



State of the Park Report

Gates of the Arctic National Park and Preserve

Alaska



2017

On the cover: Caribou antlers on the tundra, silhouetted against a rugged Brooks Range mountain backdrop. NPS Photo.

Disclaimer. This State of the Park report summarizes the current condition of park resources, visitor experience, and park infrastructure as assessed by a combination of available factual information and the expert opinion and professional judgment of park staff and subject matter experts. The [internet version](#) of this report provides the associated workshop summary report and additional details and sources of information about the findings summarized in the report, including references, accounts on the origin and quality of the data, and the methods and analytic approaches used in data collection and assessments of condition. This report provides evaluations of status and trends based on interpretation by NPS scientists and managers of both quantitative and non-quantitative assessments and observations. Future condition ratings may differ from findings in this report as new data and knowledge become available. The park superintendent approved the publication of this report.

Executive Summary

The mission of the National Park Service is to preserve unimpaired the natural and cultural resources and values of national parks for the enjoyment, education, and inspiration of this and future generations. NPS Management Policies (2006) state that “The Service will also strive to ensure that park resources and values are passed on to future generations in a condition that is as good as, or better than, the conditions that exist today.” As part of the stewardship of national parks for the American people, the NPS has begun to develop State of the Park reports to assess the overall status and trends of each park’s resources. The NPS will use this information to improve park priority setting and to synthesize and communicate complex park condition information to the public in a clear and simple way.

The purpose of this State of the Park report is to:

- Provide to visitors and the American public a snapshot of the status and trend in the condition of a park’s priority resources and values;
- Summarize and communicate complex scientific, scholarly, and park operations factual information and expert opinion using non-technical language and a visual format;
- Highlight park stewardship activities and accomplishments to maintain or improve the State of the Park;
- Identify key issues and challenges facing the park to help inform park management planning.

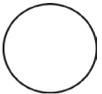
The National Park Service Organic Act of 1916 states that units of the national park system are established to “conserve the scenery and the natural and historic objects and the wildlife therein and to provide for enjoyment of the same in such manner and by such means as to leave them unimpaired for the enjoyment of future generations.” This statement represents the most basic mission of Gates of the Arctic National Park and Preserve.

Most of the national parks in Alaska, including Gates of the Arctic National Park and Preserve (Gates of the Arctic), were established or expanded under the Alaska National Interest Lands Conservation Act (ANILCA), which was signed into law on December 2, 1980. ANILCA’s passage culminated more than 20 years of deliberation on federal land claims after Alaska statehood.

The purpose of Gates of the Arctic National Park and Preserve is to preserve the vast, wild, undeveloped character and environmental integrity of Alaska’s central Brooks Range and to provide opportunities for wilderness recreation and traditional subsistence uses.

The summary table below, and the supporting information that follows, provide an overall assessment of the condition of priority resources and values at Gates of the Arctic based on scientific and scholarly studies and expert opinion. The internet version of this report, available at <https://www.nps.gov/stateoftheparks/gaar/>, provides additional detail and sources of information about the resources summarized in this report, including references, accounts on the origin and quality of the data, and the methods and analytical approaches used in the assessments. Reference conditions that represent “healthy” ecosystem parameters, and regulatory standards (such as those related to air or water quality) provide the rationale to describe current resource status. In coming years, rapidly evolving information regarding climate change and associated effects will inform goals for managing park resources, and may alter how the park measures the trend in condition of resources. Thus, reference conditions, regulatory standards, and/or best judgment about resource status or trend may evolve as the rate of climate change accelerates and the park responds to novel conditions. In this context, the status and trends documented here provide a useful point-in-time baseline to inform understanding of emerging change, as well as a synthesis to share as the park builds broader climate change response strategies with partners.

The status and trend symbols used in the summary table below and throughout this report are summarized in the following key. The background color represents the current condition status, the direction of the arrow summarizes the trend in condition, and the thickness of the outside line represents the degree of confidence in the assessment. In some cases, the arrow is omitted because data are not sufficient for calculating a trend (e.g., data from a one-time inventory or insufficient sample size).

Condition Status		Trend in Condition		Confidence in Assessment	
	Warrants Significant Concern		Condition is Improving		High
	Warrants Moderate Concern		Condition is Unchanging		Medium
	Resource is in Good Condition		Condition is Deteriorating		Low

State of the Park Summary Table

Priority Resource or Value	Condition Status/Trend	Rationale
Natural Resources web ▶		
Air Quality		Overall air quality at Gates of the Arctic is in good condition, and park scenic views are rarely affected by air pollution-caused haze; however, the steady input of contaminants from both local and global sources make pollution a primary concern for park managers. Sources of contaminants in parklands include point sources, regional sources, and trans-Pacific and transpolar global pollution sources. Airborne toxics, including mercury, can deposit with rain or snow and accumulate in birds, mammals, amphibians, and fish, resulting in reduced foraging efficiency, survival, and reproductive success. Some vegetation communities and surface water in the park may be susceptible to acidification and nutrient enrichment effects of excess sulfur and nitrogen deposition.
Snowpack		Snow depth at Bettles on April 1, 2015 was 22 inches, which is ≈8 inches below the 1981–2010 average for that date. The 10-year average snow depth at Bettles on April 1st is 29 inches. The reference range is between 16 inches and 51 inches. Both the annual and 10-year average fall within this reference range. The presence of a seasonal snowpack is important for the ecological health of the park; many plant and animal species have adapted to a snow dominated landscape and any changes, whether positive or negative, could have implications.
Geologic Features and Processes		Gates of the Arctic includes much of the central and eastern Brooks Range and the headwaters of the Kobuk River. Active glaciation and permafrost are characteristic of this arctic environment. The National Petroleum Reserve in Alaska borders Gates of the Arctic to the west.
Water Quantity and Quality		Many pristine streams and rivers are present in Gates of the Arctic, including six designated Wild and Scenic Rivers. Current hydrologic data for the park are almost nonexistent. There are currently no active stream gages within the park boundaries.
Landscape and Ecosystem Processes		Wetlands and tundra are the primary landcover types in the area. Shrub expansion into tundra is occurring as a result of climate warming. Fire frequency has increased elsewhere in interior Alaska (Kasischke et al. 2010), but the small area susceptible to fires in the park has muted the increase within the park boundary. The only known exotic plant site in Gates of the Arctic, a single bird cherry (<i>Prunus padus</i>) tree on Walker Lake, was removed in 2013.

Priority Resource or Value	Condition Status/Trend	Rationale
Birds		Birds are an important component of park ecosystems, and their high mobility and capacity for responding rapidly to environmental change makes them good indicators of local and regional ecosystem change (Fancy and Sauer 2000). Population status information is lacking for most shorebird and landbird species in this park; the only broad-scale landbird inventory to date within Alaska’s arctic parklands occurred from 2001–2003 and counted ninety-six species of montane nesting birds. Birds warrant moderate concern, as there is very limited knowledge about the species in the park, and changes in climate may impact bird habitat.
Fish		Fish species in the park include sheefish, whitefish, Dolly Varden, and others. Fish are an important subsistence resource. As a group, they represent the most accessible subsistence resource in the area, and are available from late spring through early winter. Although few comprehensive fish studies have been conducted, indications are that fish diversity and populations are healthy.
Mammals		Terrestrial mammals in the park include, but are not limited to, moose, brown bear, caribou, Dall’s sheep, wolves, and wolverines. Populations fluctuate naturally over time, but are generally thought to be in good condition.
Dark Night Sky		A photic environment is described as the physical amount and character of light at a particular location, irrespective of human perception. The NPS Night Sky Program characterizes a park’s photic environment by measuring both anthropogenic and natural light. While no ground-based or modeled data are available for Gates of the Arctic, 2012 visible infrared imaging radiometer (VIIRS) satellite data, which uses a broadband imaging detector with high sensitivity, indicates that there is very limited visible upward radiance within the park boundary. The most significant source of upward radiance in the region originates from Prudhoe Bay north of the park.
Acoustic Environment		All sound resources, whether audible or not, are referred to as the <i>acoustic environment</i> of a park. The quality of the acoustic environment affects park resources including wildlife, cultural resources, the visitor experience, and landscapes. The condition of the acoustic environment is assessed by determining how much man-made noise sources contribute to the acoustic environment through the use of a national noise pollution model. This measure is referred to as the <i>mean acoustic impact level</i> . Impact is measured in A-weighted decibels (dBA). The mean acoustic impact level at the park is 0.0 dBA, meaning that the acoustic environment is in good condition. Overall, long-term projected increases in ground-based and aircraft traffic indicate a deteriorating trend in the quality of acoustic resources at this location, as does an increase in development and steady tourism pressure throughout the state of Alaska (McDowell 2014).
Cultural Resources web ▶		
Archeological Resources		Major themes/historic contexts in Gates of the Arctic are moderately well developed, but it is very likely that a significant number of archeological sites have not yet been identified or professionally documented. A substantial amount of archeological inventory has been conducted, but the area is vast. Knowledge of these resources is increasing with continued research and management efforts by park staff and collaborators.
Cultural Anthropology		The park has considerable knowledge and data related to ethnographic resources and a good understanding of connections between members of resident zone communities, their history and culture, and connections to park resources and important places.
Cultural Landscapes		Gates of the Arctic has identified and documented 2 cultural landscapes that are the best representative of the most significant historic contexts (subsistence economies) in the park: Agiak Lake and Itkillik Lake. Documentation of these cultural landscapes is complete and thorough.

Priority Resource or Value	Condition Status/Trend	Rationale
Historic Structures		The majority of historic structures in the park are documented in ways that track condition and establish architectural features and historic context. The park needs additional studies to establish the importance of historic structures in the park.
History		Research to document the history of Gates of the Arctic has been inconsistent; however, recent efforts are underway to provide more systematic coverage. The park does not yet have an administrative history, but the reasons for the establishment of the park are well documented in legislation (ANILCA), the park's Foundation Statement (2012), and the park's General Management Plan (2014).
Museum Collections		Gates of the Arctic museum collections have been the subject of ongoing research efforts to better understand the cultural and natural histories of the park and the ways these histories are represented by the collection. The Gates of the Arctic research collection is considered to be a significant aspect of the cultural and natural histories of the park.
Visitor Experience web ▶		
Number of Visitors		The park visitor centers received a record 12,669 visitors in 2014. The remoteness and difficult accessibility of this park makes counting visitors difficult. Of the number of people that visit the visitor centers on the road system, only a fraction of those visit areas within the park. There is a core of local users that enter the park on a regular basis.
Visitor Satisfaction		Visitor satisfaction surveys show consistently high results, with 98% to 100% of visitors satisfied overall with facilities, services, and recreational opportunities.
Interpretive and Education Programs – Talks, Tours, and Special Events		Visitor centers that provide information are located outside of the park in Bettles, Coldfoot, and Fairbanks. These locations offer backcountry orientation and some interpretive programs. The University of Alaska at Fairbanks is a key partner for providing educational programs.
Interpretive Media – Brochures, Exhibits, Signs, and Website		The park map, movie, and website are current. New wayside signs were installed recently in Bettles and Anaktuvuk Pass. Signage in the park is purposely minimal, to preserve its remote nature and wilderness character. Short videos have been produced for social media. Gates of the Arctic recognizes the importance of social media to allow visitors to connect with a park that is remote and relatively inaccessible.
Accessibility		Park visitor centers and the ranger stations are Americans with Disabilities Act (ADA) compliant. Due to the remote nature of the park, access is difficult for all visitors.
Safety		The safety of visitors is a park priority. The park works to quickly identify and mitigate potential hazards, and the number of accidents is very low.
Partnerships		Many long-term community partnerships exist to enhance interpretive efforts for the public. Volunteers are a key resource for park operation.
Scenic Resources		Scenic resources are a fundamental resource of the park, and are currently in good condition; however, proposed development adjacent to the park could impact this pristine resource. Many visitors come to Gates of the Arctic to see nature, the remoteness of this wilderness, and unspoiled beauty. Gates of the Arctic is one of the last undeveloped, untrammeled places in North America.

Priority Resource or Value	Condition Status/Trend	Rationale
Park Infrastructure web ▶		
Overall Facility Condition Index		<p>Overall, Gates of the Arctic facilities are in good condition. Currently, Gates of the Arctic has 79 operating assets with a recorded cost replacement value of \$27,937,905. The average facility condition index (FCI) for these assets is 0.021, which indicates good condition.</p>
Wilderness Character and Stewardship web ▶		
Overall Wilderness Character		<p>Gates of the Arctic Wilderness represents the essence of the term “untrammled”. It is a landscape of massive size and scale that over the course of time has not allowed humans to exert control over it. The remoteness of this wilderness from other centers of human settlement has protected its ecosystems, leaving them by and large intact and robust, predominantly under the control of natural processes and not under the control of civilization. Because it is free from roads and other infrastructure, visitors will experience solitude and a primitive and unconfined recreation experience. (Wilderness Character Narrative 2012).</p> <p>Gates of the Arctic Wilderness also provides outstanding opportunities for research, with a unique position and abundance of significant cultural, paleontological, and archeological resources. Intricate food webs and population fluctuations are largely unchecked by modern human interference, allowing natural communities to retain their diversity and complexity and maintain their own balance.</p>
Wilderness Stewardship		<p>Park operations and management, as well as outside research permits for the park are evaluated with concern for conservation of wilderness character.</p> <p>The park completed a Wilderness Stewardship Plan in 2014, which amends the General Management Plan of 1986. This plan provides staff with guidance for management of wilderness and the preservation of wilderness character.</p>
Subsistence web ▶		
Overall Condition, Opportunity, and Continuity for Subsistence Activities		<p>Residents of rural communities in and around Gates of the Arctic are active in the harvest and use of wild foods and other subsistence resources, and there are continued opportunities available to harvest these resources. Local subsistence users are engaged in subsistence management through participation in the Gates of the Arctic National Park Subsistence Resource Commission and the Federal Subsistence Program. With the recent completion of harvest surveys in several local communities, up-to-date information is available to park managers as they make decisions about subsistence management.</p>

Summary of Stewardship Activities and Key Accomplishments to Maintain or Improve Priority Resource Condition

The list below provides examples of stewardship activities and accomplishments by park staff and partners to maintain or improve the condition of priority park resources and values for this and future generations:

Natural Resources

- Park scientific staff undertook a landmark [grizzly bear study](#) in recent years along the southern slope of the Brooks Range. Data from this research is increasing understanding of bear range, diet, and seasonal movement patterns and is informing park responses to proposed development projects in and around Gates of the Arctic.
- Extensive Dall's sheep surveys have been conducted by NPS scientific staff annually over the past five years in order to have the best possible information available as sheep populations have declined substantially. Novel sampling methods, which have reduced costs and enhanced the inferential value of the data, have been developed over the course of this work.

Cultural Resources

- Documentation of traditional place names across the park is ongoing. Park staff worked with the Simon Paneak Museum to document place names around Anaktuvuk Pass. The park consults with the Alaska Native Language Center to translate traditional place names from historical maps and to conduct site visits with language experts to document historical native land use.
- A Gates of the Arctic funded project entitled “Traditional Ecological Knowledge of Moose, Other Wildlife Species, and Climate Change in Allakaket/Alatna” resulted in a written report of local knowledge about ecological and social impacts of climate change by residents of Allakaket and Alatna.
- The park is engaged in consultations with residents of Anaktuvuk Pass and the Inupiaq History and Language Commission to draft national historic landmark documentation for historic sites on the Killik River.
- Museum collections in cultural resource disciplines (archeology, ethnology, and history) contain 180,024 objects and are fully cataloged (0 backlog reached in 2013).

Visitor Experience

- The NPS continues its outreach with the Anaktuvuk Pass community, including a variety of educational programs. A recent highlight was the removal of abandoned materials utilizing the Denali sled dogs.
- Backcountry orientation materials used for training are updated to keep them effective and relevant.

Park Infrastructure

- In 2012, a wind turbine was installed in Anaktuvuk Pass, serving the ranger station there. Monthly savings in electricity costs exceeds \$400.00.
- Electricity costs for the visitor center and office in Bettles have dropped from \$8,913 in 2013 to \$4,299 this year—a savings of \$4,613.

Wilderness

- The park provides a high level of support for protection of wilderness character and values by stakeholders—both locally and regionally.
- The park has refrained from making infrastructure improvements and additions in an effort to preserve wilderness.

Subsistence Use

- Government-to-government consultation occurs freely and this interagency collaboration is essential in decision-making regarding resource declines. NPS consults with the State of Alaska and the Alaska Department of Fish and Game Division of Subsistence. Collaboration on Dall's sheep and moose surveys and monitoring is ongoing.
- NPS continues to protect resources for the future while considering their current uses and importance for subsistence uses. Traditional ecological knowledge transfer between local natives and NPS biologists is ongoing.

Key Issues and Challenges for Consideration in Management Planning

Some of the park's primary management challenges are listed below. For a more thorough description of these challenges, and to see what Gates of the Arctic is doing about these issues, please see [Chapter 4](#).

Climate Change

The Arctic has been warming at twice the rate of that of the temperate latitudes, which has led to physical and ecological changes in Gates of the Arctic, with many more anticipated. Models predict that Gates of the Arctic is likely to experience warming of up to 10 °F mean annual temperature over the next 60 years. With a changing climate comes a host of current and potential issues requiring management approaches including thoughtful adaptation, mitigation, and education/communication strategies. In addition to changes already measurable, some of the anticipated changes to the landscape include continued changes in vegetation type and distribution, and the associated shifts of animals dependent on those plants. Animal numbers and migratory changes may result in reduction in the availability of and access to key wildlife species hunted for subsistence by local residents, especially caribou.

In parallel with changes on the land, Gates of the Arctic's aquatic resources are anticipated to change dramatically in the decades to come. This will present park managers with a number of potential challenges. Shallow lakes and ponds have shown a modest decrease in number and size, a trend expected to intensify. The disappearance of shallow lakes will reduce lake fish habitat, as well as the habitat and food for waterbirds. Changes in the abundance and distribution of fish may also influence the abundance and distribution of piscivorous (fish-eating) birds.

Rivers will also warm and become more filled with sediment seasonally, presenting challenges to subsistence and sport harvests of fish. Local residents rely on the park fisheries for subsistence, particularly chum salmon, sheefish, and several species of whitefish and eels.

External Development

A number of potential external development projects could impact Gates of the Arctic's natural and cultural resources in the future, including large-scale mining, industrial road construction, a gas pipeline, and support infrastructure in the vicinities of Gates of the Arctic's boundary. Related impacts may include air pollution, sound pollution, viewshed disturbances, introduction of invasive species, illegal harvest, and non-authorized motor vehicle activity. The Kobuk River Preserve portion of Gates of the Arctic has a congressionally-mandated right-of-way (ROW) authorized across it. When built, the industrial road will provide access to an extensive heavy metals mining district in proximity to Gates of the Arctic's western boundary. Additional related impacts would include fugitive dusts into the environment and accidental spills of fuels and mining materials along the ROW. The potential for illegal activity such as looting of archeological and paleontological resources and wanton waste of wildlife are also management concerns.

Logistical Challenges

Working in the remote and roadless Arctic presents unique logistical challenges. Fieldwork in Gates of the Arctic is hampered by high costs of access and supplies, poor weather, and lack of infrastructure. The park struggles with staff recruitment due its remote nature and arctic climate, lack of housing, difficulty in hiring of local residents due to low federal wages (compared to the high cost of living in the bush), and slow and expensive telecommunications.

