Dam spilled due to early warnings whenever a spill event does occur. The primary egress into and out of WES is the bridge over Clear Creek which is above the 500-year flow. Vehicles would primarily maintain access to this bridge via the new proposed road southwest of the new cabins. Vehicles would have to cross one stretch of inundated road near the south end of WES. Regrading of the road in this area will decrease flood depths and potentially eliminate some inundated areas. Using the existing topography flow depths at a 100-year flow are about 1 foot or less and velocities less than 0.5 ft/s. However, at a 500-year flow with existing topography, flow depths are 3 to 4 feet and peak velocities approach 6 ft/s. Under this scenario, vehicles would likely not cross, and people would need to walk around the inundated portion of the road and cross the Clear Creek bridge on foot.

A flood risk analysis associated with Whiskeytown Dam failure was not performed as part of this FSOF. However, BOR assessed the failure modes, including static, seismic, and hydrologic and their exceedance probability in a 2006 Whiskeytown Dam Issue Evaluation Study. The failure modes, exceedance probabilities, and return intervals are summarized in Table 4, as cited in BOR 2008. The potential hydrologic failure modes are overtopping and breach of the dam or dike during a large flood event, which causes the dam or dike to overtop and piping of the embankment due to the higher reservoir water surface elevation. The dam is overtopped during a Probable Maximum Flood and is expected to lead to breach and dam failure (BOR, 2008).

Table 4. Summary of expected Whiskeytown Dam failure risks from 2006 Issue Evaluation Study (as cited in BOR 2008).

Failure Mode	Expected Annual Probability of Failure	Return Interval (yrs)
Static	0.0000018	555,556
Seismic	0.0000002	5,000,000
Hydrologic	0.00012	8,333

4 FLOODPLAIN IMPACT MITIGATION MEASURES

Selected proposed activities within the 500-year floodplain should positively impact physical processes, including: 1) removing the PBC bridge; 2) constructing a new footbridge with abutments outside the PBC bankfull channel and a bridge soffit that is above the 500-year water elevation; and 3) regrading the existing road and outsloping the road bank so that flow concentration is reduced. Removing the PBC bridge and its abutments that are currently within the channel would reduce the potential for debris flow plugging, decrease the scouring within PBC, and in general improve geomorphic processes within PBC.

Extreme flood flows on Clear Creek can occur when Whiskeytown Dam spills through the glory hole. These events are generally known by the BOR well in advance and should provide significant advance warning to evacuate WES anytime a spill is going to occur. Primary WES buildings (i.e., sleeping quarters, gathering halls, administrative buildings) are located above the 500-year flood level, and substantial ground exists at higher elevations to further retreat beyond 500-year flood levels should that be necessary.

5 SUMMARY

The National Park Service has determined that implementing the proposed action at WES does not significantly impact floodplain processes and there is minimal risk to infrastructure or human health and safety. Implementing the proposed action to rebuild the WES campus, including rebuilding cabins and an amphitheater, renovating Hatcher Hall, and other campus improvements is needed to continue one of the longest running outdoor education programs in the National Park System. This outdoor education program is of high importance to multiple organizations, such as NPS, SCOE, and WESC. An Environmental Assessment is in process to ensure that all actions associated with this project are in compliance with federal laws and DOI and NPS policies.

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Addendum to Flood Risk Evaluation

Whiskeytown Environmental School Rebuild

Prepared for: Whiskeytown National Recreation Area

Prepared by: Hannah Karlsson – Hydrologist

& John Wooster – Hydrologist/Geomorphologist

Water Resources Division (WRD)

National Park Service – Natural Resource Stewardship and Science

September 30, 2025

INTRODUCTION

This report serves as an addendum to the Flood Risk Evaluation Report (Anderson, 2022) to inform the Floodplain Statement of Finding (FSOF) for the Whiskeytown Environmental School (WES) Rebuild project (Project). The Water Resources Division (WDR) adapted the hydraulic model developed for the Flood Risk Evaluation Report (Anderson, 2022) to determine the 100- and 500-year flood inundation areas at the Project site.

HYDROLOGY

The model used for the Flood Risk Evaluation Report (Anderson, 2022) focused on flood hazard analysis at WES, specifically evaluating flood risk from Paige-Boulder Creek (PBC), a tributary of Clear Creek. Peak flow statistics for the PBC tributary were estimated using the USGS StreamStats tool, which applies regional regression estimate methods (Gotvald et al., 2012) to provide streamflow estimates at ungagged sites in California.

In 2018, the PBC watershed was significantly impacted by the Carr fire. Anderson (2022) assessed various scenarios for the flood flows at PBC, incorporating post-fire burn severity and bulking factors. Given that approximately seven years have passed since the fire, the burn severity and bulking effects have diminished. According to the "Sediment/Debris Bulking Factor and Post-Fire Hydrology" paper (Gusman, 2011), the burn severity factor typically declines to zero within 7.5 years. Therefore, the updated model for the 100- and 500-year flood events does not apply a burn severity or bulking factor. However, it is important to note that the Flood Risk Evaluation Report acknowledges the Project area is susceptible to frequent wildfires, and the bulking factor flows can be referenced in the *Flood Risk Evaluation* Report (Anderson, 2022) if needed.

Clear Creek is primarily regulated by Whiskeytown Dam. As such, the flows on the mainstem of Clear Creek were assumed to remain at the upper end of the average daily flow rate for all scenarios in the prior hydraulic model. To assess floodplain inundation along Clear Creek, the model's hydrology was updated to reflect the 100- and 500-year return period flows for both PBC and Clear Creek.

The nearest historic gage to the project site was USGS Gage 11372000, located on Clear Creek near Igo, CA. This gage collected discharge and peak streamflow records for 84 years from 1941 through 2024. The gage is located approximately five river miles downstream from the Project site. The project site on Clear Creek is approximately two miles downstream of Whiskeytown Dam. The dam, constructed by the Bureau of Reclamation between 1960 and 1963, regulates stream flow in the area. Data from the regulated flow record (1963 to 2024) was used to calculate the 100- and 500-year return periods flows, employing the Log Pearson III distribution.

The highest recorded instantaneous peak flow at this gage, post-dam construction, occurred on March 3, 1983, with a flow of 18,400 cubic feet per second (cfs). The 100- and 500-year flows calculated at this site were 18,100 and 26,600 cfs, respectively. Tributary contributions between the project site and the gage location are small and often do not sync with the primary floods released from Whiskeytown Dam. Therefore, the peak flows recorded at the gage are considered representative of the potential flood flows at the project site. The 100- and 500-year flood flows for Clear Creek and PBC are summarized in Table .