Wilderness Stewardship

Wilderness advocate Robert Marshall's descriptions of the Brooks Range inspired studies that resulted in the establishment of Gates of the Arctic in 1980 with the passage of ANILCA. The park contains 7,154,000 acres of congressionally designated wilderness, and six designated Wild and Scenic Rivers. Section 707 of ANILCA says that "except as otherwise expressly provided for in this Act, wilderness...shall be administered in accordance with...the Wilderness Act..." The Wilderness Act mandates that wilderness be managed to preserve wilderness character. The challenge to the park is balancing the preservation of wilderness character with provisions of ANILCA that recognize the unique nature of Alaska parks.

Specifically, Gates of the Arctic attempts to balance wilderness protection with the following activities (most are provided for in ANILCA): snowmachine use to access traditional activities; off-road vehicle (ORV) use by residents of Anaktuvuk Pass for traditional subsistence activities in specified geographical areas; cabin management and maintenance; commercial ORV use in wilderness; maintenance and management of installations, climate stations, emergency cabins, and research activities; management of visitor use associated impacts such as campsites and social trails; and administrative activities in wilderness.

The 2014 Wilderness Stewardship Plan and Gates of the Arctic General Management Plan Amendment provide both specific and general guidance for staff to manage activities in wilderness while preserving wilderness character in accordance with the legal framework of the Wilderness Act, ANILCA, and NPS policy and regulations. These include requirements for park planning and wilderness management where desired future conditions for the park align with the park purpose, the Wilderness Act, and significance statements identified in the 2010 Foundation Statement.

Subsistence Management

Gates of the Arctic was established in part to provide for subsistence opportunity for local residents. A large fraction of subsistence harvest in the park is represented by caribou, most notably near Anaktuvuk Pass and the three villages along the upper Kobuk River. Dall's sheep, moose, salmon, and whitefish are also important to subsistence harvesters.

Subsistence opportunity for hunting caribou is likely to face increasing hardship as the Central Arctic Caribou Herd and Western Arctic Caribou Herd numbers have dropped in recent years. The Western Arctic Caribou Herd has declined over 50% from approximately 500,000 and both herds are likely to face habitat constriction due to changing vegetation.

The caribou's annual migration south after the summer calving is the time at which local residents harvest caribou. The timing and pathways of migration have changed over the past decade, which has led to much more hunting uncertainty and has created the potential for conflict over sport hunting closure dates to help protect subsistence opportunity.

Wildlife Management

There are several important challenges to wildlife management in Gates of the Arctic. The park lacks sufficient data on wildlife populations that are critical to meeting ANILCA's mandates of protecting habitat for and populations of fish and wildlife, providing for subsistence, protecting resources related to subsistence needs, allowing sport hunting, and providing for non-consumptive uses.

Other challenges relating to wildlife management include providing appropriate staffing for the logistics of permitting hunts and enforcing wildlife regulations over the park's 8 million+ acres.

Inholder Access/ Off-Road Vehicle Use

While off-road vehicles are not allowed throughout the park, six and eight-wheeled off-road vehicles (ORV) are allowed to be used by residents of Anaktuvuk Pass through a special legislative provision that provided access easements to hunt caribou and other prey through the Anaktuvuk Pass Land Exchange. Travel to Chandler Lake and Ernie Pass is possible on easements and allows local residents to use these areas for fishing, gathering edible plants, and hunting sheep, bear, marmot, and caribou. While the purpose of the land exchange provision was to accommodate and control ORV use for subsistence purposes near the village of Anaktuvuk Pass, it was also intended to eliminate the potential for incompatible developments on private lands and open private lands to dispersed public recreational use.

Chapter 1. Introduction

The purpose of this State of the Park report for Gates of the Arctic National Park and Preserve (Gates of the Arctic, “the park”) is to assess the overall condition of the park’s priority resources and values, to communicate complex park condition information to visitors and the American public in a clear and simple way, and to inform visitors and other stakeholders about stewardship actions being taken by park staff to maintain or improve the condition of priority park resources for future generations. The State of the Park report uses a standardized approach to focus attention on the priority resources and values of the park based on the park’s purpose and significance, as described in the park’s Foundation Document or General Management Plan. The report:

- Provides to visitors and the American public a snapshot of the status and trend in the condition of a park’s priority resources and values.
- Summarizes and communicates complex scientific, scholarly, and park operations factual information and expert opinion using non-technical language and a visual format.
- Highlights park stewardship activities and accomplishments to maintain or improve the state of the park.
- Identifies key issues and challenges facing the park to inform park management planning.

The process of identifying priority park resources, tracking their condition, organizing and synthesizing data and information, and communicating the results will be closely coordinated with the park planning process, including Natural and Cultural Resource Condition Assessments and Resource Stewardship Strategy development. The term “priority resources” is used to identify the fundamental and other important resources and values for the park, based on a park’s purpose and significance within the National Park System, as documented in the park’s Foundation Document and other planning documents. This report summarizes and communicates the overall condition of priority park resources and values based on the available scientific and scholarly information and expert opinion.

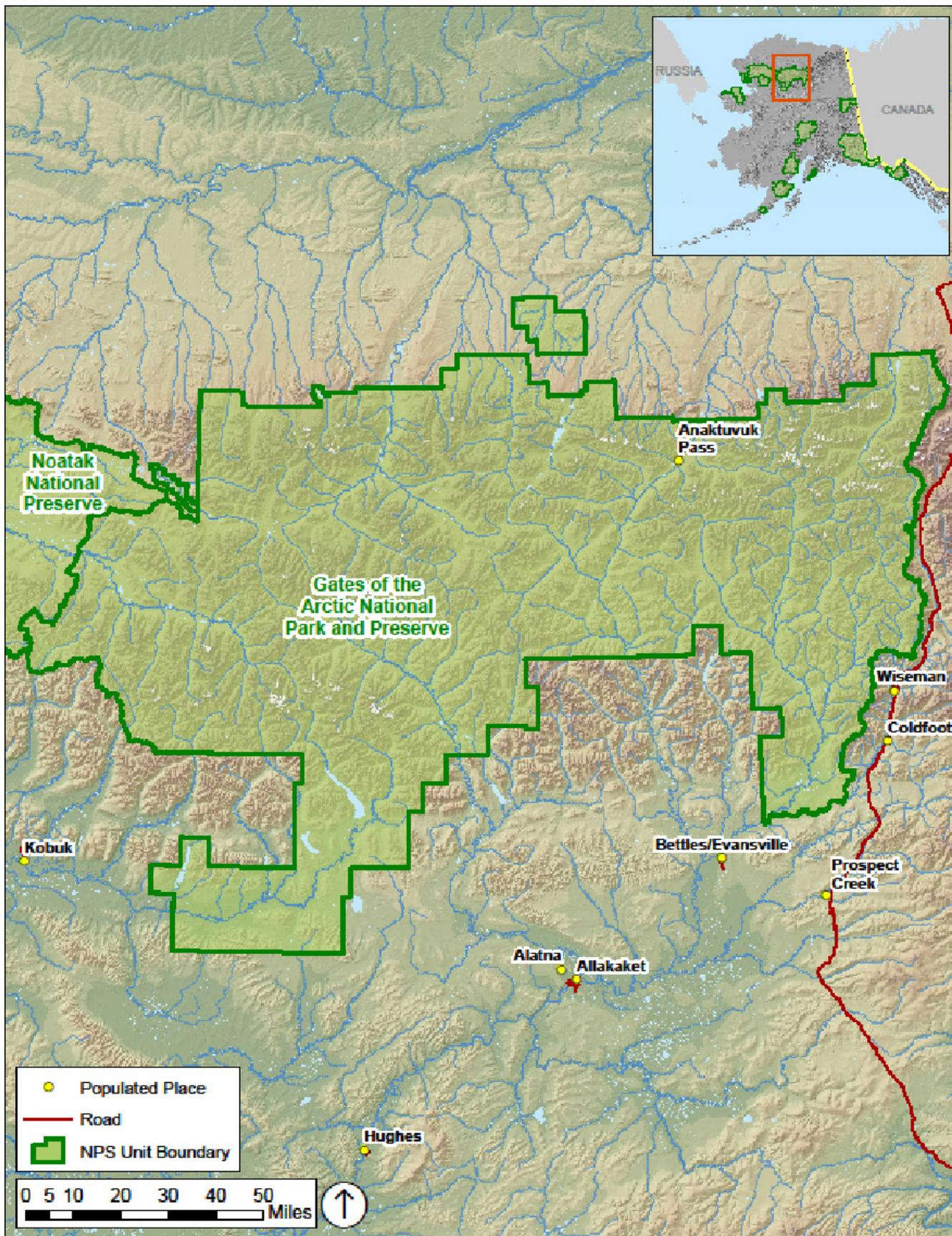
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The purpose of Gates of the Arctic National Park and Preserve is to preserve the vast, wild, undeveloped character and environmental integrity of Alaska’s central Brooks Range and to provide opportunities for wilderness recreation and traditional subsistence uses.

Significance statements express why the park unit’s resources and values are important enough to warrant national park unit designation. Gates of the Arctic is significant because:

1. Gates of the Arctic is acknowledged as the premier Wilderness park in the national park system, protecting 8.4 million acres of diverse arctic ecosystems.
2. Gates of the Arctic serves as the headwaters for six Wild Rivers that support natural systems and human activities across northern Alaska.
3. Gates of the Arctic protects a functioning arctic, mountain ecosystem in its entirety and provides habitat of world importance for naturally occurring plant and animal populations.
4. Gates of the Arctic provides visitors with opportunities for solitude and challenging wilderness adventures within a remote and vast arctic landscape.
5. Gates of the Arctic protects habitats and resources in consultation with local rural residents to provide subsistence opportunities on lands that have supported traditional cultures and local residents.
6. Gates of the Arctic protects a 12,000-year record of human cultural adaptations to high latitude mountain environments and an unbroken tradition of living on the land.

Located completely north of the Arctic Circle, Gates of the Arctic preserves over 8 million acres of land, mostly in the Brooks Range. A large part of the park is protected as the Gates of the Arctic Wilderness (7.2 million acres). While there are no roads in the park, the Dalton Highway (AK State Highway 11) is near the park’s eastern boundary. Noatak National Preserve shares a boundary on the western side of the park. Visitor information for the park is available during the summer at the Arctic Interagency Visitor Center in the town of Coldfoot or year-round at the Alaska Public Lands Information Center in Fairbanks and the visitor center in Bettles.



Map of the Park

Chapter 2. State of the Park

The State of the Park is summarized below for six categories—Natural Resources, Cultural Resources, Visitor Experience, Park Infrastructure, Wilderness Character, and Subsistence—based on a synthesis of the park’s monitoring, evaluation, management, and information programs, as well as expert opinion. Brief resource summaries are provided below for a selection of the priority resources and values of the park. Clicking on the [web](#) ► symbol found in the tables and resource briefs below will take the reader to the internet site that contains content associated with specific topics in the report.

The scientific and scholarly reports, publications, datasets, methodologies, and other information that were used as the basis for the assessments of resource condition are referenced and linked throughout the report and through the [internet version of this report](#) that is linked to the [NPS IRMA data system](#) (Integrated Resource Management Applications). The internet version of each report provides additional detail and sources of information about the findings summarized in the report, including references, accounts on the origin and quality of the data, and the methods and analytical approaches used in data collection and the assessments of condition. Resource condition assessments reported in this State of the Park report involve expert opinion and the professional judgment of park staff and subject matter experts involved in developing the report. This expert opinion and professional judgment are derived from the in-depth knowledge and expertise of park and regional staff involved in the day-to-day practice of all aspects of park stewardship and from the professional experience of subject matter experts. This expert opinion and professional judgment utilized available factual information for the analyses and conclusions presented in this report. This State of the Park report was developed in a park-convened workshop.

The status and trends documented in Chapter 2 provide a useful point-in-time baseline measured against reference conditions that represent “healthy” ecosystem parameters, or regulatory standards (such as those related to air or water quality). Note that climate change adaptation requires park managers to continue to learn from the past, but attempting to manage for conditions based on an understanding of the historical “natural” range of variation will be increasingly futile in many locations. Thus, these reference conditions, and/or judgment about resource condition or trend may evolve as the rate of climate change accelerates and park managers respond to novel conditions. Management must be even more “forward looking,” to anticipate plausible but unprecedented conditions, also recognizing there will be surprises. In this context, the park will incorporate climate considerations into decision processes and management planning as it considers adaptation options that may deviate from traditional practices.

Climate impacts many aspects of park management, from ecological systems to park infrastructure. The climate is changing and human influence is now detectable in nearly all major components of the climate system, including the atmosphere and oceans, snow and ice, and various aspects of the water cycle ([IPCC 2013](#)). Global patterns of change that demonstrate the human effects on climate are even more pronounced in high latitudes and Polar Regions ([Larsen et al. 2014](#)). As a region, Alaska has warmed more than twice as rapidly as the rest of the United States over the past 60 years, with average annual air temperature increasing by 3 °F and average winter temperature increasing by 6 °F ([Chapin et al. 2014](#)). The observed impacts of a warming climate in Alaska include declining sea ice, shrinking glaciers, thawing permafrost, changing ocean temperatures and chemistry, increased coastal erosion, and more extensive insect outbreaks and wildfire (e.g., [Larsen et al. 2014](#), [Chapin et al. 2014](#), [Markon et al. 2012](#)).

Even with multiple lines of evidence that Alaska is warming, interpreting temperature trends and other climatic indicators is complicated. Climate in Alaska is dynamic and nonlinear, with strong linkages to atmospheric and oceanic processes, such as the position of the polar jet stream or the frequency of El Niño events (Papineau 2001). An important climate pattern, evident in the relatively few long-term climate stations located in parks, is the Pacific Decadal Oscillation (PDO). Much of the warming that has occurred since the middle of the 20th century occurred in 1976 as a stepwise shift, attributed to a climatic transition from a cool to a warm phase in the PDO ([Chapin et al. 2014](#), [Bieniek et al. 2014](#)). In the early 2000s the PDO shifted back to a cooler phase resulting in statewide temperatures that were cooler than the previous decades ([Bieniek et al. 2014](#)). The most recent years have seen yet another shift back to a warm phase that may or may not persist, but has resulted in two of the warmest years on record for Alaska in 2014 and 2015 ([NOAA 2016](#)). The North Slope of Alaska has continued to warm, despite changes in the PDO.

Nonlinear responses and regional variations are expected to continue to occur as the planet adjusts to global scale change ([IPCC 2013](#), [Larsen et al. 2014](#)). Recent studies suggest that warming Arctic temperatures weaken the temperature gradient between the poles and lower latitudes leading to a wavier jet stream, which results in more persistent weather patterns and extreme conditions such as cold spells, heat waves, droughts, and flooding ([Francis and Vavrus 2015](#)). The data and information gathered from national parks provide an important piece of the puzzle in understanding both the drivers and effects of climate change.

2.1. Natural Resources

Air Quality  web ▶			
Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Visibility	Haze index		Visibility is in good condition. This status is based on NPS Air Resource Division benchmarks and the 2009–2013 estimated visibility on mid-range days of 1.8 deciviews (dv) above estimated natural conditions of 4.1 dv. The degree of confidence in the visibility status at Gates of the Arctic is high because of the nearby visibility monitor. No trend information is available because the monitor has insufficient number of years of data (IMPROVE Site ID: GAAR1, AK; NPS-ARD 2015).
Ozone	Human health: annual 4th-highest 8-hour concentration	N/A	Ozone condition status cannot be evaluated at Gates of the Arctic due to the lack of data. Ozone is a respiratory irritant, causing coughing, and other symptoms. Children, the elderly, people with existing health problems, and active adults are most vulnerable.
	Vegetation health: 3-month maximum 12-hour W126	N/A	The risk of ozone injury to vegetation cannot be evaluated due to a lack of information on ozone exposure. While ozone effects have not been documented in the park, there are several ozone-sensitive plants in the park (NPSpecies 2015).
Deposition	Sulfur wet deposition		Wet sulfur deposition warrants moderate concern. This status is based on NPS Air Resources Division benchmarks and the 2010–2014 estimated 0.2 kilograms per hectare per year (kg/ha/yr) of wet sulfur deposition. Ecosystems at Gates of the Arctic may be very highly sensitive to acidification effects relative to other parks (NPS-ARD 2015 ; Sullivan et al. 2011a ; Sullivan et al. 2011b). Ecosystems such as the park’s remote high-elevation lakes and headwater streams are sensitive to the effects of acidification from atmospheric nitrogen and sulfur deposition. Gates of the Arctic has more high-elevation stream length than any of the other arctic parks. Acidification effects can include changes in water and soil chemistry that impact ecosystem health. Acidification can also affect the reproduction and survival of fish, invertebrates, and phytoplankton (Sullivan et al. 2011a ; Sullivan et al. 2011b). The degree of confidence in the sulfur deposition status is high because of the nearby deposition monitor. No trend information is available because the monitor has insufficient number of years of data (NADP Monitor ID: AK06; NPS-ARD 2015).

Air Quality (continued)

[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Deposition (continued)	Nitrogen wet deposition		<p>Wet nitrogen deposition is in good condition. This status is based on NPS Air Resources Division benchmarks and the 2010–2014 estimated 0.2 kilograms per hectare per year (kg/ha/yr) of wet nitrogen deposition. The degree of confidence in the nitrogen deposition status is high because of the nearby deposition monitor. No trend information is available because the monitor has insufficient number of years of data (NADP Monitor ID: AK06; NPS-ARD 2015).</p> <p>Ecosystems at Gates of the Arctic have moderate sensitivity to nutrient-enrichment effects relative to other parks. Ecosystems and vegetation types such as the park’s remote high elevation lakes, wetlands, subalpine meadows, and arctic herbaceous plant communities are sensitive to the effects of nutrient enrichment from atmospheric nitrogen deposition, which can alter plant communities and reduce biodiversity. In general, nitrogen concentrations in park rivers are low, reflecting good, oligotrophic conditions (O’Donnell et al. 2015). If the arctic climate continues to warm, widespread melting of permafrost may contribute nitrogen to surface waters. This conversion of stored nitrogen to a more highly available form may augment atmospherically deposited nitrogen, leading to greater eutrophication effects in the future (Sullivan et al. 2011c; Sullivan et al. 2011d).</p>
	Mercury/toxics deposition		<p>Mercury/toxics deposition warrants moderate concern. The 2011–2013 average wet mercury deposition is very low at the park at 2.1 micrograms per square meter (NADP MDN Monitor ID: AK06) and predicted methylmercury concentrations in surface waters is very low, estimated to be 0.02 nanograms per liter (USGS 2015). Both factors were compared to NPS Air Resource Division benchmarks and would normally warrant good condition. However, the condition has been elevated because in-park data (studies and availability of fish consumption guidelines) on mercury and toxics in food webs have been used to determine the moderate concern status (NPS-ARD 2015).</p> <p>Toxic contaminants may enter the ecosystem from waterborne sources, including mine waste, or both regional and global airborne sources, fugitive ore dust, and trans-Pacific transport (Pacyna and Pacyna 2002, Landers et al. 2008). In wildlife, these contaminants may induce male feminization, impaired reproductive and immune functions, and more. The degree of confidence level in this condition is medium given that Gates of the Arctic has park-specific studies examining contaminant levels in limited taxa from park ecosystems. No trend information is available because of insufficient number of years of data (NADP MDN Monitor ID: AK06; NPS-ARD 2015).</p>

Resource Brief: Mercury and Toxics Deposition and Landscape Impacts

Toxic contaminants may enter the ecosystem from waterborne sources, including mine waste, or both regional and global airborne sources, fugitive ore dust, and trans-Pacific transport (Pacyna and Pacyna 2002, [Landers et al. 2008](#)). These contaminants include persistent organic pollutants (POPs), polycyclic aromatic hydrocarbons (PAHs), mercury, and other heavy metals such as lead, zinc, copper, and nickel. Many pesticides and polychlorinated biphenyl (PCBs) are known or suspected carcinogens, or have been implicated in chronic diseases, reduced IQ, altered behavior, etc. In wildlife, these contaminants may induce male feminization, impair reproductive and immune functions, and more.

Landers et al. (2008) assessed these semi-volatile organic compounds (SOCs) and heavy metals at Gates of the Arctic, one of 20 parks in the Western Airborne Contaminants Assessment Project (WACAP). Primary SOCs detected in air were HCB and a-HCH, both historic-use pesticides. SOC flux from snow was mid-to-high for endosulfans and a-HCH pesticides compared to values at other WACAP parks. Concentrations of SOCs, nutrients, and toxic metals—including mercury—found in lichens in Gates of the Arctic were the lowest among the parks. Concentrations of historic-use SOCs in fish were mid-range compared with those at all other sites, whereas current-use SOCs were some of the lowest measured in fish. Dieldrin pesticide concentrations in some individual fish in Lake Matcharak exceeded contamination health thresholds for subsistence fishers ([Landers et al. 2008](#)).

Pesticide deposition is attributed to long-range trans-Pacific transport because there are no significant regional sources nearby. Historic use contaminants found in park ecosystems probably indicate re-volatilization of persistent compounds from regional or local soils ([Landers et al. 2008](#)). The total contaminant burden (PCBs and pesticides) in fish from Alaskan parks is especially high, compared to burdens in fish from the Rockies, Cascades, and Sierra Nevada—suggesting atmospheric influence from global sources. Other contaminant sources may include marine-derived fish (sockeye salmon) that spawn and die in anadromous lakes ([Flanagan Pritz et al. 2014](#)).

Lake Matcharak was found to have fairly high dissolved organic carbon, an important factor in mercury methylation in lake systems. Mercury concentrations in fish were high, indicating high mercury methylation and bioaccumulation in the park. Mercury concentrations exceeded thresholds for wildlife health and some fish in Lake Matcharak exceeded the human health threshold. Mercury levels in sediment were very low, but showed similar increasing trends from about 1875. This pattern reflects the general increase in the global background mercury in the atmosphere largely caused by coal burning and smelting ([Landers et al. 2008](#)).



Lake Matcharak, a large alpine lake in the upper Noatak River basin on August 6, 2014. NPS Photo. by Greta Burkhardt.

High mercury concentrations in animals such as fish can result in reduced foraging efficiency, survival, and reproductive success. Elevated levels of mercury in humans can affect the brain, kidneys, and reproductive function. There are mercury-related fish advisories with consumption guidelines for fish caught in the Noatak and Kobuk watersheds within the park ([EPA NLFA 2014](#); [AK H&SS 2014](#)).

Snowpack


[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Snow Water Equivalent	Snow water equivalent for April 1st (monitoring location)		<p>The snow water equivalent (SWE) on April 1, 2015 was 4.9 inches; the period of record (1981–2010) average is 6.7 inches with a range between 2.1 and 13.6 inches. The average SWE on April 1st over the past decade was 5.9 inches. The most recent conditions, including the most recent annual and 10-year average snow water equivalent, while lower than average, fall within the expected range based on the 30-year record. The confidence is high due to the available record for the reference period.</p>
Snow Depth	Snow depth on April 1 (Bettles index site)		<p>The snow depth at Bettles on April 1, 2015 was 22 inches, which is \approx 8 inches below the 1981–2010 average for that date. The 10-year average snow depth at Bettles on April 1st is 29 inches. The reference range is between 16 and 51 inches. Both the annual and 10-year average fall within this reference range. The presence of a seasonal snowpack is important for the ecological health of the park; many plant and animal species have adapted to a snow dominated landscape and any changes, whether positive or negative, could have implications. The confidence is high due to the long-term record available as a reference period.</p>
Snow Cover	Greenup timing		<p>Snow cover was monitored from the fall of 2000 through the spring of 2013, using 500m resolution daily data from the MODIS Terra satellite. The median first snow day was in October over most of the low-elevation areas (< 2,000 feet) and mainly in September at higher elevations, except at elevations above 3,000 feet along the north side of the Brooks Range, where the first snow came in August.</p> <p>The median length of the continuous snow season (CSS) was 6 to 7 months in most lowland areas (below 1,000 feet), 7 to 8 months at most mid-elevations, and 8 to 9 months at most high elevations (above 4,000 feet). Higher elevations generally had later snow-off dates, though there was some interesting variability within this overall pattern. Snow usually disappeared in April and early May in valleys on the north side of the Brooks Range (Swanson 2014). While the overall trend over the past century in North America has been toward earlier snow-cover loss due to climate warming (Brown and Robinson 2011), the observed lack of a warming-related trend in the period 2001–2013 is consistent with climate observations showing that most of Alaska experienced a slight cooling in the 2000–2010 decade, especially in the winter (Wendler et al. 2012). It also illustrates that, as a result of large inter-annual variations, monitoring over a long time series is required to understand temporal trends in snow cover loss (Swanson 2014).</p>

Resource Brief: Monitoring Snow Cover by Satellite in Alaska's Arctic Parks

Snow is a dominant feature of the arctic landscape. A change in the depth or duration of snow cover would have important consequences for arctic wildlife, vegetation, and the water cycle. NPS scientists are using satellite images of the National Parks in northern Alaska to monitor the time of snow establishment in the fall and snow cover loss in the spring. The MODIS Terra satellite has been gathering daily images since it was launched by NASA 2000. The MODIS satellite images are processed into snow cover maps by the National Snow and Ice Data Center in Boulder, Colorado, and the Geographic Information Network for Alaska at the University of Alaska.

Winter comes early and quickly to the Arctic. The first dustings of snow come to the mountains in Gates of the Arctic in August, and in September or October elsewhere. Within 2 weeks of the first snow, the snow cover comes to stay for the winter, blanketing the landscape for 6 to 9 months, depending on the location. The snow usually melts away over most of the arctic national parks in May, when temperatures finally rise well above freezing. Snow in deep drifts and shady places in the high mountains lasts into June and even July in most years. Occasionally, such as in 2004, snow lingers into June even at low elevations. Other years, a thin snowpack or warm spring causes the snow to leave as early as late April in the lowlands.

In a landscape so dominated by snow, the places where snow is habitually thin or absent really stand out. In places with high winds and relatively light snowfall, the snow never gets very deep and a lot of bare ground is exposed, even in the winter. The bare ground absorbs warmth from the sun, and the snow largely disappears from these windswept places even before the spring thaw arrives in May. Several valleys in the Brooks Range along the north side of Gates of the Arctic are like this, as is the upper Noatak River valley in Gates of the Arctic and Noatak National Preserve. Snow-free areas are important to wildlife, particularly those species that have trouble digging through deep snow such as muskox and Dall's sheep.

Scientists have documented a trend towards earlier snowmelt over the past 50 to 100 years in other parts of Alaska and elsewhere in North America. The MODIS record of snow cover from the year 2000 to 2013 is too short to see any trend yet, but NPS scientists will be watching in the future for any changes and the profound impacts they might have on arctic ecosystems.



The Itkillik River valley in late winter. This area typically loses its snow cover early—in April—on both the valley floor and adjacent slopes due to wind and relatively light precipitation. The year this photo was taken (2012), the continuous snow season ended in early May on the valley floor and April on most adjacent slopes. This was a week or two later than normal for the area. NPS Photo.

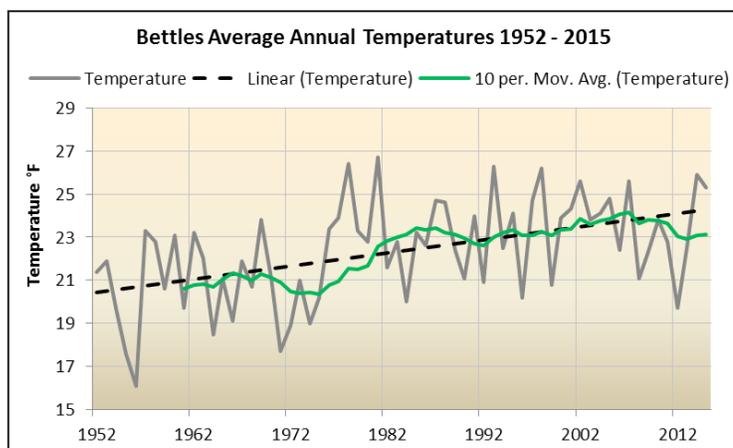
Resource Brief: Historical and Projected Changes in Climate for Gates of the Arctic National Park and Preserve

Climate, by determining the temperature and precipitation regimes for any ecosystem, is widely recognized as one of the most fundamental drivers of ecological condition. The climate patterns of Alaska are primarily influenced by latitude, continentality, and elevation. The high latitude drives the seasonal pendulum of available solar radiation; areas farther north have limited incoming solar warmth in the winter and an abundance of available light in the summer. Major mountain ranges act as barriers to the moisture from surrounding ocean waters. Large-scale atmospheric and oceanic circulation patterns influence seasonal and annual weather patterns in the parks, like the repositioning of the polar jet stream and the Aleutian low pressure system or the frequency of La Niñas and El Niños (Papineau 2001). Each of these can affect the regional patterns of storm tracks, prevailing winds, snowfall amounts, and the extent of sea ice (ACIA 2004).

Gates of the Arctic encompasses two climate zones—the northern half of the park is within the North Slope climate division and the southern half is within the Central Interior climate division as defined by Bieniek et al. (2012). The mountains of the Brooks Range act not only as the environmental control to drive climate but also contribute to the highly localized microclimates found in complex mountain terrain. Temperature inversions are common through much of the year as a result of low water vapor content, extended periods of snow cover, and low solar radiation.

There is one long-term climate station that anchors the Central Interior climate division, just outside the park boundary to the south. The climate stations with long-term records that characterize the North Slope climate division are located along the north coast of Alaska; stations closer to the northern park boundary have relatively short weather records. Bettles, with a climate record dating back to 1952, provides insight on long-term climate trends that affect the parklands. Average seasonal and annual temperatures from Bettles are shown in the graphs below. Temperature and precipitation projections over the next century have been calculated on a monthly time scale for all three locations as well. The projections are based on the PRISM model historical baseline projected at a 2-km resolution using the mid-range emissions scenario (representative concentration pathway RCP 6.0). This graph is useful for looking at overall trends in temperature, versus specific values, due to the uncertainty in models and natural climate variability (SNAP 2016).

Historical trends and future projection for temperature

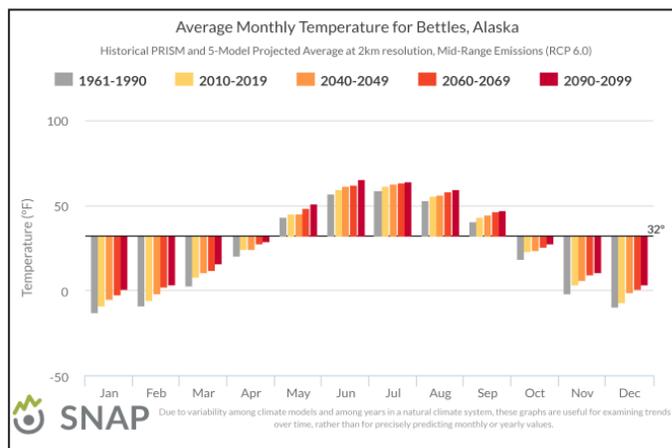


Average annual temperatures at Bettles. The green line shows the 10-year moving average. The dotted line shows a simple linear regression trend.

The observed temperature trend is non-linear, with multi-decadal variations. The increase in the mean annual temperatures is significant with temperatures warming ≈ 3.9 °F at Bettles when a simple linear regression is applied to the long-term record. Considering just a linear trend masks important variability in the time series; this record spans the phase shift of the Pacific Decadal Oscillation (PDO) in 1976 where annual temperatures at this location, and at most locations around the state, abruptly shifted up by ≈ 2.5 °F in a single year and then persisted in this warmer phase for the next several decades. The ecological consequences of an abrupt shift in temperatures versus a steady increase in temperatures need further investigation.

The trend in annual temperatures since 1977 has been relatively stable. However, over the past several years the PDO index has had the highest, most persistent positive values since the 1980s, coinciding with a strong El Niño pattern, resulting in two of the warmest years on record for the state of Alaska in 2014 and 2015.

Seasonally, winter temperatures show the most significant increase. Spring and summer temperatures have also increased significantly over the period of record. Temperatures are projected to increase for all seasons by mid-century, with the greatest increases likely



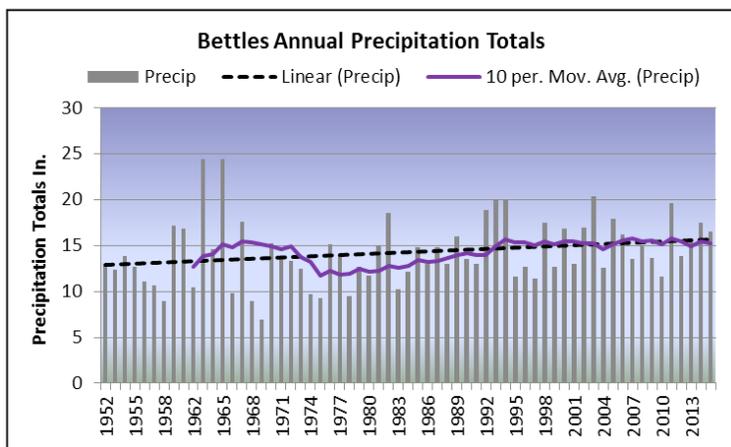
The Scenarios Network for Alaska and Arctic Planning (SNAP) monthly temperature projections for the next century are shown for Bettles (SNAP 2016).

Resource Brief: Historical and Projected Changes in Climate for Gates of the Arctic National Park and Preserve (continued)

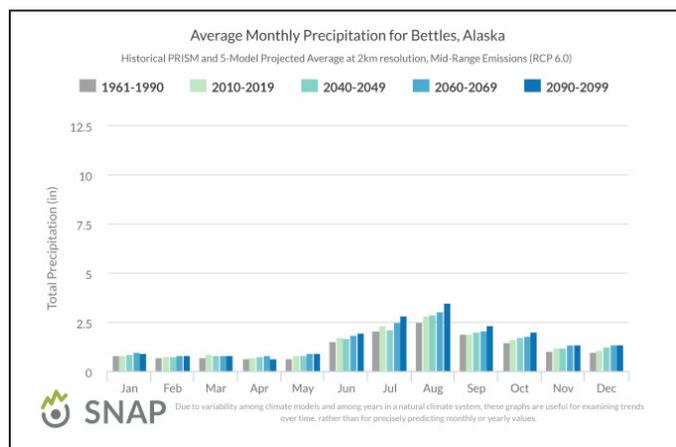
in winter. There is general agreement among individual climate models in the direction and magnitude of warming over the coming decades. Warming temperatures pose serious threats to park resources when the average annual temperatures are near freezing.

Persistent warm periods and temperatures that reach above freezing in winter can pose problems to an ecosystem that is dominated by snowcover for a good portion of the year: snow turns to rain, which leads to icing, which makes foraging difficult; plants are subject to desiccation because of low or no snow cover; and subnivean fauna are left unprotected. Extremes in spring temperatures, especially in late spring, can have repercussions related to the timing of many phenological events that are triggered by the return of warmer temperatures in May. An increase in summer temperatures can lead to many scenarios that fall out of the “normal” range of expectations including impacts to the fire season, insect outbreaks, wildlife migrations, aquatic ecosystems, active layer thawing, etc. Changes in early fall season temperatures can once again impact the timing of many phenological events that are triggered by cooler temperatures and decreasing daylight.

Historical trends and future projection for precipitation



Total annual precipitation at Bettles. The purple line shows the 10-year moving average. The dotted lines show a simple linear regression trend.



The Scenarios Network for Alaska and Arctic Planning (SNAP) monthly precipitation projections for the next century are shown for Bettles (SNAP 2016).

In Bettles, the annual precipitation totals have increased over the period of record, but not significantly, with the largest increases occurring during the summer and winter season. Annual snowfall totals have increased significantly over the past 63 years at Bettles. Total annual precipitation is projected to increase throughout the next century, particularly in the summer season ([SNAP 2016](#)). Precipitation variability is likely to remain large over the coming decades (larger uncertainty in precipitation than in temperature projections) ([Stewart et al. 2013](#)).

Seasonal trends show the extreme variability in precipitation between seasons and among seasons, and can also be used to highlight extreme events that have large ecological implications for humans (i.e., floods, droughts) and wildlife (i.e., high or low snowfall).

Increasing winter temperatures can lead to an increase in the number or intensity of rain-on-snow events that could potentially disrupt the path to the food supply for wildlife. The precipitation projections indicate that late spring may see an increase in precipitation amounts. Late spring snowfall events can interfere with the timing of bird migrations, wildlife health, green-up, and other ecological processes that begin once the snow has melted. The precipitation projections show that precipitation will increase the most during the summer months in Bettles; more rain and more intense rain events can lead to flooding, landslides, and soil instability.

Other projections

In addition to warmer average temperatures and changes in annual precipitation, climate change will exhibit itself in many other ways. Permafrost, which is present throughout the park, is projected to thaw across large portions of Interior Alaska by 2100 under both low and high emissions scenarios, altering local hydrology and potentially impacting roads, buildings, and other infrastructure ([Stewart et al. 2013](#)). The growing season is projected to increase 15–25 days by mid-century, and warmer spring temperatures already are linked to increased wildfire activity in Alaska ([Stewart et al. 2013](#)). Global climate change will interact with regional phenomena, such as the Pacific Decadal Oscillation (PDO). The phase of the PDO (negative or positive) may modify observed climate trends, with the negative phase damping and the positive phase exacerbating overall climate change trends. Significantly warmer temperatures and a more variable precipitation regime may lead to both more frequent droughts and more severe flooding and erosion.