TABLE 2. FLOOD FLOWS

Probability (AEP)	Return Periods (years)	Clear Creek at Project Site (cfs)	Paige-Boulder Creek at Project Site (cfs)
1.0%	100	18,100	1,990
0.2%	500	26,600	2,570

HYDRAULICS

MODEL DEVELOPMENT

The hydraulic model and flood inundation map were developed by refining the previously established U.S. Army Corps of Engineers Hydraulic Engineering Center River Analysis System (HEC-RAS) Version 6.6 two-dimensional (2D) model, initially created by Anderson (2022).

Topographic Data

The Flood Risk Evaluation model (Anderson, 2022) terrain data was used in the updated hydraulic analysis for the project area. The terrain data was obtained from a 2019 Lidar from the USGS data source. The DEM used is a 0.5 meter (~1.64 ft) resolution LiDAR data set. The data was collected by flights between 10/07/19 and 08/15/20. Therefore, low flows in the river cannot be assumed for this dataset. Topobathy data was not available for this project location.

Model Refinement

The model upstream boundary condition on Clear Creek was extended approximately 500 feet to improve the representation of the flood inundation and flow patterns upstream of WES and the PBC confluence. Additionally, the downstream boundary condition was extended approximately 700 feet, which ensured that the roadway bridge crossing southeast of WES did not influence the hydraulic calculations at the boundary. The bridge deck and pier on Clear Creek was incorporated into the model, using Lidar return point from the bridge deck, with an assumed deck depth of 6.67 feet and a pier width of 6.25 feet based on information from the Bridge inspection reports (FHWA, 2011). Further model refinement included adding more breaklines to capture shallow overbank flows, and the 2D flow area was expanded to encompass the full extent of the 500-year flood inundation.

Roughness Coefficients

The roughness coefficient along the channel was assigned a manning's n values of 0.035 and the overbank area was modeled with a manning's n value of 0.08. The roughness coefficient for the existing and proposed roadway and parking area surrounding the WES site was assigned a Manning's n value of 0.016 (Chow, 1959).

Boundary Conditions

The 100- and 500-year flood discharges, as presented in Table , were applied as the upstream boundary conditions. A normal depth boundary condition was used for the downstream boundary condition of the 2D flow area, with normal depth calculated from measured channel slope derived from the Digital Elevation Model (DEM) along the downstream boundary condition.

HYDRAULIC RESULTS

The objective of the hydraulic model was to evaluate potential flood impacts for the 100- and 500-year flood events at the WES site at the proposed rebuild project. Preliminary locations for the proposed construction were provided by WHIS park. A key component of the proposed project is the removal of Paige Boulder Creek (PBC) bridge. To assess the flood hazard improvements resulting from the bridge removal, the 100- and 500-year flood events were modeled for both pre- and post-project conditions—both with and without the PBC bridge.

The flood inundation areas for the 100- and 500-year, with and without the bridge, are shown in Figure 11 and Figure 12, respectively. The 100-year flood depths for both pre- and post-project conditions are shown in Figure 13 and Figure 14, respectively. Similarly, the 500-year flood depths for the pre- and post-project conditions are shown in Figure 15 and Figure 16, respectively.

The results indicate that during the 500-year flood event, flows along PBC overtop the banks upstream of the bridge (see Figure 15) and inundates some administrative buildings and the southwest edge of Hatcher Hall on the right bank. However, when the bridge is removed, the hydraulic model shows that the 500-year flood flow along PBC is mostly contained within the channel (see Figure 16). Hatcher Hall, the existing building closest to the PBC bank, is also at risk of flooding. The water surface elevation for the 100- and 500-year flood events along the right bank northwest of Hatcher Hall is approximately 5 and 2.5 feet, respectively, below the base of the building. In terms of flood extent along Clear Creek, the

100-and 500-year flood inundation areas extend beyond the parking area at WES, potentially impacting the proposed site.

Flood velocities for the 100-year flood event under pre- and post-project conditions are shown in Figure 17 and Figure 18, respectively. For the 500-year flood event the velocity maps for both the pre- and post-project conditions are shown in Figure 19 and Figure 20, respectively. The results demonstrate a significant reduction in velocities on the floodplain, particularly in the overbank areas and within the vegetated zones along the creek banks and upland areas.

CONCLUSION

The hydraulic analysis confirms that the proposed removal of the Paige-Boulder Creek bridge results in a reduction in flood hazard along the creek. Specifically, the removal of the bridge improves the containment of 500-year flood flows within the channel, reducing the potential for flooding outside the defined creek banks. Additionally, flood velocities are substantially reduced in the overbank areas and vegetated zones, which may mitigate potential erosion and sediment transport. Despite these improvements, the 100-year flood still extends into the WES parking area, which could require further design considerations to mitigate flood impacts on the proposed development. Overall, the bridge removal is expected to significantly improve floodplain management in the area.

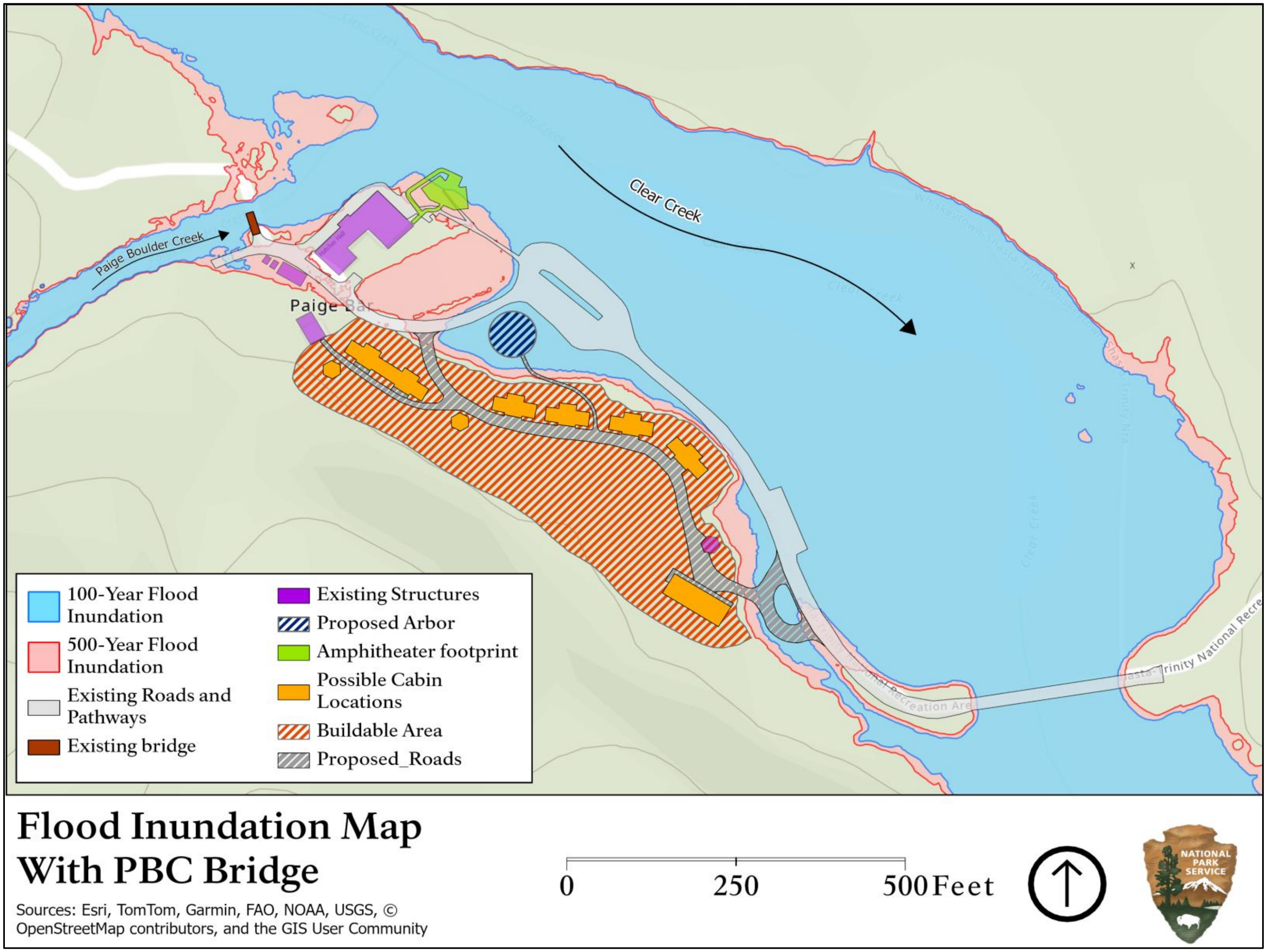

FIGURE 1. 100- AND 500-YEAR FLOOD INUNDATION AREAS WITH PBC BRIDGE IN PLACE.

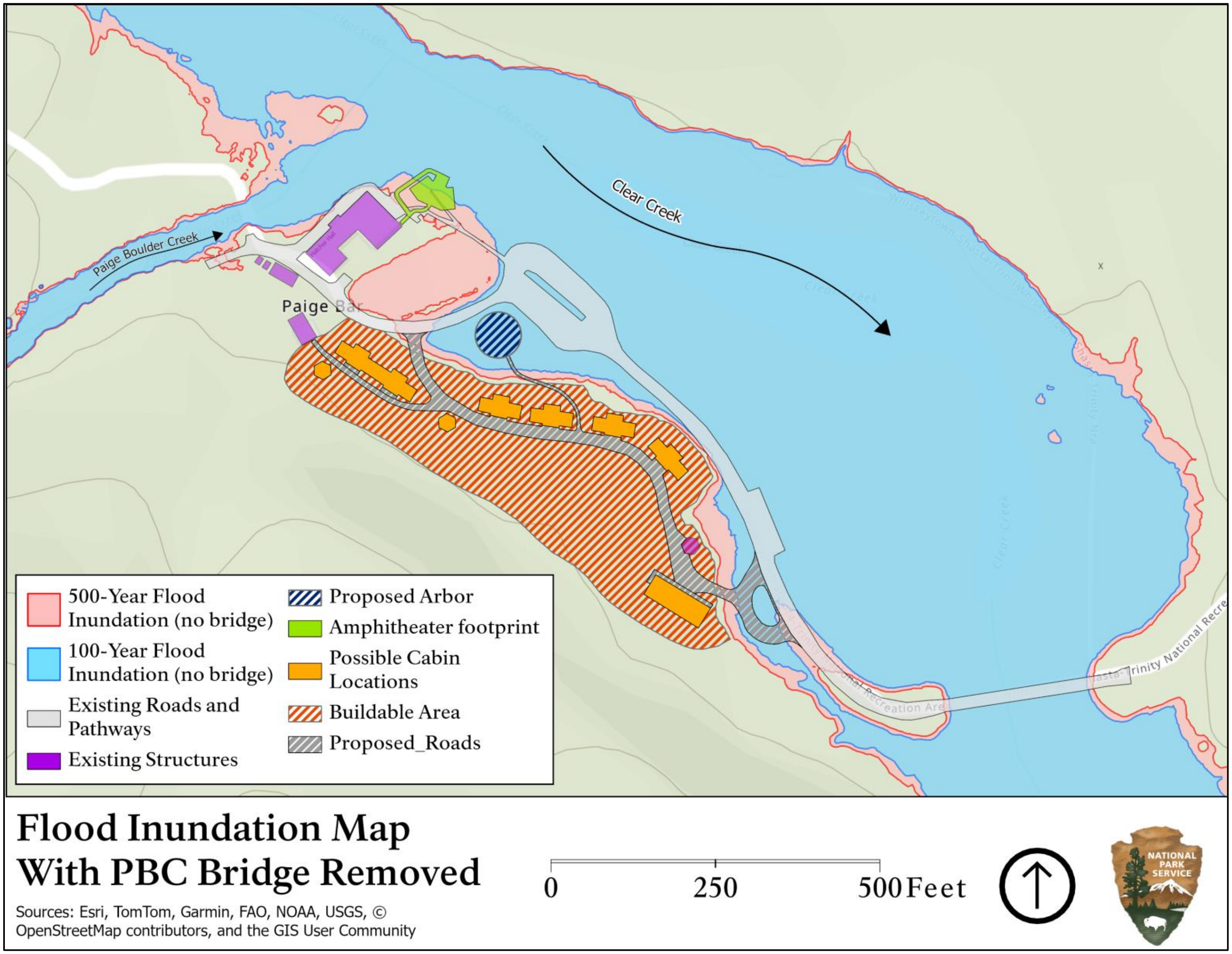

FIGURE 2. 100- AND 500-YEAR FLOOD INUNDATION AREAS WITH PBC BRIDGE REMOVED.