Geologic Features and Processes


[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Geologic Record and Paleontological Resources	Robustness of available record		<p>A surficial geology map of Gates of the Arctic is available through the Geologic Resources Inventory (GRI) project (Hamilton and Labay 2012). A bedrock map is in production. A GRI report will soon follow the geologic maps. A formal paleontological resource survey has not been conducted, but a preliminary paleontological inventory was completed for all arctic parks (Elder et al. 2009).</p> <p>Gates of the Arctic contains marine sedimentary and metamorphic rocks that span from the Mesozoic to the Precambrian ≈ 75–600 million years ago. The older rocks are the source rocks for the North Slope oil province and the younger rocks represent the conventional reservoirs for the province. Hence, there is a long history of oil exploration on the adjacent lands managed by the state of Alaska, the National Petroleum Reserve in Alaska (NPR), and Alaska National Wildlife Refuge, and geologic exploration of the Gates of the Arctic region.</p> <p>Fossils are present in abundance throughout these rocks of the central Brooks Range. Most of the rock units found in the park contain considerable invertebrate paleontological resources, so there is potential for new discoveries.</p>
Glacial Features	Glacial extent & volume		<p>Most of the active glaciers (alpine glaciers) that appear in Gates of the Arctic are nestled in north-facing cirques. Glacial features as well as associated landforms including moraine deposits, outwash deposits, perched drainages, erratic boulders, eskers, drumlins, glacial lakes, cirques, hanging valleys, kettle lakes, and U-shaped valleys are abundant in the arctic parks. The Arrigetch Peaks and Killik areas are dramatic examples of glaciation in the Brooks Range at Gates of the Arctic. The Arrigetch area has large blockfalls and talus cones.</p> <p>Glaciers carved and sculpted much of the Brooks Range more than a million years ago. Later glacial events were smaller in scale and only partially overprinted the older events, thus preserving a complex history of intermittent glaciations, interglacial periods, and periglacial conditions. The area of glaciers in Gates of the Arctic today is only about half of what it was 30 to 40 years ago (Loso et al. 2014). Even prior to this retreat, glaciers in Gates of the Arctic covered relatively small areas and thus their loss has not greatly affected other resources.</p>

Geologic Features and Processes (continued)

[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
<p>Permafrost</p>	<p>Area of permafrost, temperature of permafrost, area of surface disturbance due to permafrost thaw</p>		<p>Permafrost underlies most of the park and affects everything in the arctic ecosystem. Permafrost refers to the layer of permanently frozen material beneath the intermittent freeze-thaw zone known as the active layer. Maintaining permafrost requires sub-freezing mean annual temperatures (21 °F to 10.4 °F locally).</p> <p>Permafrost is particularly sensitive to changes in climate. Degradation of permafrost occurs due to many factors including climate change, groundwater movement, and ice content. Degradation produces thermokarst, landscape collapse (scars, fens, bogs, and pits), water tracks and gullies, tussocks, piping, mounds, hummocky topography, and polygonal patterned ground.</p> <p>Modeling of permafrost temperature and extent in Gates of the Arctic has shown minor loss of area and warming since 1950 (unpublished results by the authors of Panda et al. 2014a, b). Ground temperatures at Bettles (the park's only near-by monitoring station with a long-term record) shows little warming since the sudden shift to a warmer regime in 1976 (Hartmann and Wendler 2005), indicating general stability of permafrost. The area of thaw slumps and slides in Gates of the Arctic was about 300 ha in the mid-2000s and has probably declined since (Swanson 2014).</p>
<p>Economic Resources and Mining</p>	<p>Mining potential</p>		<p>Alaska, with its natural resource abundance, has been a target for petroleum and mineral exploration throughout its history. The National Petroleum Reserve in Alaska borders Gates of the Arctic to the west. The Arctic National Wildlife Refuge (ANWR), an area of ongoing political debate, sits just east of Gates of the Arctic. Exploration studies stretch across the north slope of the Brooks Range north of Gates of the Arctic amidst waterfowl nesting habitat and caribou calving grounds.</p> <p>Within the schist belt along the south side of the Brooks Range in the Antler River area are volcanogenic sulfide deposits, approximately six of which are high grade. These deposits may continue laterally east or west outside of Gates of the Arctic. Mining companies could attempt to establish access to these deposits. Abandoned mines of Mascot Creek are upstream of Glacier Creek, which flows in Gates of the Arctic. The park is concerned about potential mine drainage issues from this abandoned mine.</p>

Resource Brief: Mapping Permafrost Thaw Features in Alaska's Arctic

The NPS has recently completed a map of small landslides and slumps caused by thaw of permafrost in the five NPS units in northern Alaska. These features expose bare soil to erosion, which makes them visible on high-resolution satellite imagery. The project mapped active-layer detachments (ALD) and retrogressive thaw slumps (RTS). Both of these features form by thaw of ice-rich permafrost near the ground surface.

Active-Layer Detachments – ALD are small landslides that occur on vegetated slopes. A surface layer a few feet thick slides downhill on a liquefied layer of mud over permafrost. ALD form after periods of unusually warm summer weather. This project found over 2,000 ALD, mostly in Noatak National Preserve and Gates of the Arctic. They were common on moderate slopes with thick tundra vegetation. Most of these ALD appear to have slid during the exceptionally warm summer of 2004, and most have grown over with vegetation since then.

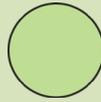


A retrogressive thaw slump where the top layer of usually frozen soil has melted and slid into the river below. NPS Photo.

Retrogressive Thaw Slumps – RTS are amphitheater-like areas of bare soil with an escarpment at the upper end that advances upslope by the thawing of very ice-rich material. Material falls down the escarpment and then oozes slowly downslope or is eroded away by flowing water. RTS often occur next to rivers or lakes and can shed sediment into an adjacent water body. Individual RTS can grow for a decade or more before they finally stabilize. This mapping found over 700 RTS, again mostly in Noatak National Preserve and Gates of the Arctic. The largest one, in Gates of the Arctic, covered about 20 acres (9 ha), but aside from this exceptional feature, most RTS were less than half this size. Old aerial photographs show that RTS have occurred in this region for decades, usually in the same general areas where they occur today. RTS can grow rapidly, with the upper escarpment moving uphill at up to 100 ft (30 m) per year.

The NPS will continue to monitor permafrost thaw features to determine if they are becoming more widespread.

Water Quantity and Quality


[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Water Quality	Water chemistry		In general, the lakes and streams within Gates of the Arctic are thought to be in good condition. The park's lakes and streams have low nutrient concentrations (LaPerriere, Jones, and Swanson 2003). Water chemistry in these remote ecosystems is most susceptible to climate change. Small changes in temperature can alter the thermal regime and nutrient cycling in these arctic ecosystems. Repeat monitoring data were collected in 2014 and 2015, and samples from these collection events have not yet been analyzed.
Streams & Rivers	Hydrologic regimes: mean annual flow and timing and magnitude of peak flows		<p>Many pristine streams and rivers are present in Gates of the Arctic. Six rivers in Gates of the Arctic have Wild and Scenic designation: Noatak, Kobuk, North Fork of the Koyukuk, John, Alatna, and Tinayguk. These rivers do not have any dams, bridges, or other development, and they provide an excellent opportunity to study fluvial processes free of human influence.</p> <p>Current hydrologic data for the park are almost nonexistent. There are currently no active stream gages within the park boundaries, and only limited information on instantaneous discharge or hydrologic regime at a handful of locations. Based on the available data and expert opinion, hydrologic regimes are expected to be within the range of natural variability. Climate change is expected to affect hydrologic regimes across the park in the future.</p> <p>Along the northern flank of the Brooks Range, surface water drains northward. North of these units is the National Petroleum Reserve in Alaska. Exploration for petroleum and coal may impact the downstream areas of the major drainages within the park. This could affect fish spawning and bird migration in addition to vegetation degradation in those areas.</p>
Lakes	Unspoiled character		Large arctic lakes dot the Central Brooks Range, including Kitnik Lake, Killik Lake, and Selby Lake. These lakes are uniquely pristine. Walker lake is a National Natural Landmark. Water quality monitoring is not conducted in the park.

Resource Brief: Nutuvukti Lake and Fen

Nutuvukti Lake is one of the most unique and interesting places in Gates of the Arctic. The lake lies in a trough between two mountain ridges covered with dwarf subarctic spruce forest and alpine tundra. Six miles long, Nutuvukti Lake is smaller than its more famous neighbor, Walker Lake, but is still one of the largest lakes in northern Alaska and home to lake trout, arctic grayling, arctic char, northern pike, and whitefish. The water in Nutuvukti Lake comes as runoff from the nearby mountain slopes and from the fen that lies on its northern shore. This fen is one of the few, and perhaps the largest, patterned fens in all of interior Alaska. It is called “patterned” because it is covered with an intricate pattern of low ridges and pools.

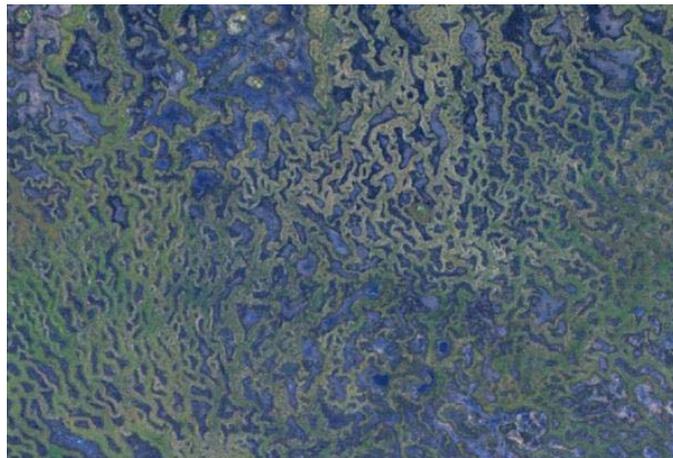
What is a Fen?

A fen is a type of wetland where the ground is composed of peat—partly decomposed plants. The spongy mass of peat is saturated with water and the vegetation is mostly grass-like sedges, usually with some moss and low shrubs. The water in a fen is not strongly acidic, because it originates from groundwater that contains dissolved mineral nutrients. In a fen, the water seeps slowly downhill in a wide sheet, like a “River of Grass,” as America’s most famous fen—the Florida Everglades—is sometimes called.

Permafrost and Water Flow

Most of the landscape around Nutuvukti Lake is underlain by permafrost—ground that stays frozen year-round. Only the top foot or two thaws each summer, so water from snowmelt and summer rains flows downslope quickly over the permafrost and never soaks deeply into the ground. As water flows downslope, it concentrates into “water tracks,” which are visible as green lines of vegetation. The permafrost contains ice bodies, and if it thaws, the ground subsides to form pits and ponds.

Just north of the Nutuvukti Fen is an area of low hills and rocky soil, called a glacial moraine, which marks the end of a glacier during the last ice age. This moraine is one of the few places on this landscape that lacks permafrost, which allows water to soak deeply into the ground and move underground into the fen and then on to the lake.



An aerial photograph of the western side of Nutuvukti Fen, showing the patterning. To give an idea of scale, the green wavy lines (vegetated ridges) are about 10–15 feet wide. NPS Photo.



Nutuvukti Lake, one of the largest lakes in Northern Alaska, lies between two mountain ridges in the Kobuk Preserve portion of Gates of the Arctic National Park and Preserve. NPS Photo.

Landscape and Ecosystem Processes


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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Wetlands	Area and continuity		Wetlands are a significant part of the landscape in the park, and are generally thought to be in good condition. Unimpeded flow of water over large surface areas is the foundation of the ecosystem. Impacts from thawing permafrost due to climate change as well as potential construction projects could impact this fragile resource.
Tundra Vegetation	Composition of vegetation communities		<p>Shrub expansion onto tundra is occurring as a result of climate warming. Shrub expansion onto tundra has been documented in Gates of the Arctic (Swanson 2013) and in other areas nearby (Tape et al. 2006). The herbaceous tundra and low shrub ecosystems where tall shrub increase has occurred are the most widespread ecosystem in the park.</p> <p>The cover, density, and height of shrubs have increased in tundra areas of Gates of the Arctic. Comparison of aerial photographs from about 1980 and 2010 across 5 NPS units in northern Alaska showed that about 14% of the area of tall shrub thickets in 2010 was new since 1980, but they still cover only about 6% of the total area (Swanson 2013). Most of the increase in shrubs is occurring in the relatively warm portions of the tundra lowlands or near current treeline. This shrub increase is expected to continue with climate warming. While shrub increase will benefit certain species such as moose and willow ptarmigan, it will alter the iconic arctic tundra landscape and harm some of the species that depend on it (Marcot et al. 2015).</p>
Invasive Plants	Area of invasive plant infestation		The only known exotic plant in Gates of the Arctic, was a single bird cherry (<i>Prunus padus</i>) tree on Walker Lake that was removed in 2013. An infestation of bird vetch (<i>Vicia cracca</i>) vine is present at Tramway Bar just outside the park boundary and is not reported to have spread into the park. A plant of concern is the invasive Elodea, a freshwater aquatic plant that has become established in southern and interior Alaska, often transported unknowingly by floatplanes. This plant has not been found in Gates of the Arctic.
Wildfire	Area burned		Large fire years (more than 50 km ² burned) occurred in Gates of the Arctic in 1959, 1969, 1991, and 2005. Very little has burned since 2005. Fire frequency has increased elsewhere in interior Alaska (Kasischke et al. 2010), but the small area susceptible to fires in the park has muted the increase within the park boundary.

Resource Brief: Ecosystem Connections

Geology forms the foundation of any ecosystem and there are numerous examples of geologic factors strongly influencing flora and fauna distribution patterns throughout the arctic parks. Geologic structures and formations often have unique characteristics that render them ideal habitat for birds and animals. Bedrock composition factors strongly into the overlying soil chemistry. Plants growing in soils derived from heavy metal deposits have high heavy metal tissue concentrations and this is creating dental problems in moose populations feeding on these plants.

Glacial deposit distributions strongly control plant assemblages. For example, well drained glacial moraine crests support aspen groves whereas the poorly drained troughs between the crests host spruce forests. Some plant species are able to tolerate the movement associated with solifluction slopes developed on shale. Permafrost also has significant implications for ecosystem health. In transition areas between frozen and unfrozen ground, vegetation changes from spruce forests to aspen forests, respectively. Other permafrost-related features include patterned ground.

Where permafrost is degrading, lowland areas flood, forest and shrub vegetation drowns, and upland areas become drier. Along thermokarst lakes, the margins degrade laterally as the shoreline slumps into the lake. This slumping releases bursts of sediment into the system. The effects of this increased sediment load on fish and aquatic habitats are unknown. Melting ice from permafrost degradation may release components that could also change local water and soil chemistry.



Colorful fall tundra and the Brooks Range. NPS Photo.

Birds


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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Landbirds	General status		<p>Breeding birds are an important component of park ecosystems, and their high mobility and capacity for responding rapidly to environmental change makes them good indicators of local and regional ecosystem change (Fancy and Sauer 2000). Early monitoring efforts in Alaska's arctic parks focused on riverine bird assemblages. The current NPS Arctic Network landbird monitoring program (implemented in 2015) consists of three montane reference sites including Anaktuvuk Pass in Gates of the Arctic and two sites in Noatak National Preserve. The only broad-scale landbird inventory to date within the arctic parks was conducted by the USGS from 2001–2003 (Tibbits et al. 2006). Multiple years of data does not exist for these sites or the riverine sites surveyed by NPS, precluding estimation of temporal trends in distribution and population size.</p> <p>Recent work in Denali National Park and Preserve showed rapid alteration of the passerine community (Mizel et al. 2016) consistent with observed patterns of climate-induced expansion of woody vegetation across open landscapes in the sub-arctic and Arctic (Tape et al. 2006, Stueve et al. 2011). Most shrub-tundra species exhibited upward shifts in their optimum elevation and several forest-associated species showed range expansion near treeline. These results suggest the potential for similar changes in the abundance and distribution of passerine species in the Arctic although the ultimate effects of climate warming are unknown.</p>
Shorebirds	General status		<p>Loss of wetlands—particularly migratory stopover areas outside of Alaska that are important to the species breeding in the park—represents the greatest threat to shorebird populations worldwide. In addition to development impacts, wetland habitats are threatened by climate change, through rising sea level, drying of interior wetlands, and increased storm frequency and intensity (Thorne et al. 2015).</p>

Fish


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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Non-salmon Fish	Abundance		<p>Lake trout, Dolly Varden, arctic char, and grayling are commonly harvested by Anaktuvuk Pass residents in surrounding lakes, rivers, and creeks. Backcountry users are allowed to harvest non-salmon fish. The amount of recreational and subsistence harvest and its effects on healthy fish populations is not currently quantified.</p>
Chum Salmon	Abundance		<p>Chum salmon are mainly found in the Kobuk Preserve unit of Gates of the Arctic. The abundance and degree of harvest of chum salmon in the preserve unit is unknown at this time.</p>

Resource Brief: Dall's Sheep

Dall's sheep are an alpine-adapted species at their northernmost extent in the Brooks Range of Alaska. Dall's sheep are an important subsistence species for local residents and highly valued where sport hunting is permitted in preserves. Monitoring population trends is critical to conserving Dall's sheep and maintaining hunting opportunities. Moreover, information about sheep abundance, distribution, demographics, and health can be highly indicative of changing environmental conditions over time.

There were an estimated 10,072 sheep in 2010 in Gates of the Arctic National Park and Preserve. Annual surveys indicated a stable population in the Itkillik subarea of Gates of the Arctic from 2009 to 2012 ($\approx 1,750$ sheep). However, sheep declined more than 60% in the Itkillik in 2013 and 2014 and more than 70% across other Western Arctic Parklands from 2011 to 2014. Very low numbers of lambs were observed in 2013 (1–14 lambs per 100 ewe-like sheep, which includes ewes, yearlings and young rams) in multiple areas in Alaska and Canada and this trend was repeated in the Brooks Range in 2014.

In 2015, total and adult sheep were about 25% lower across Gates of the Arctic than in 2010. The exact cause of the recent decline is not known, but may in part be due to the record cold spring in 2013. Environmental conditions, including particularly harsh winter weather, are limiting factors for Dall's sheep populations. Due to the decline, all hunts in the Western Arctic Parklands were closed by emergency order in 2014 and 2015. Surveys will be conducted annually in Gates of the Arctic to assess further population changes.

Substantial populations of Dall's sheep reside in the central Brooks Range and constitute an important subsistence resource in areas adjacent to Allakaket, Alatna, Anaktuvuk Pass, and Wiseman. Sport hunters prize opportunities to pursue sheep in the Itkillik Preserve unit of the park.



Dall's sheep in the Brooks Range. NPS Photo.

Mammals



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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Moose	Population density		<p>Distribution of moose in the Arctic is limited by their winter range and winter access to shrubs over 1 meter tall (Tape et al. 2016). Available habitat has changed over time concurrently with climate and fire regimes that favor the succession of woody browse over lichens (Joly et al. 2012). Moose have been found in the archeological record in arctic Alaska, but were absent from this region prior to recolonization in the 20th century (Westing 2012).</p> <p>Moose are an important subsistence resource and a prized sport hunting species. Moose density in the southeastern portion of the park appears to be low but relatively unchanged over the past decade (Sorum et al. 2015). In the southwestern portion of the park, moose density is low and also relatively unchanged (Lawler and Dau 2006). Additional data was collected for this area in 2014, but results are pending. Moose are less common in northern areas of the park.</p>

Mammals (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Caribou	Migration phenology (average date of fall Kobuk River crossing)		<p>Climate change is anticipated to affect mammals in many ways, including the timing of migration. Caribou in north-west Alaska have crossed the Kobuk River for thousands of years. There does not appear to be a change in the average timing of this fall crossing, though there is some indication that the first collared caribou has been coming later and later (Joly & Cameron 2015).</p> <p>The Western Arctic Caribou Herd is currently at the low end of its population cycle. In general, the health and success of the various herds in this region is stable, with some natural fluctuation.</p>
Dall's Sheep	Population size in Itkillik Preserve		<p>There was a 60% decline in sheep abundance from 2012 to 2014 (Rattenbury, <i>unpublished data</i>). Preliminary data from 2015 indicates that the decline might not be a long-term trend. Natural fluctuations in population may increase impacts of human harvest on population numbers.</p> <p>Populations fluctuate naturally as sheep are a relatively non-migratory and alpine-adapted species sensitive to local environmental change. Large declines have been linked to severe winter weather such as the cold spring in 2013, deep snow in the early 1990s, and icing events that may reduce nutritional condition and increase vulnerability to predation (Nichols and Bunnell 1999, Shults 2004).</p>

Resource Brief: Caribou

Many residents of northwestern and northern Alaska—including those in and around Gates of the Arctic—are Alaska Natives that identify as “caribou people.” The caribou is ingrained in the history, traditions, and psyche of this region. Approximately 15,000 are harvested annually from the Western Arctic Caribou Herd by local rural residents; most of whom live a lifestyle with a strong subsistence component. The Western Arctic Caribou Herd has been one of the largest herds in the world, nearing 500,000 animals in 2003, though it had declined to 235,000 by 2013 and 201,000 in 2016 (decline slowed from 15% per year to 5% per year). This decline has resulted in restrictions in sport and subsistence harvests. The herd’s ecological impact on the parks, though still great, is not fully appreciated. A herd of this size can substantially impact its habitat, which covers all of northwest Alaska (over 360,000 km²), its primary predators (wolves and grizzly bears), as well as a suite of other animals through cascading trophic effects.