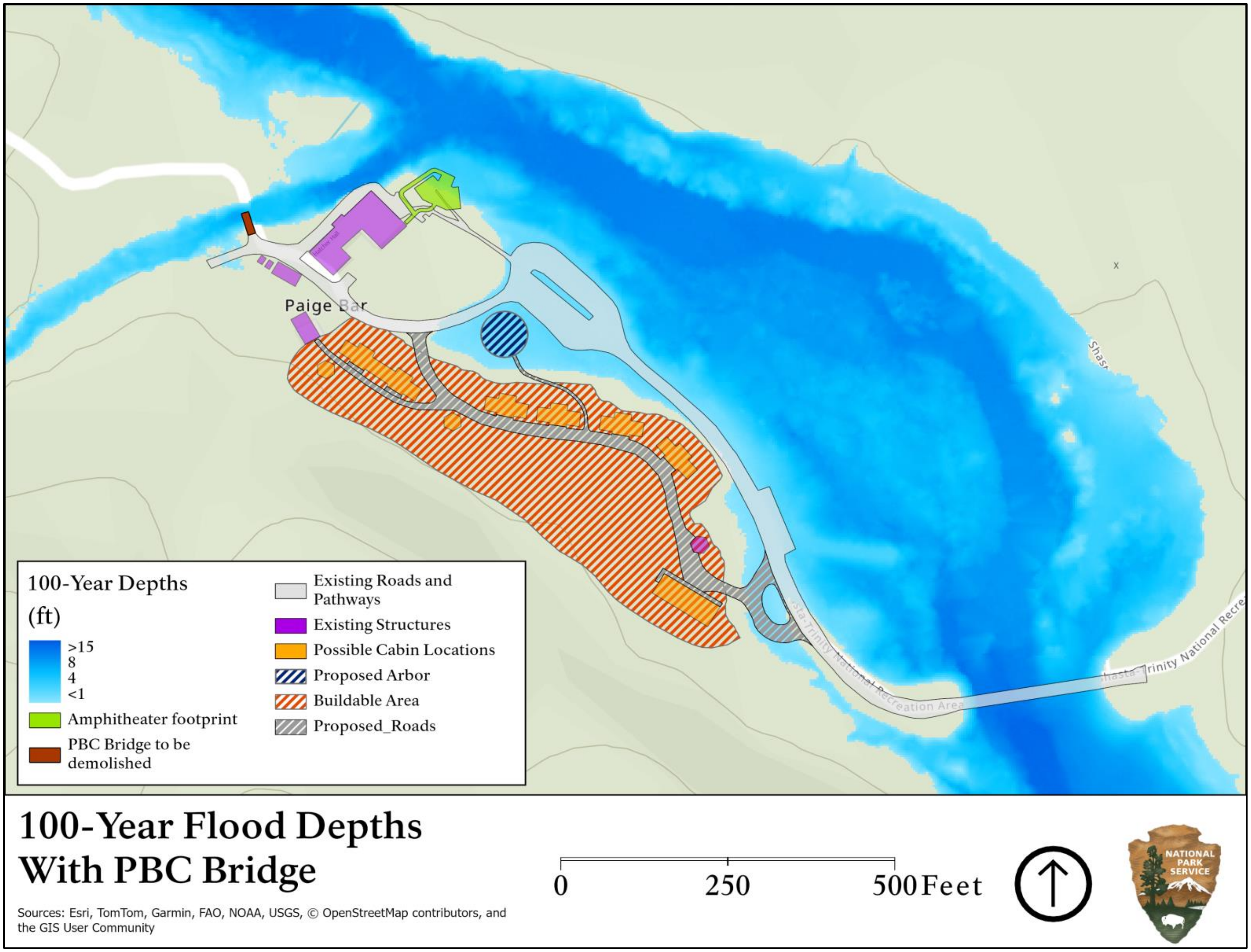

FIGURE 3. 100-YEAR FLOW DEPTHS WITH PBC BRIDGE IN PLACE.

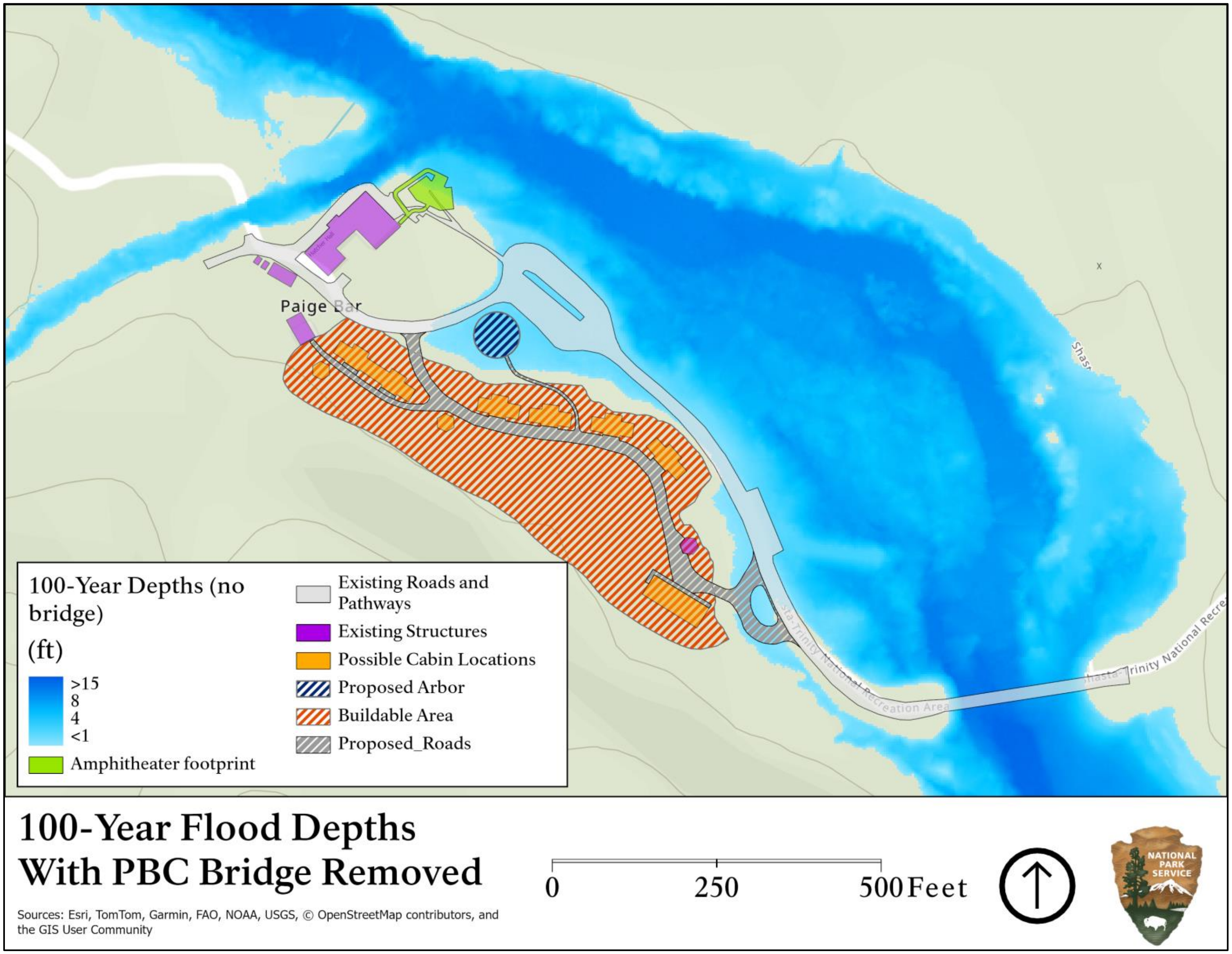

FIGURE 4. 100-YEAR FLOW DEPTHS WITH PBC BRIDGE REMOVED.

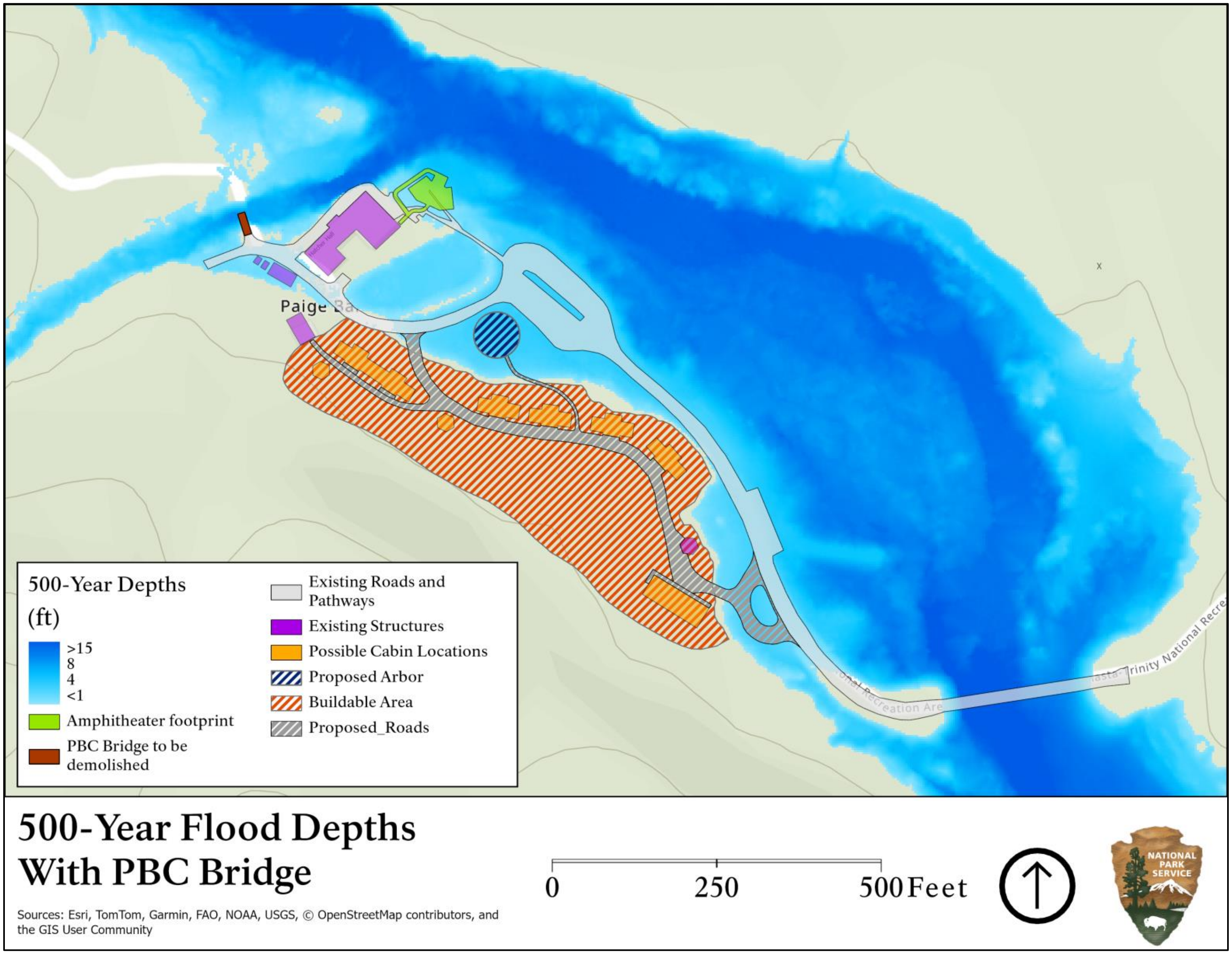

FIGURE 5. 500-YEAR FLOW DEPTHS WITH PBC BRIDGE IN PLACE.