NPS goals are to monitor the movements, distribution, and health of these caribou. The caribou traverse all of the parks in northern and western Alaska—Gates of the Arctic, Noatak National Preserve, Kobuk Valley National Park, Cape Krusenstern National Monument, and Bering Land Bridge National Preserve—moving across them and residing in different park units at different times of year. Further, the timing and spatial pattern of the herd’s migration plays a critical role in the harvest of caribou by rural villages. Changes to these patterns may affect these subsistence users, the vitality of the herd and the ecosystem as a whole.



Caribou swim the Kobuk River. NPS Photo.

NPS monitoring of the Western Arctic Caribou Herd began in 2009. Since then, over 95 GPS collars have been deployed which have collected well over 250,000 caribou locations. Collared caribou have utilized all five arctic park units (Bering Land Bridge, Cape Krusenstern, Gates of the Arctic, Kobuk Valley, and Noatak). During September and October, Kobuk Valley National Park was heavily utilized by the Western Arctic Caribou, while Bering Land Bridge National Preserve was also heavily used as winter range. The herd calved north of the Noatak Preserve in early June. The herd walks about 3,100 km (1,900 miles) each year during its annual migration cycle—one of the longest terrestrial movements on the planet. Caribou use the historic Onion Portage crossing of the Kobuk River in fall and spring. The fall migration tends to be concentrated towards the eastern end of the Noatak River, away from many large subsistence communities including Kotzebue, Noatak, Kiana, Selawik, and Noorvik. Caribou migrating west encounter an industrial road, which has been recently shown to delay migration of some caribou by a month. It is too soon to identify trends in the timing and distribution of Western Arctic Caribou Herd movements. New analyses confirmed the importance of lichens as winter forage for the Western Arctic Caribou Herd ([Joly et al. 2012](#)).

Dark Night Sky



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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Anthropogenic Light	Anthropogenic light ratio (ALR) — average anthropogenic sky glow: average natural sky luminance		A photic environment is the physical amount and character of light at a particular location, irrespective of human perception. The NPS Night Sky Program characterizes a park’s photic environment by measuring both anthropogenic and natural light. While no ground-based or modeled data are available for Gates of the Arctic, 2012 visible infrared imaging radiometer (VIIRS) satellite data, which uses a broadband imaging detector with high sensitivity, indicates that there is very limited visible upward radiance within the park boundary. The most significant source of upward radiance in the region originates from Prudhoe Bay north of the park.

Resource Brief: Night Sky Resources at Gates of the Arctic

The night sky has been a source of wonder, inspiration, and knowledge for thousands of years. Unfettered night skies with naturally occurring cycles of light and dark are integral to ecosystem function as evidenced by the fact that nearly half the species on earth are nocturnal. The quality of the nighttime environment is relevant to nearly every unit of the NPS system as the nighttime photic environment and its perception of it by humans (the lightscape) are both a natural and a cultural resource and are critical aspects of scenery, visitor enjoyment, and wilderness character.



Northern lights in the dark winter sky over Gates of the Arctic. NPS Photo.

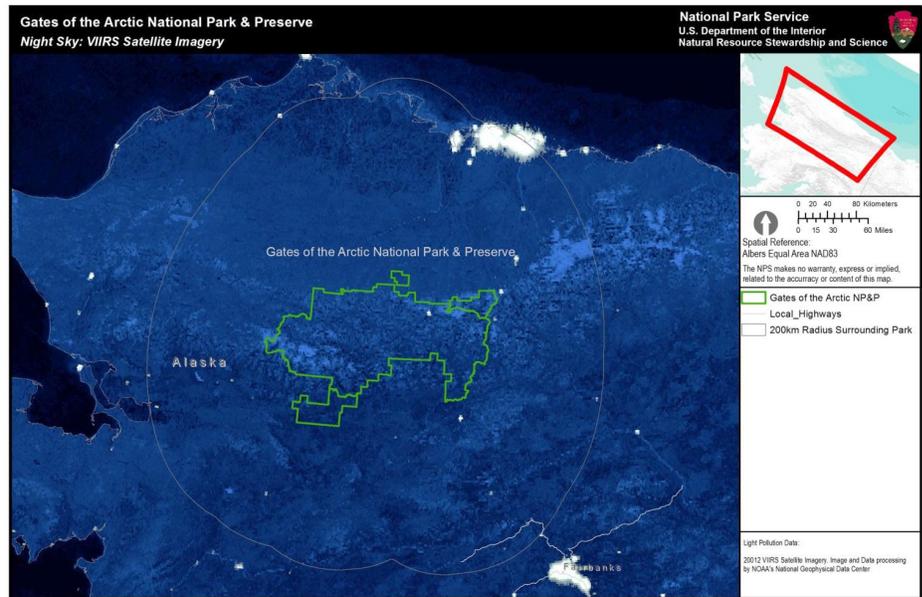
feel they are in a natural environment. The Milky Way is visible from horizon to horizon and may show great detail, with fine details such as the Prancing Horse. Zodiacal light (or “false dawn” which is faint glow at the horizon just before dawn or just after dusk) can be seen under favorable conditions, and there is negligible impact to dark adaptation looking in any direction.

Assessment

No ground based or modeled data are available for Gates of the Arctic. However, 2012 visible infrared imaging radiometer (VIIRS) satellite data, which uses a broadband imaging detector with high sensitivity is suitable for detecting direct or reflected sources of upward radiance of anthropogenic sources of light on the earth’s surface. These data are qualitative and are not calibrated to known thresholds or reference conditions.

Condition and Functional Consequences

Night sky quality at Gates of the Arctic is in good condition. 2012 visible infrared imaging radiometer (VIIRS) satellite data, which uses a broadband imaging detector with high sensitivity—suitable for detecting anthropogenic sources of light on the earth’s surface—reveals limited upward light within the park from the Anaktuvuk Pass area. Additionally, very little anthropogenic light is detected in an area within a 200-km radius around the park except for substantial upward radiance from the Prudhoe Bay region north of the park. Given these very low levels of upward radiance within the park and the distance from Prudhoe Bay—the main source of upward radiance in the region—the photic environment of Gates of the Arctic is subject to the natural regime of dark/light patterns, allowing visitors to the park to experience pristine night sky resources. At these light levels, most observers



Regional view of anthropogenic light near Gates of the Arctic. White and red represent more environmental influence from artificial lights while blue and black represent natural conditions. This scale shows regional context and how far-reaching the impacts of artificial lighting can be. With limited upward radiance visible within the park boundary, and the distance of Prudhoe Bay from the park, Gates of the Arctic serves as a harbor of dark skies.

Acoustic Environment


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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Acoustic Impact Level	A modeled measure of the noise (in dBA) contributed to the acoustic environment by man-made sources		The condition of the acoustic environment is assessed by determining how much noise man-made sources contribute to the environment through the use of a national noise pollution model. The mean acoustic impact level at the park is 0.0 dBA, meaning that the acoustic environment is in good condition. Acoustic conditions in national parks are largely driven by transportation activity, and overall, long-term projected increases in ground-based (Federal Highway Administration 2013) and aircraft traffic (Federal Aviation Administration 2010) indicate a deteriorating trend in the quality of acoustic resources at this location.

Resource Brief: Soundscape Monitoring in Southern Gates of the Arctic

In 2013, NPS scientists collaborated on an effort to monitor sounds in the southern portion of Gates of the Arctic. The data were used to establish a baseline of acoustic conditions in this uniquely wild, low elevation, lakes region.

In addition to superlative scenic and recreation values, the region is the headwaters of the Kobuk River, a pristine recreational area and highly productive fishery and freshwater resource for subsistence communities along the river to the immediate west. In 1980, the United States Congress designated 110 miles (177 km) of the river downstream from Walker Lake as the Kobuk Wild and Scenic River, part of the National Wild and Scenic Rivers System.

The 2013 monitoring effort was the first of its kind in the park and is partly in response to current development proposals and the associated increase in human activity in and around this area of the park and preserve. The sound monitor was installed by NPS staff on the southern shore of Walker Lake at an altitude of 645 feet (198 m) on August 22, 2013. The data collected and metrics to be analyzed include: the amount of time motorized sounds are audible, the number of motorized events by source category (e.g., propeller aircraft, jets, helicopters, boats, etc.), decibel levels of sound events (loudness), as well as categorization of natural sounds. Additional monitoring is in the planning stages with locations of monitors adjusted based upon future management objectives within the park.



View from the southern shore of Walker Lake in Gates of the Arctic National Park. NPS Photo.

Resource Brief: Acoustic Environment at Gates of the Arctic

To characterize the acoustic environment, the NPS has developed a national model of noise pollution (Mennitt et al. 2014). This model predicts the increase in sound level due to human activity on an average summer day. The model is based on measured sound levels from hundreds of national park sites and approximately 100 additional variables such as location, climate, vegetation, hydrology, wind speed, and proximity to noise sources such as roads, railroads, and airports. The model reveals how much quieter parks would be in the absence of human activities. The quality of the acoustic environment affects visitor experience and ecological health. Acoustic resource condition, both natural and cultural, should be evaluated in relation to visitor enjoyment, wilderness character, ecosystem health, and wildlife interactions. Learn more in the document [Recommended indicators and thresholds of acoustic resources quality for NPS State of the Park Reports](#), and the NPS Natural Sounds & Night Skies Division [website](#).

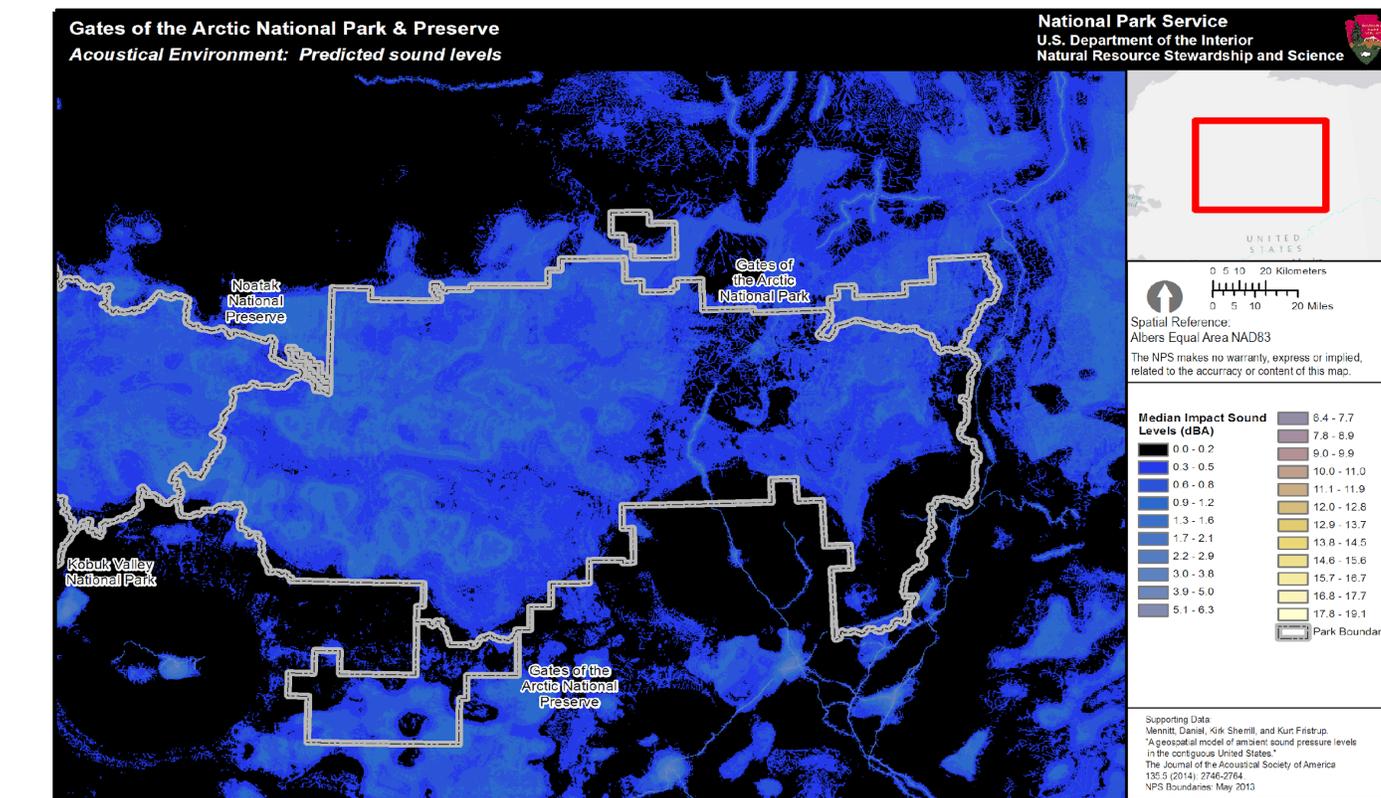
Additionally, long-term acoustical measurements were made in the park at seven sites in 2013 and 2014. Results from this analysis are forthcoming and will be available as a natural resource report on the web at irma.nps.gov.

Criteria for Condition Status/Trend

For State of the Park reports, NPS has established acoustic standards (green, amber, red) and two sets of impact criteria for urban parks and non-urban parks. A park's status (urban or non-urban) is based on data from the U.S. Census Bureau (U.S. Census 2010). Parks outside designated urban areas typically possess lower sound levels, and exhibit less divergence between existing sound levels and predicted natural sound levels. These quiet areas are susceptible to even subtle noise intrusions, so care should be taken to maintain low impact conditions in these places. Park units inside designated urban areas typically experience more interference from noise sources. Based on these assumptions, all Alaska parks will be assessed using the non-urban criteria. Condition thresholds are listed in the table to the right. Just as smog limits one's ability to survey a landscape, noise reduces the area in which important sound cues can be heard. Therefore, thresholds in the table are also explained in terms of listening area.

Indicator	Threshold (dBA)
Acoustic Impact Level A modeled measure of the noise (in dBA) contributed to the acoustic environment by man-made sources.	Threshold ≤ 1.5 Listening area reduced by $\leq 30\%$
	$1.5 < \text{Threshold} \leq 3.0$ Listening area reduced by 30 – 50%
	$3.0 < \text{Threshold}$ Listening area reduced by $> 50\%$

Condition thresholds for the acoustic environment in non-urban parks



NPS Natural Sounds & Night Skies Division and NPS Inventory and Monitoring Program MAS Group 20151124

Map of predicted acoustic impact levels in the park for an average summer day. The color scale indicates how much man-made noise increases the sound level (in A-weighted decibels, or dBA), with 250-meter resolution. Black or dark blue colors indicate low impacts while yellow or white colors indicate greater impacts. Note that this graphic may not reflect recent localized changes such as new access roads or development.

2.2. Cultural Resources

Archeological Resources			web ▶
Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Scope of archeological resources in the park is understood and a determination has been made whether or not they are a fundamental or other important resource.		Archeological resources are a significant resource, as stated in the park foundation statement. The scope of archeology within the park is generally well understood and knowledge of these resources is increasing with continued research and management efforts by park staff and collaborators. While the broadest scope of prehistoric and historic archeological resources are known, there are many portions of the park and kinds of settings that are only superficially understood. For example, the earliest prehistory (> 7,000 years ago) is represented by very few sites, and the nature of the archeological record in specific contexts such as the alpine zone, caves, and smaller tributary valleys is not well understood.
	The distribution and types of archeology sites is understood.		General understanding of the distribution and types of archeological sites throughout the park is well documented. A more detailed understanding exists for some areas of the park, including well known lakes and portions of major drainages. At the scale of 8+ million acres, there are still unknowns and room for improvement. For example, permanent snow and ice patches have become resources of high archeological potential in the past decade, and are only now beginning to be studied in earnest by the park.
	The mechanisms affecting site stability and taphonomic influences are understood.		Mechanisms affecting site stability and taphonomic (physical change over time) processes are largely natural, including bioturbation and cryogenic factors. Park staff is aware of the implications of Arctic warming and permafrost loss, and is prioritizing survey and excavation locales accordingly.
Inventory	Percentage of survey data included in the Geographic Information System (GIS).		All survey data from 2007 to present is included in the park GIS and meets the current Cultural Resource Spatial Data Transfer Standards (v. 2). Legacy data has been digitized from technical reports and included in the GIS. Over the past five years 100% of geospatial survey and inventory data is included in the park Geographic Information System and regional permanent GIS.
	Percentage of archeological resources with complete, accurate, and reliable State site forms.		Archeological discoveries and assessments are entered into the Alaska state database by professional archeologists in a timely manner. The park has a good relationship and a history of good communication with the State Historic Preservation Office (SHPO).
	Percentage of archeological resources with complete, accurate, and reliable data in the Archeological Sites Management Information System (ASMIS).		100% of ASMIS records have all required fields completed. ASMIS data entry is entered by professional archeologists by the September 30 deadline each year. Over the past ten years, 100% of newly documented sites are added to ASMIS in the year they are discovered; there is no data entry backlog for ASMIS.

Archeological Resources (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Documentation	Percentage of known sites with Determination of Eligibility (DOE) documentation.		128 of 1,784 known sites (7%) have completed DOE documentation. In an expansive wilderness park, park staff has recently transitioned from a basic inventory mode to projects focusing on DOEs. These projects are slated to continue for the next two to three years, and will add to this effort.
	Percentage of archeological materials cleaned, conserved, studied, cataloged, and properly stored.		All incoming archeological collections are cleaned, cataloged, and stored according to the current professional standards. There is no catalog backlog. Collections are stored in a modern facility in the Fairbanks Administrative Center that meets or exceeds the vast majority of curatorial standards.
	Park base maps are prepared showing the location and distribution of archeological resources, the nature and extent of archeological identification activities, and the types and degree of threats and damages.		GIS data such as archeological site locations, survey transects, and ASMIS information are updated annually after the close of the field season. Maps displaying this information can be created on demand.
Certified Condition	Percentage of archeological resources certified as complete, accurate, and reliable in the Archeological Sites Management Information System (ASMIS) in good condition.		64% of archeological sites within the park are in good condition. Generally, site revisits show no change in condition.

Cultural Anthropology


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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research is conducted to understand the relationship of the park's ethnographic resources to the historic context(s) for the park.		The park has considerable knowledge and data related to ethnographic resources and a good understanding of connections between members of resident zone communities, their history and culture, and connections to park resources and important places. A rich body of oral histories exists from places like Anaktuvuk Pass and communities on the upper Kobuk River. Additional ethnographic treatments of specific topics and geographic areas are in progress or planned for future years. The park does not employ a dedicated ethnographer or cultural anthropologists, but does have a team of specialists with anthropological backgrounds (subsistence specialist, archeologist, and historian) who address ethnographic research needs with help from regional NPS staff, and often through contracts and agreements with academic collaborators.
	The scope of resources significant to affiliated groups associated with the park is understood and a determination has been made whether or not they are a fundamental resource or other important resource or value.		There is understanding of cultural resources that are historically significant to affiliated groups linked to Gates of the Arctic. This understanding is based on historic written reports and books compiled when the park was established. Documentation about evolving cultural connections to the park and modern connections to the land and its uses could be improved.
	Percentage of cultural anthropology baseline documents with current and complete information.		Gates of the Arctic has a wealth of documentation of ethnographic information, including oral histories and photographs, but formally drafted baseline documents are lacking. Information on contemporary subsistence is limited and could be improved. A new ethnographic assessment is in progress. A Gates of the Arctic funded project entitled "Traditional Ecological Knowledge of Moose, Other Wildlife Species, and Climate Change in Allakaket/Alatna" resulted in a written report sharing local knowledge about ecological and social impacts of climate change by residents of Allakaket and Alatna. Each passing year marks the loss of knowledge bearers and elders who can contribute to the documentation process.
Documentation	Planning documents contain current information on traditional resource users and uses, the status of ethnographic data, and the legislative, regulatory, policy, or other bases for use.		Cultural uses and themes (modern and historic) are actively incorporated into park planning documents. The current Gates of the Arctic General Management Plan (GMP) incorporates information on traditional resource users and uses and related legislative/regulatory policies. The park's foundation document has a heavy emphasis on local cultural elements and the relationship between local people and their landscape.

Resource Brief: Uncovering Prehistory at Lake Matcharak

The Matcharak Peninsula archaeological site in the Noatak River valley was originally identified in 2009 when NPS archeologists discovered a 5,000 year-old caribou bone and stone tools. Small portions of the site were excavated between 2010 and 2013, resulting in over 600 bones, bone fragments, and stone tool flakes being recovered from approximately 6 m³ of excavated sediments.

The first formal tools recovered from the site were found in 2013, including the base of a side-notched point (a tool indicative of Northern Archaic technology), a microblade core, numerous microblades, and utilized flake tools. Radiocarbon dates that are associated with stone tools and well-preserved bone recovered from the site reflect human occupations as early as 7,000 years ago, making it significant as the largest collection of well-preserved faunal remains from this time period and the associated Northern Archaic technological tradition. Analysis of the artifacts from this site should shed light on life ways of these arctic hunter-gatherers, how they subsisted at Lake Matcharak, during what time period, and at what time of year. All sediments were backfilled upon completion of the project to leave as little trace of the fieldwork as possible.



A stone microblade core discovered during excavations at the Matcharak Peninsula Site in 2013. NPS Photo.



Archeologists at work on the Matcharak Peninsula Site during August 2013. This photo was taken about a week after excavations began. The string grid helps to guide the archeologists on where to excavate and is used to map the exact location of each artifact that is found. NPS Photo.

Cultural Landscapes


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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research exists to understand the relationship of the park's cultural landscapes to the historic context(s) for the park.		Gates of the Arctic has identified and documented two cultural landscapes that are the best representative of the most significant historic contexts (subsistence economies) in the park: Agiak Lake Landscape and Itkillik Lake Landscape.
	Scope of cultural landscapes in the park is understood and a determination has been made whether or not they are a fundamental or other important resource.		Thorough consideration has been made concerning identified cultural landscapes in the park. These archeologically rich areas have been rigorously documented and are fundamental resources to the park.
Inventory	Percentage of Cultural Landscapes Inventory (CLI) data included in the Geographic Information System (GIS) meeting current cultural resource standards.		100% of the cultural landscapes defined in Gates of the Arctic have been captured in a GIS format. Data is professionally collected and managed, and is of high resolution. Structures have been mapped with high precision.
Documentation	Percentage of cultural landscapes with adequate National Register documentation.		100% of the cultural landscapes in the park have been evaluated using National Register criteria. Both of the identified cultural landscapes in Gates of the Arctic have been determined eligible, but have not yet been nominated for National Register listing.
	Percentage of cultural landscape reports and publications entered in the Integrated Resource Management Applications (IRMA) database.		100% of the park's cultural landscape reports and publications are entered in IRMA.
Certified Condition	Percentage of cultural landscapes certified as complete, accurate, and reliable in the Cultural Landscapes Inventory (CLI) in good condition.		100% of the park's cultural landscapes are in good condition and documentation is complete and thorough. Ongoing assessment and updating of CLI data occurs annually.

Historic Structures


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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research is conducted to understand the relationship of the park's historic structures to the historic context(s) for the park.		The large majority of historic structures in the park are documented in ways that track condition and establish architectural features and historic context. Types of documentation include: List of Classified Structures, National Register Determinations of Eligibility (DOE), and cultural landscape inventories. The Historical Context Study "Arctic Citadel" (2013) helped establish historical context for the park unit. More work needs to be done related to gold mining and related structures.
	Historic structures are identified and evaluated using historical contexts.		National Register determinations of eligibility (15 total) document historic context for park structures. More structures remain to be documented. The park would benefit from further work on historic contexts.
	Scope of historic structures in the park is understood and a determination has been made whether or not they are a fundamental or other important resource.		The park unit needs additional history studies to establish the importance of historic structures in the park. Gates of the Arctic is a designated wilderness, and that designation includes protections for historic structures. An upcoming Special History Study of the Koyukuk River and Kobuk River gold stampedes will increase the scope of knowledge surrounding these important pieces of the park's history.
	Percentage of historic structures with Determination of Eligibility (DOE) documentation.		Of the roughly 75 known historical sites in the park, 15 have DOEs or equivalent documentation (20%). Not all of the historical sites would warrant DOE treatment, but many do, and more work needs to be done. A phased, multi-year plan exists to more completely document and evaluate historic structures.
	Research results are disseminated to park managers, planners, interpreters, and other NPS specialists and incorporated into appropriate park planning documents.		Research related to the park's history is disseminated by various methods, including the park website, one-page factsheets, social media, books, and presentations. All information about park history is available for incorporation into park planning documents, including into the park's 2014 General Management Plan Amendment.
Inventory	Percentage of historic structures certified as complete, accurate, and reliable in the List of Classified Structures (LCS) in good condition.		In the park LCS, 11 of 12 structures are listed in good condition (91%). The LCS for the park includes 11 archeological sites of prehistoric origin. The remaining property is a log cabin ruin that will never improve to good condition.

History


[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research is conducted to understand the national significance and historical contexts for the park.		<p>Research to document the history of Gates of the Arctic has been inconsistent over the past 20 years, but has improved steadily in the past 7 years.</p> <p>The Historic Context Study “Arctic Citadel” (2013) provides a broad understanding of military and naturalist exploration history in Gates of the Arctic and nearby park units as well as an introduction to the Klondike-Alaska gold rush and other expeditions that shaped the history of northern Alaska. However, more needs to be done, particularly regarding gold rush history and later gold mining.</p>
	Sufficient research is conducted to establish the reasons for park establishment and a history of the NPS management of the site.		Gates of the Arctic is a relatively young park, established in 1980. The park does not yet have an administrative history, though the reasons for the establishment of the park are well documented in legislation (ANILCA), the park’s Foundation Statement (2012), and the park’s General Management Plan (2014).
	Research at the appropriate level of investigation (exhaustive, thorough, or limited) precedes planning decisions involving cultural resources.		In general, Gates of the Arctic actively completes the appropriate level of investigation and compliance regarding research for planning.
	Research is conducted by qualified scholars.		The park historian holds a doctorate in public history and has over ten years of experience working for Alaska’s national parks. The park historian is assisted by regional and national NPS staff and works closely with park-based archeologists.
	Cultural resources are inventoried and evaluated in consultation with State Historic Preservation Officers (SHPOs).		The Alaska SHPO is consulted whenever plans are in place to alter a historic structure or a historical landscape. Only after approval is received from the SHPO does such work proceed.
	Research data are accessioned as part of the park’s museum collection.		All research data are added to the park’s museum collection as a matter of routine.
	Inventory	Percentage of cultural resources listed in appropriate Servicewide inventories, including the National Register.	

Museum Collections


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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research and analysis exists to understand the relationship of the park's museum collection to the historic context(s) for the park.		In recent years, the Gates of the Arctic museum collections have grown. Collections have been the subject of ongoing research efforts to better understand the cultural and natural histories of the park and the ways these histories are represented by the collection.
	Scope of museum collection in the park is understood and a determination has been made whether or not they are a fundamental or other important resource.		The Gates of the Arctic research collection is considered to be a significant aspect of the cultural and natural histories of the park. It is actively maintained and collections are part of ongoing research projects to further understand park resources.
	Percentage of museum collection baseline documents with current and complete information.		90% of museum collections baseline documents are current and complete. The collection is still in need of a Condition Survey (a required baseline document that describes the condition of museum collections).
	Museum curator is included in permit review and informed about park resource projects that may affect collections.		The Gates of the Arctic museum curator position is currently vacant, although an interim curator is in place. For the past several years, the curator has been a member of the Gates of the Arctic interdisciplinary compliance team and actively participates in the research permitting process and projects that affect collections.
Inventory	Archival and manuscript collections are surveyed and described in the Interior Collections Management System (ICMS) and finding aids are produced.		The Gates of the Arctic archives collection was processed and reorganized in 2014 to current, best practice standards. However, the collection has continued to grow and is currently in need of a secondary processing effort. Additionally, the reorganized records were not properly entered into ICMS.
	Percentage of existing collection that is accessioned and cataloged.		99.8% of the park collections are accessioned and cataloged, and only a small backlog exists. A system is in place to accession and catalog newly acquired collections within the fiscal year they are acquired.
Documentation	Accession and deaccession files are complete with all appropriate signatures		Accession and deaccession files for the park are generally complete, although they are represented by a combination of paper and digital records. Work is underway to better organize these records for more efficient search and retrieval of accessions data.
	Percentage of cataloged records with completed descriptive fields (beyond required fields).		100% of cataloged records have completed descriptive fields in ICMS. Catalog records for archives have completed descriptive fields, but would benefit from being updated to reflect current standards.
Certified Condition	Percentage of museum collection reported in the Collections Management Report and checklist report in good condition.		79% of the park's cataloged collections are in good condition.

Resource Brief: Ancient Brooks Range Artifacts Return Home after Nationwide Tour

In March 2015, four objects from the Gates of the Arctic museum collections returned from a year-long traveling exhibit that traversed the United States and shared a few arctic treasures with people outside of Alaska. Throughout 2014, the “Voices of the Wilderness” exhibit celebrated the 50th anniversary of the Wilderness Act. Archeological and ethnographic objects from Gates of the Arctic included a quartz crystal spear point used to hunt caribou 5,000 years ago and a ladle made from a Dall sheep’s horn, which was dated to the last century. These objects played a unique role in the exhibit, highlighting the very long history and deep connections that people have to the lands included in the national wilderness preservation system. The objects have since returned safely to their climate-controlled and secure storage in the Gates of the Arctic collections facility in Fairbanks, but are routinely rolled out for temporary displays, graduate student research projects, and educational outreach efforts with local K–12 students.



This ancient spear point tip from an archeological site in Gates of the Arctic dates to 5,000 years ago. It once armed a hunter who likely used it for caribou hunting. Made from a rarely seen material—quartz crystal—the tool was not only functional, but also beautiful, a quality surely appreciated by its prehistoric owner. NPS Photo.

2.3. Visitor Experience

Visitor Numbers and Visitor Satisfaction

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Number of Visitors	Number of visitors per year		The park visitor centers received a record 12,669 visitors in 2014 and 10,745 in 2015. The remoteness and difficult accessibility of this park creates challenges in actually counting visitors. Only a fraction of the visitors who stop in at the visitor center on the Dalton Highway will visit areas within the park, but the Bettles Visitor Center serves more who do access the park. There is a core of local users that enter the park on a regular basis, but they are not counted as visitors.
Visitor Satisfaction	Percent of visitors who were satisfied with their visit		Visitor satisfaction surveys show consistently high results, with 98% to 100% of visitors satisfied overall with facilities, services, and recreational opportunities.

Interpretive and Education Programs – Talks, Tours, and Special Events


[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Education Programs	Number and quality of programs, and number of participants		<p>Over 40 educational programs are offered annually in Fairbanks, the largest city in northern Alaska, through the Fairbanks Alaska Public Lands Information Center (FAPLIC) and education specialists based there. In 2016, the education staff debuted a long distance learning program.</p> <p>Budget and travel logistics limit visits to the small rural communities closer to the park. On average, Gates of the Arctic staff provides 10 education programs to schools in rural communities near the park. This includes an annual program focused on engaging students with local resources, including bird identification, caribou butchering and use, and passing on traditional knowledge from elders in the community of Anaktuvuk Pass, which is within the boundaries of the park. In 2016, the NPS hosted the first BioBlitz for the Anaktuvuk Pass area, which involved students and other community members.</p> <p>FAPLIC provides interpretive materials for Gates of the Arctic National Park, Yukon-Charley Rivers National Preserve, and the Western Arctic Parklands to visitors in person, via the internet, or by mail.</p> <p>High school and college students assist operations annually through internships with Youth Conservation Corps, Student Conservation Association, Alaska Native Science and Engineering Program, and graduate schools.</p>

Interpretive and Education Programs – Talks, Tours, and Special Events (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Ranger Led Programs	Number and quality of programs and attendance		The Bettles and Coldfoot visitor centers offer tours and programs throughout the summer. These programs reach approximately 2,500 people annually. Park staff at these locations is proactive in designing new interpretive programs and talks.
Backcountry Orientation	Number and quality of programs and attendance		Backcountry orientation is presented to all visitors entering the park. A strong safety and leave no trace ethic is emphasized. Bear resistant food containers are provided to visitors during backcountry orientation. Annually, approximately 800 visitors complete backcountry orientation. A slideshow about backcountry safety is available in the Fairbanks Public Lands Information Center.
Junior Ranger Programs	Number of programs and attendance		A Junior Ranger book is available at the Coldfoot, Bettles, and Fairbanks visitor centers. Approximately 200 books are distributed annually.
Special Events	Variety and longevity of events, community involvement		Gates of the Arctic participates in a variety of special events throughout the year. NPS hosts an annual potluck for the Bettles community and park partners at the start of the summer season. 2016 was the fourth year of a partnership with University of Alaska Fairbanks Summer Sessions to host a field photography course float trip with NPS volunteers as trip leaders. The park has hosted an annual artist-in-residence program since 2004. Several events related to the NPS Centennial took place in 2016, including concerts in Fairbanks, Homer, New York, and Anchorage featuring music compositions inspired by the park.

Resource Brief: Winter Patrol – Cleanup and Outreach

The year 2014 marked the 50th anniversary of the signing of the Wilderness Act of 1964. This historic act gives legal protection to designated wilderness areas. Gates of the Arctic is one of the wildest and most pristine of these protected wild places. Motivated by the desire to celebrate wilderness values during this 50th anniversary year and also by the need to clean up some of the barrels left from the era of oil and gas exploration, park rangers from Gates of the Arctic and Denali National Park completed a [winter patrol](#) at May Lake, one of the least visited areas of the park.



Using a traditional mode of transportation in the Arctic, rangers took dogsled teams into the wilderness. NPS Photo.

Winter was chosen to minimize impact on the fragile tundra and the many archeology sites. For protection of the natural soundscape, dog sled teams—a traditional form of travel—were used to retrieve the discarded barrels.

The journey began at Galbraith Lake, located slightly northeast of the park boundary, well outside the designated wilderness. Two snow machine teams broke trail for the dog sleds and provided support for the humans. Camp was set up outside the wilderness boundary and rangers on foot accompanied the dog sled teams into the May Lake area.

Rangers used GPS coordinates to guide them to the approximate location of the barrels. Once located, they then packed a trail to the barrels with snowshoes for the dogs to follow. The dog's sleds were loaded with a metal detector, crowbars, and shovels in preparation for digging out the barrels from beneath the snow. Rangers then laid tracks to the community of Anaktuvuk Pass, where the barrels were taken by sled.

Rangers arrived in the village to the delight of its residents, and spent the next couple of days in the school doing education outreach while waiting for the dogs to catch up. This patrol helped to preserve the wilderness character of one of the nation's most pristine landscapes.

Interpretive Media – Brochures, Exhibits, Signs, and Website

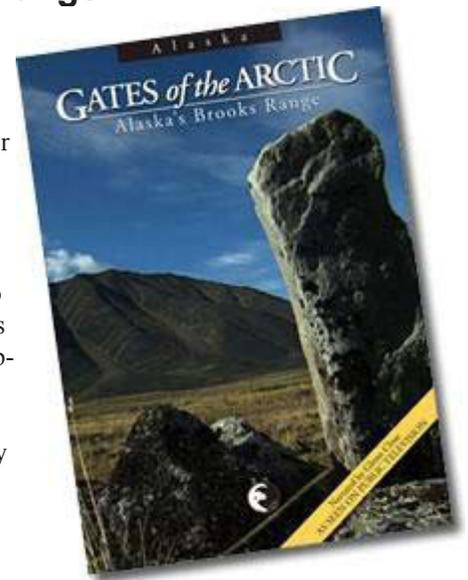

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Wayside Signs	Condition and currency of signs		New wayside signs were installed recently in Bettles and Anaktuvuk Pass. Signage in the park is purposely minimal, to preserve its remote nature and wilderness character.
Exhibits	Bettles Visitor Center		Visitor center exhibits and map are in good condition and are up-to-date.
	Coldfoot Visitor Center		There is an interagency visitor center in Coldfoot. The NPS is the primary staffer and provider of interpretive programming at this visitor center. Exhibits are in good condition and up-to-date. During the summer, interpretive programs are offered.
	Traveling exhibits		Ethnographic material and artwork inspired by the park were included in the traveling “Voices in the Wilderness” exhibit.
Print Media	Accuracy and availability of primary park publications		The park map is in good condition. Handouts about park resources are plentiful. Resource briefs are available at the visitor centers and online.
Audio-visual Media	Orientation films		The award-winning park film is recent and up to date. Narrated by Glenn Close, the film won multiple awards, was shown at several film festivals, and was broadcast on PBS.
	Web content video		Short videos have been produced for social media. Gates of the Arctic recognizes the importance of these media to allow visitors to connect with a park that is remote and relatively inaccessible.
	Classical music and scenery slideshow		Written as part of the artist-in-residence program, this 13-minute symphony orchestra composition with accompanying slideshow features 170 images of park staff and scenery.
Websites	Currency and scope of website; number of website visitors		The Gates of the Arctic website is current. The website contains information about available about significant park resources, and information about resources immediately adjacent to the park. Website visits for 2015 were 58,000. Web traffic is relatively high compared to the number of actual visitors in the park. The park is remote and access is difficult—the web presence allows visitors to learn about the park and its resources from afar.
	Social media: Facebook updates and “likes,” overall activity		Gates of the Arctic has a Facebook page and posts are made daily. The Facebook page has over 24,400 “likes”. Park alerts are posted to social media. Social media allows a way for people to be virtual visitors, and learn about this remote park and its unique and wild resources.

Resource Brief: Gates of the Arctic – Alaska’s Brooks Range

The park film, *Gates of the Arctic: Alaska’s Brooks Range* was produced in 2008 and communicates the values of this exceptional place to the American public. The film was produced by North Shore Productions of Portland, Oregon for Alaska Geographic and the National Park Service. A shorter alternate version was developed for showing at park visitor centers.

Gates of the Arctic: Alaska’s Brooks Range is a one-hour broadcast documentary about the Brooks Range and the extraordinary people who live in this arctic landscape, including Iñupiat Eskimo elders who were the last nomadic people in the United States. The film also details the important role that the Brooks Range played in the birth of America’s wilderness movement. The film aired on public television nationwide and reached 86% of the U.S. public television audience. The film is narrated by Oscar-nominated actress Glenn Close and scored with the other-worldly music of Fairbanks composer John Luther Adams. *Gates of the Arctic: Alaska’s Brooks Range* has received much attention in film festivals and industry awards. It was selected for nine film festivals worldwide including Big Sky Documentary Film Festival and the American Conservation Film Festival. The film won three Telly Awards, the National Association for Interpretation Media Award, and the Communicator Award of Excellence.