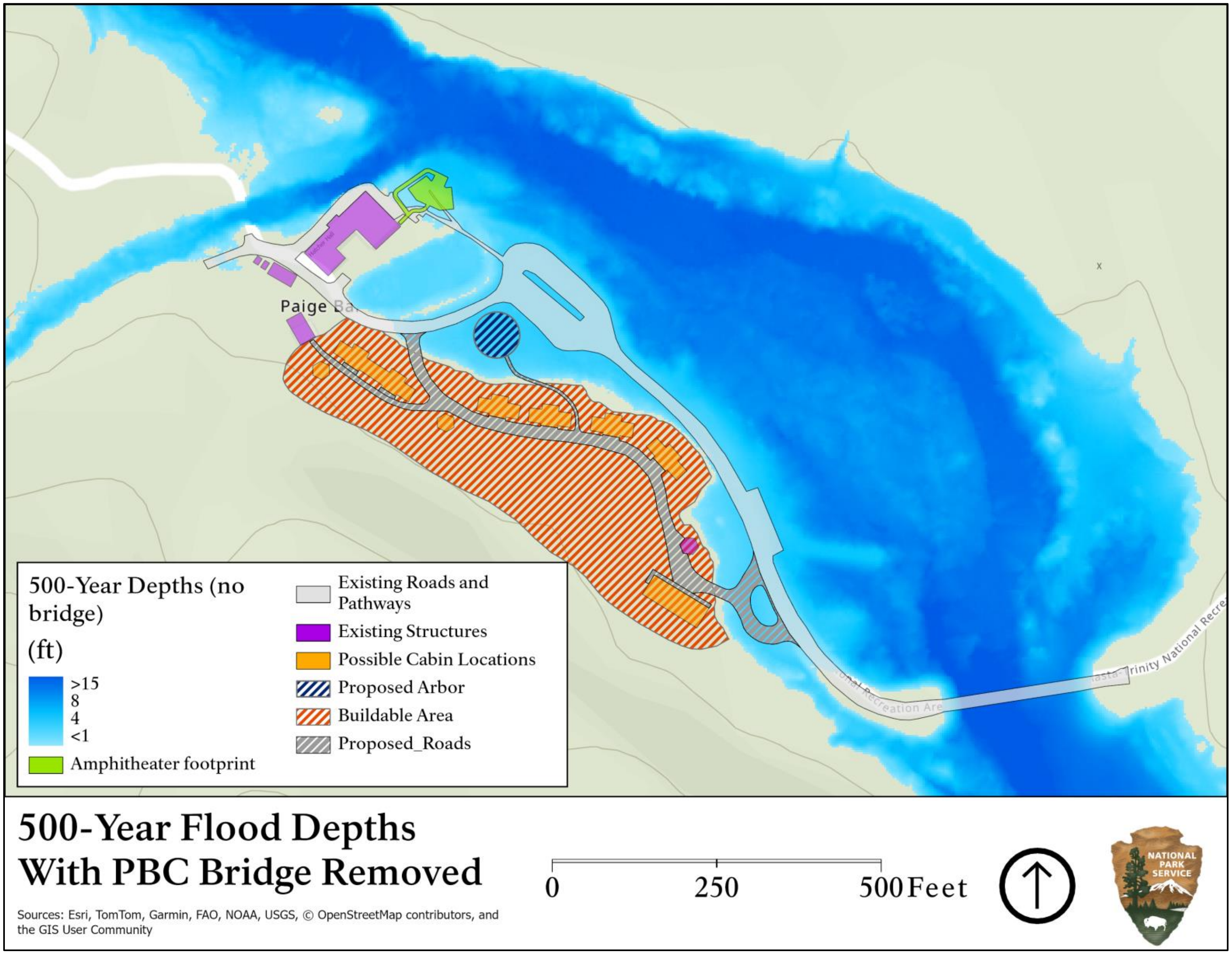

FIGURE 6. 500-YEAR FLOW DEPTHS WITH PBC BRIDGE REMOVED.

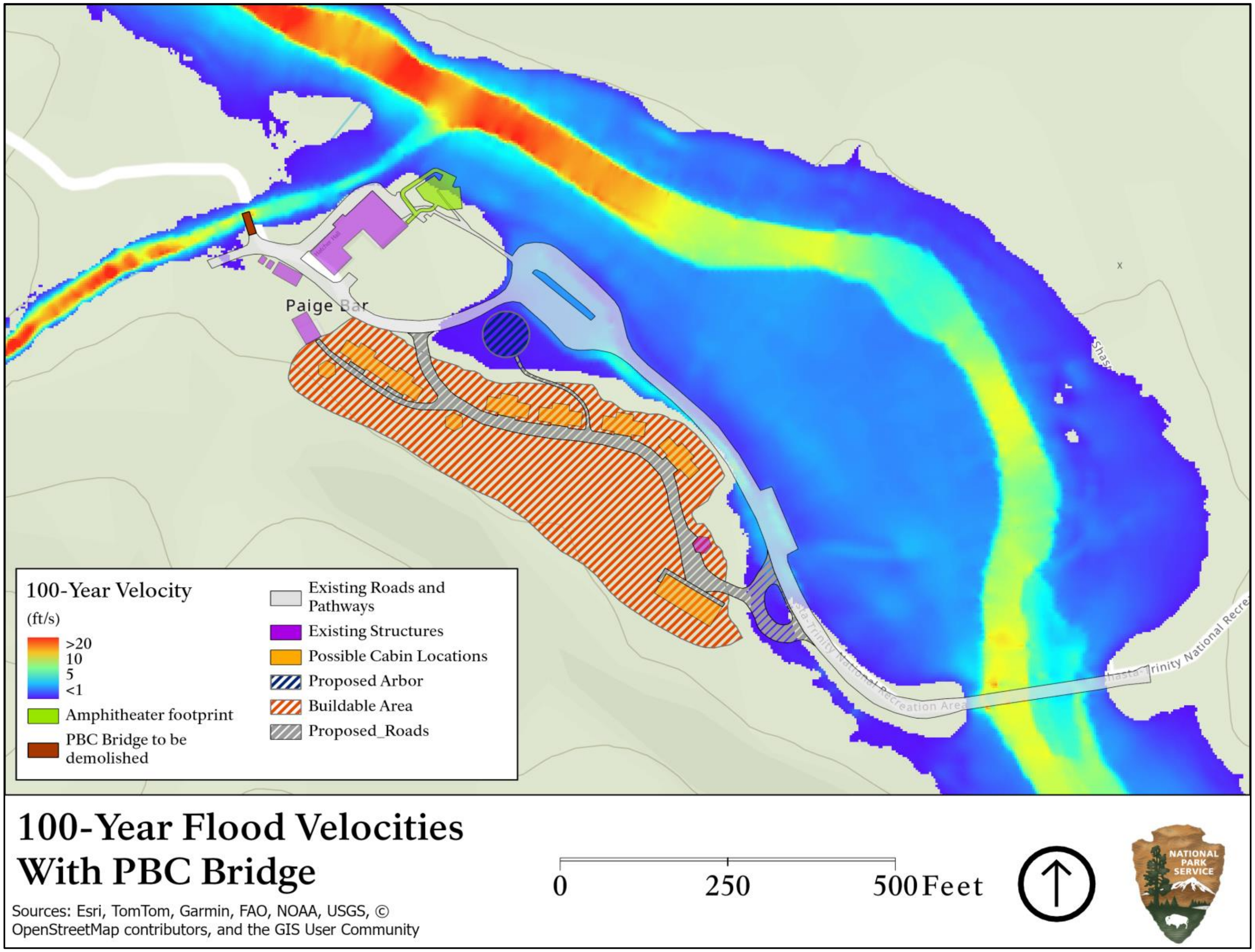

FIGURE 7. 100-YEAR FLOW VELOCITIES WITH PBC BRIDGE IN PLACE.