DVDs of the film, which include bonus footage not seen on public television, are available from Alaska Geographic.

Learn about the Gates of the Arctic Area on DVD. NPS Photo.

Accessibility  web ▶			
Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Mobility	ADA compliance		Park visitor centers and the ranger stations are ADA compliant. Due to the remote nature of the park, access is difficult for all visitors.
Visual Accommodation	ADA compliance		Some, but not all interpretive materials are presented in a hands-on display. The park web page is compliant with all accessibility standards.
Auditory Accommodation	ADA compliance		Some, but not all interpretive materials have auditory accommodation. The park movie includes auditory accommodation (subtitles). The park web page is compliant with all accessibility standards.
Multi-lingual Resources	Audio and print materials in multiple languages, bi-lingual staff		Some, but not all printed park materials are available in German and Japanese.

Safety


[web](#) ▶

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Visitor Safety	Programs and training		<p>The safety of visitors is a park priority. The park works to quickly identify and mitigate potential hazards, and the number of accidents is very low.</p> <p>Backcountry safety orientation is provided to visitors before entering the park. Bear resistant food canisters are provided to backcountry visitors. This training is available at visitor centers in Bettles, Coldfoot, and Fairbanks.</p> <p>Primarily in the summer months, backcountry patrols are available to assist with visitor safety.</p> <p>Guardians of the Gates program (ended in 2015) funded distribution of orange bandanas with leave-no-trace information and safety information to visitors bound for the backcountry.</p>
Staff Safety and Training	Number of staff trained and thoroughness of programs		<p>Operational Leadership Training has been completed by park staff, and CPR, First Aid, and AED training are offered to staff. Job Hazard Analysis is conducted before jobs throughout the park. Regular safety messages are given and distributed to staff members. The park has a designated collateral duty safety officer.</p> <p>Summer (pre-season) training is conducted annually for all park employees, along with advanced, on-the-ground pre-season training for personnel working in the backcountry. All park staff completes required boat safety and aviation safety training. Appropriate personal protective equipment is provided and use is required.</p> <p>Seasonal training for staff includes bear awareness and bear defensive training (utilizing bear spray and firearms is required for backcountry patrols) and a motor operator certification course for watercraft operators.</p> <p>The Safety Action Team for the park meets regularly to assess safety concerns and mitigate hazards as they are identified. The team also recognizes people with safe work practices who are setting an example for others.</p> <p>Safety-Seconds (buddy system) is required during backcountry travel. Staff are required to check in at least daily by phone (satellite phones, radios, and emergency locator beacons are issued to staff).</p> <p>The park created the Northern Aviation Hub to enhance aviation safety in areas where planes are the primary means of transportation.</p>

Partnerships


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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Volunteers	Number and hours contributed		<p>Volunteers play an important role in many facets of park operations and augment park staff in an appropriate manner. The park has approximately 30 volunteers annually (5-year average), that contribute a total of 5,000 hours. They work in the visitor centers providing backcountry orientation and informal and formal interpretive contacts. In the backcountry, they provide assistance to visitors and assist with resource protection projects such as hauling out abandoned gear and campsite monitoring.</p>
Partnerships	Number of partnerships		<p>The park partners with a wide range of agencies and organizations to help meet its mission and to assist others. They include:</p> <ul style="list-style-type: none"> • NPS Western Arctic Parklands (WEAR) – natural resource management, law enforcement, administration, and safety. • U.S. Fish and Wildlife Service (Kanuti National Wildlife Refuge); Bureau of Land Management/Alaska Fire Service; Alaska State Troopers, Alaska Department of Fish and Game Division of Subsistence • Alaska Geographic • University of Alaska Fairbanks – educational and recreational courses or field trips offered through the Summer Sessions program. • Other academic partners that participate in natural resource management through research permits, etc. • Nunamiut Corporation and Nunamiut Schools • North Slope Arctic Borough and North Slope Borough School District • Maniilaq Association

Scenic Resources


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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Scenic Views	Scenic views quality & protection		<p>Scenic resources are a fundamental resource of the park, and are currently in good condition; however, proposed development adjacent to the park could impact this pristine resource.</p> <p>Many visitors come to Gates of the Arctic to see nature, the remoteness of this wilderness, and unspoiled beauty. Gates of the Arctic is one of the last undeveloped, untrammled places in North America.</p> <p>Development on the park's border would be a huge detriment to the wilderness and scenic character of the land. Small changes in ambient dust or noise would have a large impact on an area where these things are naturally absent. In recent years, development of roads and mineral extraction in areas around the park has been proposed.</p>

Resource Brief: Enjoy the View – Scenic Inventory in Gates of the Arctic

During the summer of 2014, resource staff from the National Park Service's Fairbanks Administrative Center collaborated with NPS Air Resources Division (ARD) staff to conduct a visual resources inventory in advance of a potential road to the Ambler Industrial Mining District.

NPS staff used a new, service-wide inventory and scenic resources assessment process developed by ARD called "Enjoy the View." Then staff identified key observation points in the preserve that were adjacent to possible routes and/or in areas designated, or known to have, significant scenic, natural, or cultural resources (e.g., Kobuk River or Walker Lake).

In July 2014, a team of four staff conducted field inventories of the 10 selected observation points. A few weeks later, an additional 10 observation points were added, as selected by the proposed road development proponent. The Environmental Protection Agency's Environmental Technology Verification (ETV) field inventory protocol was followed, including extensive photo documentation and group scenic quality ratings at each site. The second phase of the inventory—the view importance ratings—was conducted by a larger team of NPS resource specialists and managers in late August 2014, from which the scenic inventory value and scenic inventory composite scores were calculated for each field-inventoried viewscape.



A NPS team conducts a scenic inventory, which includes photographing landscapes, near potential right-of-way routes in Gates of Arctic National Preserve. NPS Photo.

In order to utilize ETV inventory data to help understand the types, scale, and locations of impacts from a new road, and in order to objectively compare alternative route locations, NPS has been working closely with interagency partners at Argonne National Labs to run a series of GIS viewshed analyses. These products include a continuous surface layer identifying visible areas from all viewpoints and their associated scenic value ratings. Composite scores were calculated in areas with overlapping viewscales. Additional GIS analyses are being run to determine those viewscape areas where potential right-of-way routes are visible and the extent of visibility.

2.4. Park Infrastructure

Facility Condition Index

The National Park Service uses a facility condition index (FCI) to indicate the condition of its facilities and infrastructure. FCI is the cost of repairing an asset, such as a building, road, trail, or water system, divided by the cost of replacing it. The lower the FCI number, the better the condition of the asset. The condition of the buildings and other infrastructure assets at each park is determined by regular facility inspections, or “condition assessments,” including daily informal inspections and formal yearly inspections. Deficiencies identified from these assessments are documented in the NPS Facility Management Software System and the cost for each repair determined. Repairs that cannot be completed within the year count against the condition of a structure. The total cost of these deferred repairs divided by the total cost to replace the structure results in the FCI, with values between 0 and 1 (the lower the decimal number, the better the condition). The FCI is assigned a condition category of Good, Fair, Poor, or Serious based on industry and NPS standards. Deferred maintenance projects that require additional funding are identified based on FCI. Planned preventive maintenance on critical components occurs during the year, using a park’s base budget. For additional information about how park managers use information about the condition of facilities and infrastructure to make decisions about the efficient use of funding for maintenance and restoration activities at the park, [Click Here](#).

Overall Facility Condition Index					web ▶
Asset Category	Number of Assets 2010/ 2015	FCI 2010/ 2015	Condition Status/Trend	Rationale	
Buildings	35 / 40	0.004 / 0.054		Gates of the Arctic buildings, including housing units, are in good condition. The FCI (Facility Condition Index) increase between 2010 and 2015 is largely due to the fact that more accurate and up-to-date data were available in 2015 than were on record in 2010. In addition, the 2015 FCI includes upcoming major component renewal projects, which include cost estimates recently added to the system. A cost estimate, interpreted as deferred maintenance, is applied to the location against the cost replacement value (CRV), resulting in an increased FCI.	
Waste Water Systems	6 / 6	0.000 / 0.000		Currently there are no existing deferred maintenance work orders affecting the FCI of the wastewater/ septic systems.	
Water Systems	6 / 6	0.210 / 0.001		Currently there are no open work orders for any of Gates of the Arctic’s water systems. In the last 6 years, substantial resources have been invested in improving, modernizing, and replacing system components.	
All Others	30 / 30	0.000 / 0.001		<p>This low number reflects that there are nearly zero existing deferred maintenance work orders on other assets. In 2010–2014, a restructuring of the Park Asset Management Plan was completed to reflect updated APIs (Asset Priority Index) for all park locations.</p> <p>The reduced optimizer bands that resulted led the facilities management staff to stop creating work orders for repairs on band 4 and 5 assets. This change was necessitated by existing budget constraints.</p> <p>The new Asset Management Plan makes the program fit within the budget, whereas before the restructuring, the park was trying to stretch an insufficient facilities management budget to fit the program per NPS ideal standards.</p>	

2.5. Wilderness Character and Stewardship

The Wilderness Act of 1964 requires the National Park Service to preserve wilderness character. The statutory language of The Wilderness Act describes how wilderness character is made up of an aggregate of qualities, including: natural, undeveloped, untrammeled, outstanding opportunities for solitude or a primitive and unconfined type of recreation, and other features of value that may be ecological, geological, scientific, educational, scenic, or historical. An account of the current state of wilderness character for the park is summarized below. More than 7 million acres of Gates of the Arctic National Park and Preserve are designated wilderness. Of the remaining area of Gates of the Arctic, more than 1 million acres are eligible wilderness and are managed so as not to preclude it from future consideration as wilderness per National Park Service policy (Director's Order 41). The Gates of the Arctic Wilderness abuts additional designated wilderness in Noatak National Preserve. Together, these two areas equal more than 12.7 million acres and comprise the largest contiguous area of designated wilderness in the National Park System.

Overall Wilderness Character			web ▶
Indicators of Condition	Condition Status/Trend	Rationale	
Natural		The park's natural arctic ecosystem is functional and intact. Within Gates of the Arctic are the central Brooks Range, boreal forests, huge expanses of tundra and six designated Wild and Scenic Rivers. Wandering through the rugged landscape are significant predator/prey populations, caribou migration corridors, migratory bird and fish species and a substantial population of Dall's sheep. Humans do not dominate the landscape but are deeply interconnected by 12,000 years of continuous habitation. In Gates of the Arctic, humans and nature continue to weave a story of mutual existence, as evidenced by thriving subsistence use within the park.	
Undeveloped		Gates of the Arctic contains one of the least developed wildernesses in the National Wilderness Preservation System. There are no trailheads and very few social trails. Primary access is by airplanes, and both bush flights and commercial jets regularly traverse the airways above the park. However, the park is without any developed airstrips. Some off-road vehicle (ORV) use occurs on motorized trails that dip into the park from outside lands. Except for cabins currently retained for emergency purposes and safety, cabins and other structures are in a state of benign neglect, or slowly folding back into the natural landscape. Very few private inholdings exist within Gates of the Arctic, and their remoteness and relative inaccessibility will likely prevent commercial developments from arising. Gates of the Arctic has not increased development within the wilderness over time. Instead, the developed footprint has been decreased. This quality has the potential to significantly change and for its condition (trend) to decrease with the possible development of the Ambler Road corridor.	
Untrammeled		Gates of the Arctic Wilderness is essentially unhindered and free from the actions of modern human control or manipulation. Every waterway in Gates of the Arctic is allowed to flow freely, including six Wild and Scenic Rivers. Natural fires are allowed to burn and carry out their course. Wildlife is rarely collared for research and only one action treating the spread of non-native invasive species has ever occurred within the park. This quality has the potential to significantly change and for its condition (trend) to decrease with the possible development of the Ambler Road corridor.	
Solitude or Primitive and Unconfined Recreation Opportunity		Gates of the Arctic Wilderness provides outstanding opportunities for solitude or a primitive and unconfined type of recreation. While noise from aircraft overflights may be heard along common air travel routes, the vast majority of the park is rarely impacted by human-caused noise. The visibility of modern human impacts both within and outside of the park is scarce. Very few social trails exist on the landscape. A deliberate, conscious effort has been made to not include amenities such as designated campsites, groomed trails, and hardened access portals; instead people must rely upon only themselves for comfort, shelter, and safety. This quality has the potential to significantly change and for its condition (trend) to decrease with the possible development of the Ambler Road corridor, especially if it becomes a public travel route.	

Overall Wilderness Character (continued)

[web](#) ▶

Indicators of Condition	Condition Status/Trend	Rationale
<p>Other Features and Values</p>		<p>Gates of the Arctic preserves features of tremendous cultural and historical value, and the condition of these features is regularly inventoried and cataloged. People have been a part of the ecosystem here for more than 13,000 years. Nomadic hunters and gatherers traveled between the mountains, forested southern slopes, and the Arctic Coast. Now, their descendants depend on and use park and preserve resources. A Nunamiut Iñupiat village, Anaktuvuk Pass, lies inside the park. Traditional place names continue to be used in the park. Gates of the Arctic also preserves unique geological features, such as the Arrigetch Peaks National Natural Landmark, Walker Lake National Natural Landmark, the Reed River Hot Springs, the Nutuvukti Lake fen system and six Wild and Scenic Rivers. This quality has the potential to significantly change and for its condition (trend) to decrease with the possible development of the Ambler Road corridor.</p>

Resource Brief: Wilderness Trek

Though Gates of the Arctic is remote, fourth grade students in the Fairbanks area can learn about the natural and cultural history of this astonishingly wild place through a field trip held during National Parks Week. Wilderness Trek is a program designed to introduce 4th-grade students to the skills necessary to safely explore the great wilderness resources of Alaska.

Each April during National Parks Week, 150 fourth grade students from three local elementary schools visit the Fairbanks Alaska Public Lands Information Center (FAPLIC) to learn about Leave No Trace principles and backcountry safety while practicing outdoor skills such as pitching a tent and filtering water. Popular with students and teachers alike, Wilderness Trek serves as a capstone experience following pre-field trip classroom activities related to outdoor safety, wilderness values, and responsible recreation on public lands.

Successful implementation of this fast-paced and logistically complex event relies on participation of many volunteer instructors. In addition to NPS volunteers representing FAPLIC, Gates of the Arctic and Yukon-Charley Rivers National Preserve, and the Arctic Inventory and Monitoring Network; staff from the U.S. Fish and Wildlife Service and Alaska State Parks also contributes.

Wilderness Stewardship			web ▶
Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Stewardship to Preserve Wilderness Character	Key information		Documentation of trends in Wilderness Character in the park is described by the Wilderness Character Mapping Project, (crafted under the updated guidelines found in “Keeping it Wild II,” Aldo Leopold Wilderness Institute), scheduled for completion 2017.
	Management operations		Park operations and management, as well as outside research permits for the park, are evaluated with concern for conservation of wilderness character.
	Status of plans		<p>There are two sections of the park that are not designated as wilderness. A draft wilderness assessment for these areas exists, but there are currently no plans to move forward with this process.</p> <p>The park amended its General Management Plan (GMP) in 2014 by writing a Wilderness Stewardship Plan. The majority of the park is designated wilderness and the Wilderness Stewardship Plan sets out guidance for the management and use of this area with the ultimate goal to preserve wilderness character. General guidelines and the Wilderness Character Monitoring Framework are included in the Wilderness Stewardship Plan document.</p>

2.6. Subsistence

Overall Condition, Opportunity, and Continuity for Subsistence Activities


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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Up-to-date documentation is available about subsistence resources and their uses in communities eligible to harvest resources in the park/ preserve/ monument.		<p>Gates of the Arctic has 11 resident zone communities as listed in ANILCA. These communities are: Nuiqsut, Anaktuvuk Pass, Wiseman, Bettles, Evansville, Allakaket, Alatna, Hughes, Ambler, Shungnak, and Kobuk.</p> <p>Documentation of subsistence resources and their uses is primarily done through comprehensive subsistence harvest surveys conducted by the Alaska Department of Fish and Game (ADF&G), Division of Subsistence. Subsistence harvest data was collected in 2011 for the communities of Alatna, Allakaket, Anaktuvuk Pass, Bettles, Evansville, and Wiseman (Holen et al. 2012). Subsistence harvest surveys were also completed in the communities of Ambler, Shungnak, and Kobuk (Braem et al. 2015).</p> <p>A comprehensive subsistence harvest survey was conducted in 2015 for the communities of Hughes and Nuiqsut and reports are currently in draft.</p>
Opportunity and Continuity for Subsistence Activities	Proportion of users who are able to engage in all the subsistence uses they would like to pursue		Opportunities for subsistence activities continue to be available. For most species and areas, harvest opportunities are not limited by drawing permits, area closures, or other restrictions on harvest.
	Subsistence users are engaged in subsistence management		The Gates of the Arctic National Park Subsistence Resource Commission meets regularly in communities around the park and Fairbanks to take comments from the public and make recommendations to the park and the Federal Subsistence Board about the management of subsistence resources.
	Continuity of subsistence uses		The harvest and use of wild foods and other subsistence uses continues to be important for residents of communities in and around the park. For more than 10,000 years, and extending into the present day, the lands within the park have been used for subsistence activities by local residents and the park strives to afford every opportunity for the continuance of these cultural patterns.
Harvest of Fish, Wildlife, and Vegetation	Fish resource availability		Most of the communities associated with Gates of the Arctic are able to harvest the fish resources that they need. For some of the communities, there is not as strong of a dependence on fish, as historically these areas were not known for their abundance of fish resources. Multiple species of fish are harvested in most of these communities and when one species is in decline, other species are targeted as needed.

Overall Condition, Opportunity, and Continuity for Subsistence Activities (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Harvest of Fish, Wildlife, and Vegetation (continued)	Wildlife resource availability		Caribou is a primary wildlife resource for all of the Gates of the Arctic resident zone communities. The two major caribou herds that are utilized by Gates of the Arctic communities are the Western Arctic Caribou Herd and the Teshekpuk Caribou Herd. Currently, both herds are in decline and impacts from this decline could come in the form of stricter wildlife harvesting regulations and varied migration routes. Additionally, Dall's sheep populations in various locations within Gates of the Arctic have experienced declines in 2013 and 2014. Dall's sheep are considered an important subsistence resource for some communities affiliated with Gates of the Arctic and a reduction in population numbers could mean a decrease in resource availability, leading to stricter wildlife harvesting regulations.
	Vegetation resource availability		Berries and firewood are valued vegetation subsistence resources. Both appear to be stable, though data on the status of these resources is lacking.

Resource Brief: Subsistence – Preserving a Way of Life

Today, as in the past, many Alaskans live off the land, relying on fish, wildlife, and other wild resources. Alaska's natural abundance forms the backbone of life and economy for many people in the state, and indigenous people in Alaska have used these subsistence resources for food, shelter, clothing, transportation, handicrafts, and trade for thousands of years. Subsistence, and all it entails, is critical to sustaining the physical and spiritual culture of Alaska Native peoples and to making life on the land possible for many of Alaska's rural residents.

When Europeans first visited Alaska's shores, all the people they met were engaged in subsistence lifeways. As the population grew through the territorial days, many new and conflicting demands were placed on Alaska's natural and cultural resources. Development of various kinds—such as the harvest of marine and inland mammals, commercial fisheries, mining operations, agriculture, the development of military bases, and the establishment of cities and towns—impacted local resources and subsistence activities. By the time Alaska gained statehood in 1959, subsistence patterns in some of Alaska's more populated areas were greatly diminished.