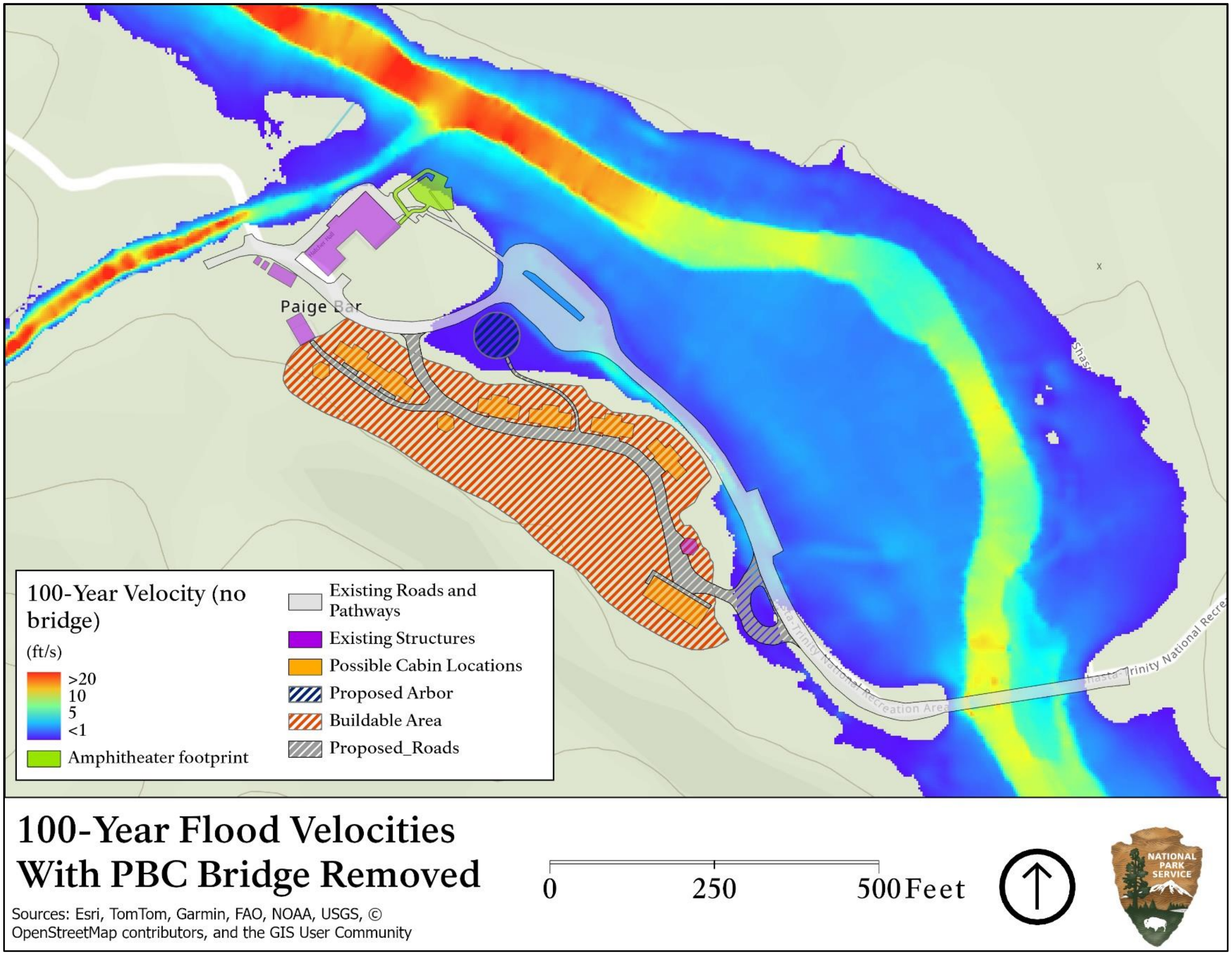

FIGURE 8. 100-YEAR FLOW VELOCITIES WITH PBC BRIDGE REMOVED.

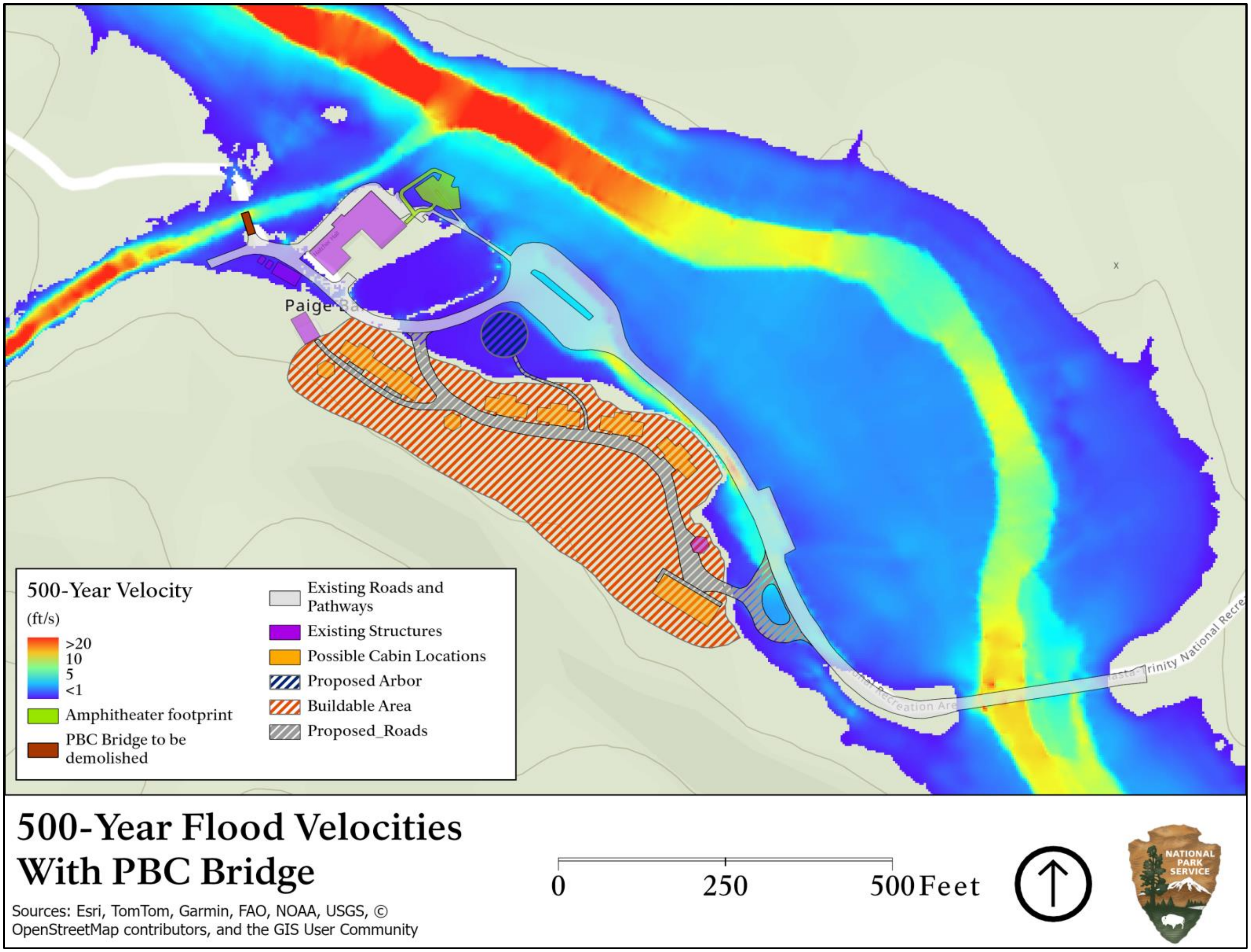

FIGURE 9. 500-YEAR FLOW VELOCITIES WITH PBC BRIDGE IN PLACE.

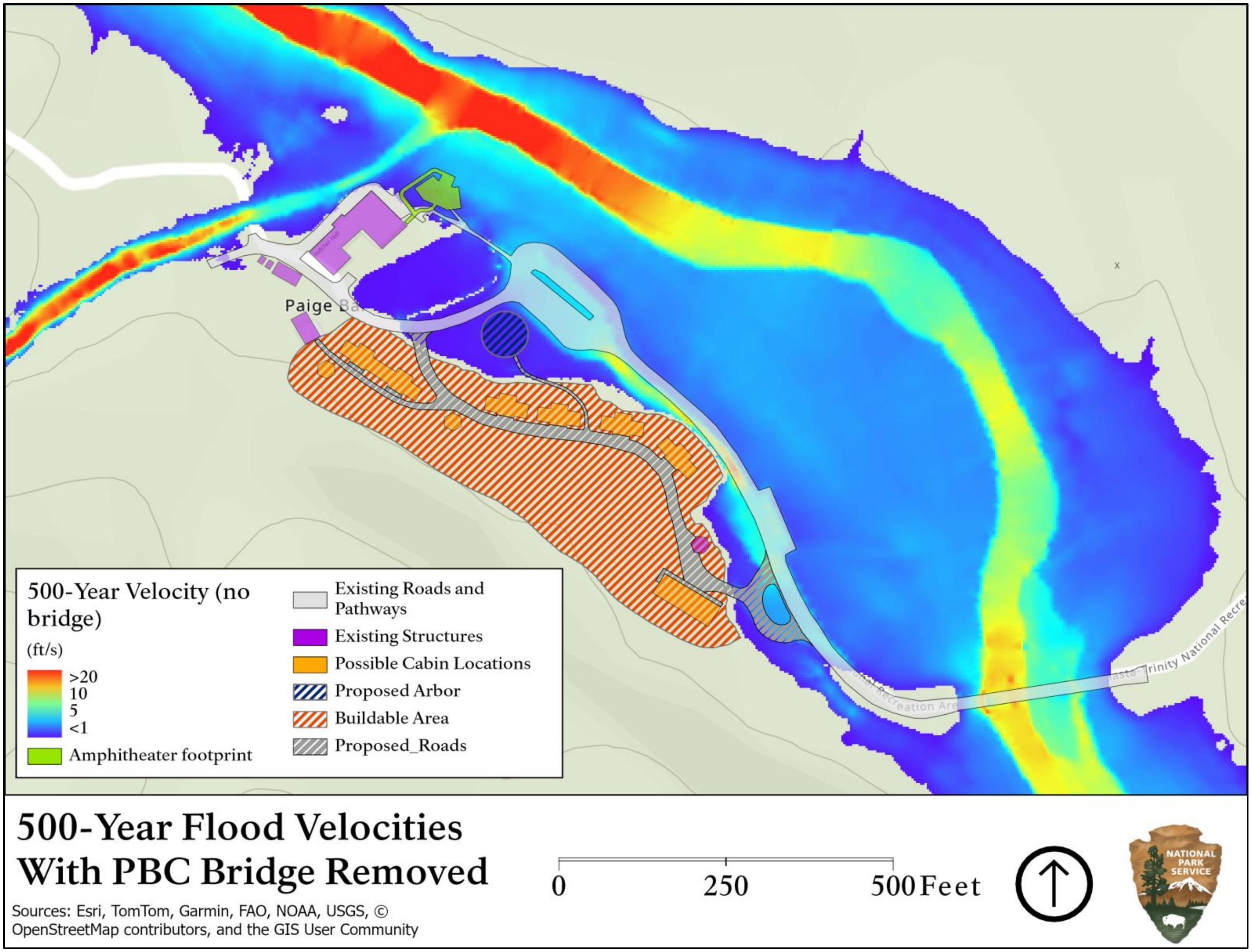

FIGURE 10. 500-YEAR FLOW VELOCITIES WITH PBC BRIDGE REMOVED.

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