Subsistence Legislation

In 1980, Congress formally recognized the social and cultural importance of protecting subsistence for both Native and non-Native rural residents when it passed the Alaska National Interest Lands Conservation Act (ANILCA). This legislation established millions of acres of new national park and national preserve lands in Alaska and helped to preserve subsistence use and a unique connection to the land fostered by tradition and lifelong experience. ANILCA defines subsistence as: *Customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools or transportation; for the making and selling of handicraft articles out of non-edible by-products of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade.* With the passage of ANILCA, the American people made a promise: to protect some of the nation's most splendid natural ecosystems and treasured landscapes while providing the opportunity for those engaged in a traditional subsistence way of life to continue to do so.



Fishing on Chandler Lake. NPS Photo

Resource Brief: Subsistence – Preserving a Way of Life (continued)

Preserving Traditions

In Gates of the Arctic, nomadic peoples have used and occupied the area for thousands of years, following caribou herds and traveling to regional trading areas to meet with other Native groups. These peoples eventually formed three distinct regional Alaska Native cultures occupying the central Brooks Range in the 1800s: Koyukon Athapaskan Indians, Kuuvaarmiit Eskimos, and Nunamiut Eskimos. Today, local rural residents in established communities and remote homesteads continue to depend upon resources in the park to sustain a subsistence way of life and maintain cultural traditions. Subsistence activities occur throughout the year and are usually concentrated in the northern and eastern portions of the park and along rivers flowing out of the mountains that connect low-lying communities. Winter trapping efforts concentrate on the harvest of lynx, wolverine, wolves, marten, and fox. Hunting, fishing, trapping, and gathering in repeated seasonal cycles remain vital parts of evolving subsistence lifeways and unbroken links to the past for local residents in this region.

The Gates of the Arctic National Park Subsistence Resource Commission (SRC) was established in 1982, and has been formally meeting with the NPS since 1984 to provide a sounding board for local concerns and develop a subsistence management program specific to Gates of the Arctic. It was the intent of Congress to limit eligibility for subsistence activities within Gates of the Arctic to local rural residents who have a personal or family history of use of park resources. Hence, 11 communities near Gates of the Arctic were designated as subsistence resident zone communities for the park: Alatna, Allakaket, Ambler, Anaktuvuk Pass, Bettles, Evansville, Hughes, Kobuk, Nuiqsut, Shungnak, and Wiseman. The SRC consists of nine members representing geographical, cultural, and user diversity for the Gates of the Arctic region. Three members are appointed by the Secretary of Interior, three appointed by the Governor of Alaska, and three appointed by Federal Regional Advisory Councils. The Commission meets at least twice a year to review regulatory wildlife and fisheries proposals and make recommendations which may address major topics such as eligibility, access, harvest monitoring, methods and means of taking, research needs, use of cabins and shelters, trapline management, and timber management.

Chapter 3. Summary of Key Stewardship Activities and Accomplishments

Activities and Accomplishments

The list below provides examples of stewardship activities and accomplishments by park staff and partners to maintain or improve the condition of priority park resources and values for this and future generations:

Natural Resources

- Park scientific staff undertook a landmark [grizzly bear study](#) in recent years along the southern slope of the Brooks Range. Data from this research is increasing understanding of bear range, diet, and seasonal movement patterns and informing park responses to proposed development projects in and around Gates of the Arctic.
- Extensive Dall's sheep surveys have been conducted by NPS scientific staff annually over the past five years in order to have the best possible information available as sheep populations have declined substantially. Novel sampling methods, which have reduced costs and enhanced the inferential value of the data, have been developed over the course of this work.
- Park archeologists completed a broad and thorough inventory of alpine snow patches and glaciers that were thought to contain excellent potential for rare kinds of artifacts and records of past environmental change. The archeological potential of Gates of the Arctic's snow patches turned out to be low, but the paleoecological record is now known to contain well-preserved animal bones, insects, and plant materials dating to at least the past three centuries.
- The park has created numerous meaningful opportunities for youth engagement that address diversity goals and identify NPS career paths. The park has consistently hosted multiple interns from the Alaska Native Science and Engineering Program, the Student Conservation Association Alaska Academy interns, and the George Melendez Wright Initiative for Young Leaders in Climate Change.

Cultural Resources

- Documentation of traditional place names across the park is ongoing. Park staff worked with the Simon Paneak Museum to document place names around Anaktuvuk Pass. The park consults with the Alaska Native Language Center to translate traditional place names from historical maps and to conduct site visits with language experts to document historical native land use.
- A Gates of the Arctic funded project entitled "Traditional Ecological Knowledge of Moose, Other Wildlife Species, and Climate Change in Allakaket/Alatna" resulted in a written report of local knowledge about ecological and social impacts of climate change by residents of Allakaket and Alatna.
- The park is engaged in consultations with residents of Anaktuvuk Pass and the Inupiaq History and Language Commission to draft national historic landmark documentation for historic sites on the Killik River.
- Museum collections in cultural resource disciplines (archeology, ethnology, and history) contain 180,024 objects and are fully cataloged (0 backlog reached in 2013).
- Arctic Citadel, a book about the exploration of the Brooks Range, was published in 2013.
- The museum collections facility in Fairbanks meets professional standards and provides local access to researchers and the public. 25 internal research requests and 18 visiting researchers have been served since 2010.
- Regular Facebook posts on cultural resource topics are reaching many virtual visitors.
- The park completed a 3-year archeological study of the Kobuk River. This study discovered new resources and assessed the condition and significance of existing resources. 33,000 acres were surveyed, 107 sites were recorded, and 129 sites were revisited.

Visitor Experience

- The NPS continues its outreach with the Anaktuvuk Pass community, including a variety of educational programs. A recent highlight was the removal of abandoned materials utilizing the Denali sled dogs.
- Backcountry orientation materials used for training are continually updated to ensure they remain effective and relevant.
- Park management operations are conducted in ways that do not detract from visitors' wilderness experience.
- There is ongoing close coordination between interpretive and natural and cultural resource staff to present educational programs and make park information accessible to visitors using the latest information and technology.
- The park maintains inclusive relationships with Commercial Use Authorization holders and communicates with them about park issues and how to continue to preserve the park's wilderness character.

Park Infrastructure

- In 2012, a wind turbine was installed in Anaktuvuk Pass, serving the ranger station there. Monthly savings in electricity costs exceeds \$400.
- Electricity costs for the visitor center and office in Bettles have dropped from \$8,913 in 2013 to \$4,299 this year—a savings of \$4,613.
- In 2013, a failed well serving housing units 104 and 105 was replaced via an extension of water service to two park housing units. This work was completed with in-house labor at a savings of more than \$100,000 over contracted work and eliminated the need to re-drill a failed well with an estimated cost savings of \$108,000.
- In 2015, a failed photovoltaic solar system, serving housing units in Marion Creek was replaced, thereby reducing fuel oil consumption costs by some \$27,000/year.
- The cyclic replacement of windows and doors on remote buildings in Gates of the Arctic was completed.
- The HVAC Gates of the Arctic project replaced inefficient HVAC units in Gates of the Arctic housing units.
- The porches for Quarters 109 and 110 were repaired.
- In 2015, the Bettles Visitor Center was improved with additional interpretive panels and walkway safety handrails.
- In 2016, the Bettles Visitor Center exterior received fresh exterior paint. In addition, the visitor center log portion and the front country cache were stripped and the logs were refinished.

Wilderness

- There is a high level of support for protection of wilderness character and values by stakeholders, both locally and regionally.
- The park has refrained from making infrastructure improvements and additions in an effort to preserve wilderness.
- The Wilderness Character Mapping Activity is scheduled for completion in 2017, and will result in a physical map of the park that defines areas that meet the guidelines for designated wilderness.

Subsistence Use

- Government-to-government consultation occurs freely and this interagency collaboration is essential in decision making regarding resource declines. NPS consults with the State of Alaska and Alaska Department of Fish and Game Division of Subsistence. Collaboration on Dall's sheep and moose surveys and monitoring is ongoing.
- NPS continues to protect resources for the future while considering their current uses and importance for subsistence uses. Traditional ecological knowledge transfer between local natives and NPS biologists is ongoing.
- Collaboration with the Fish and Wildlife Service allow for "antler-less" moose hunt (out of normal season hunting opportunities) for subsistence users.
- Gates of the Arctic facilitated removal and cleanup of hazardous materials on Chandler Lake. This lake is of critical importance to subsistence users from the community of Anaktuvuk Pass. These hazardous materials were abandoned WWII-era military fuel drums.

Chapter 4. Key Issues and Challenges for Consideration in Management Planning

Gates of the Arctic National Park and Preserve, located in the central Brooks Range of northern Alaska, was established in 1980 to preserve the vast, wild, undeveloped character and environmental integrity of the northernmost extent of North America's Rocky Mountains. The park provides unparalleled opportunities for wilderness recreation and traditional subsistence uses. Gates of the Arctic—the second largest conservation unit managed by the National Park Service—contains six congressionally designated Wild Rivers and the only indigenous community that is fully within the boundaries of an Alaska national park. Gates of the Arctic is the centerpiece of 21 million acres of designated wilderness in the Brooks Range. Issues described below provide background for some of the challenges facing managers in 2016.

Climate Change

The Arctic has been warming at twice the rate of that of the temperate latitudes, which has led to physical and ecological changes in Gates of the Arctic, with many more anticipated. Downscaled models (Rupp and Loya 2009a, b, c) predict that Gates of the Arctic is likely to experience warming of up to 10 °F mean annual temperature over the next 60 years. With a changing climate comes a host of current and potential issues requiring management approaches including thoughtful adaptation, mitigation, and education/communication strategies. Some of the anticipated changes in Gates of the Arctic's terrestrial and aquatic environments include:

Terrestrial

There are myriad changes predicted to occur within Gates of the Arctic's terrestrial ecosystems in the decades to come. These are likely to include:

- Tall shrub increase and the movement of forest into much of the park's currently open dwarf and low shrub tundra
- Loss of ungulate lichen winter range and open tundra currently hosting abundant lichen cover types
- Permafrost thaw and degradation of ice wedge polygons
- Increased fire frequency leading to more of the landscape being in an early successional state with fewer lichen
- Increased winter icing events leading to wildlife winter forage difficulties
- Changes in the composition of wildlife and bird communities, with declines in tundra-adapted species and increases in boreal and montane species
- Reduction in the availability of and access to key wildlife species for subsistence by local residents, especially caribou
- Mismatch of migration, forage, and pollination timing because of earlier green-up and longer snow-free season

Aquatic

In parallel with changes on the land, Gates of the Arctic's aquatic resources are anticipated to change dramatically in the decades to come. This will present park managers with a number of potential challenges. Shallow lakes and ponds have shown a modest decrease in number and size, a trend expected to intensify. The disappearance of shallow lakes will reduce lake fish habitat, as well as the habitat and food for waterbirds. Changes in the abundance and distribution of fish may also influence the abundance and distribution of piscivorous birds.

The thermal and hydrologic regime of aquatic systems in northern Alaska are particularly susceptible to increased temperatures associated with climate change due to the presence of permafrost (IPCC 2013) and the influence of aquatic ice. While warmer temperatures in winter may increase primary productivity and create more winter habitat, they may also change the distribution of fish species. As permafrost thaws, riparian bluffs are likely to erode more quickly; this in turn is likely to introduce new sediment into the streams, which may influence water quality and spawning success. Ocean acidification is likely to reduce the abundance of carbonate-based plankton that form the base of the food chain for anadromous fish in the North Pacific and Arctic Alaska

Rivers too will warm and become more filled with sediment seasonally, presenting challenges to subsistence and sport harvests of fish. Local residents rely on the park fisheries for subsistence, particularly chum salmon, sheefish, and several species of whitefish and eels.

What more is the park doing about the issue?

While recognizing that preventing climate-induced changes is beyond the control of the National Park Service, Gates of the Arctic managers will continue to engage with stakeholders and park partners to study and consider a suite of adaptation, mitigation, and education/communication strategies for natural and cultural resource conditions, with an emphasis on those determined to be at the highest risk(s) due to the rapidly changing climate.

External Development

A number of potential external development projects could impact Gates of the Arctic's natural and cultural resources in the future, including large-scale mining, industrial road construction, a gas pipeline, and support infrastructure in the vicinities of Gates of the Arctic's boundary. Related impacts may include air pollution, sound pollution, viewshed disturbances, introduction of invasive species, illegal harvest, and non-authorized motor vehicle activity. The potential for illegal activity such as looting of archaeological and paleontological resources and wanton waste of wildlife are also management concerns.

Section 201 (4)(b)-(e) of the Alaska National Interest Lands Conservation Act (ANILCA) provides for surface transportation access across the Kobuk River Preserve portion of Gates of the Arctic. An application for an industrial access road right-of-way (ROW) across this part of Gates of the Arctic was received 2015 from the Alaska Industrial Development and Export Authority. An environmental and economic analysis (EEA), as mandated by the statute, is currently in the planning/contracting phase. The EEA will focus solely on determining the most desirable, environmentally sound route across the Kobuk River Preserve for the ROW. The EEA will also help determine terms and conditions that may be required for the issuance of the ROW. This analysis will be prepared in lieu of an environmental impact statement for the portion of the industrial road within Gates of the Arctic. If built, the industrial road would provide access to an extensive heavy metals mining district in proximity to Gates of the Arctic's western boundary. Additional related impacts would include fugitive dusts into the environment and accidental spills of fuels and mining materials along the ROW.

What more is the park doing about the issue?

The surface transportation corridor across the Kobuk River Preserve portion of Gates of the Arctic is an obligation that the National Park Service will fulfill in accordance with ANILCA. A team of Gates of the Arctic's natural and cultural resource professionals, park planners, and subject matter experts has been established and is working through the application and permitting processes collaboratively with other federal agencies, Tribal governments, rural community members, and the State of Alaska to minimize and mitigate resulting impacts and protect park values.

Contaminants and Persistent Organic Pollutants

Despite their remoteness, northern Alaska parks receive steady inputs of mercury and persistent organic pollutants from global sources. Long-lived fish species occupying high trophic levels such as northern pike, burbot, and sheefish may bioaccumulate certain pollutants. A 2006 survey that included two lakes in Gates of the Arctic found that concentrations of methyl-mercury in lake trout in these two lakes were higher than recommended for human consumption (Landers et al. 2008). Melting permafrost has the potential to release additional mercury into the environment. Concentrations of the banned pesticide Dieldrin were above advisory levels for fish-eating mammals and birds. Release of nutrient nitrogen from permafrost thaw may influence the abundance of primary producers, dissolved oxygen levels and ultimately fish.

What more is the park doing about the issue?

Park professionals will continue to monitor fish and water bodies important to subsistence and sport users for toxic substances and will communicate information and advisories with local communities and user groups.

Wilderness Stewardship

Gates of the Arctic Wilderness is essentially unhindered and free from the actions of modern human control or manipulation. Every waterway in Gates of the Arctic is allowed to flow freely, including six Wild and Scenic Rivers. Natural fires are allowed to burn and carry out their course. Wildlife is rarely collared for research and only one action treating the spread of non-native invasive species has ever occurred within the park.

Wilderness advocate Robert Marshall's descriptions of the Brooks Range inspired studies that resulted in the establishment of Gates of the Arctic. The park contains 7,154,000 acres of congressionally designated wilderness, and six designated Wild and Scenic rivers. Section 707 of ANILCA says that "except as otherwise expressly provided for in this Act, wilderness...shall be administered in accordance with...the Wilderness Act..." The Wilderness Act mandates that wilderness be managed to preserve wilderness character.

The challenge to the park is balancing the preservation of wilderness character with provisions of ANILCA that recognize the unique nature of Alaska parks, subsistence use, and wilderness character.

Specifically, Gates of the Arctic attempts to balance wilderness protection with the following activities (most are provided for in ANILCA): snowmachine use to access traditional activities; off-road vehicle (ORV) use by residents of Anaktuvuk Pass for traditional subsistence activities in specified geographical areas; cabin management and maintenance, commercial ORV use in wilderness; maintenance and management of installations, climate stations, emergency cabins, and research activities; management of visitor use associated impacts such as campsites and social trails; and administrative activities in wilderness.

The 2014 Gates of the Arctic General Management Plan (GMP) provides both specific and general guidance on activities in wilderness allowed under ANILCA. These include requirements for park planning and wilderness management where desired future conditions for the park align with the park purpose, the Wilderness Act, and significance statements identified in the 2010 Foundation Statement.

What more is the park doing about the issue?

Gates of the Arctic continues to increase awareness of wilderness law, regulation, and policy both with staff and with the general public. The park's interdisciplinary compliance team currently uses the "Science in Wilderness" framework and a Minimum Requirements Analysis for administrative actions in wilderness. Commercial filming and other special uses are permitted only after considering impacts to wilderness character. Park staff work closely with residents and the Tribal government of Anaktuvuk Pass to maintain compliance with the terms of the 1996 Anaktuvuk Pass Land Exchange.

Subsistence Management

Gates of the Arctic was established in part to provide subsistence opportunity for local residents. A large fraction of subsistence harvest in the park is caribou, most notably near Anaktuvuk Pass and the three villages along the upper Kobuk River. Dall's sheep, moose, salmon, and whitefish are also important species to subsistence harvesters.

Subsistence opportunity for caribou is likely to face increasing hardship as the Central Arctic Caribou Herd and Western Arctic Caribou Herd (WACH) numbers have dropped in recent years. The WACH has declined over 50% from approximately 500,000 and both herds are likely to face habitat constriction due to changing vegetation.

The caribou annual migration south after the summer calving is the time at which local residents harvest caribou. The timing and pathways of migration have changed over the past decade, which has led to much more hunting uncertainty and has created the potential for conflict over sport hunting closure dates to help protect subsistence opportunity.

What more is the park doing about the issue?

Gates of the Arctic staff regularly engage with local rural communities, Tribal governments, and advisory groups to share western and traditional ecological knowledge, discuss evolving trends and concerns, and to advise on potential regulatory and management strategies to adapt to changing conditions.

Wildlife Management

There are several important challenges to wildlife management in Gates of the Arctic. The park lacks sufficient data on wildlife populations that are critical to meeting ANILCA's mandates of protecting habitat for and populations of fish and wildlife, providing for subsistence, protecting resources related to subsistence needs, allowing sport hunting, and providing for non-consumptive uses.

The lack of data leaves the park unable to appropriately respond to proposed state and federal wildlife regulatory proposals that affect park wildlife resources, including the intensive management of predators outside Gates of the Arctic's southeastern boundary. Gates of the Arctic lacks critical wildlife data primarily because of the lack of funding for wildlife studies. Although the park is visited by local residents and sportsmen both, the park does not generate user fees. For many parks, user fees help fund wildlife and other projects. Available funding is competed for from limited sources of project funds.

Additional challenges stem from divergent park uses including subsistence hunting and gathering, recreational boating, wildlife watching, and sport hunting. Some of these uses can be at odds with others, which presents park management with challenges of mitigating the effects of these activities on park resources as well as the impacts of the different user groups on each other's activities.

Other challenges relating to wildlife management are appropriate staffing to provide for the logistics of permitting of hunts and enforcing of wildlife regulations over the park's over 8 million acres.

What more is the park doing about the issue?

Gates of the Arctic continues to support wildlife projects in order to better respond to proposed wildlife actions and to protect habitat for and populations of fish and wildlife. Aerial surveys and monitoring are conducted for caribou, moose, brown bears, and Dall's sheep to determine population trends over time. Protecting habitat for and populations of fish and wildlife is a critical park value and a central tenet of ANILCA. ANILCA also protects resources related to subsistence needs, provides for subsistence use by local residents in Gates of the Arctic, and provides for sport hunting in Gates of the Arctic's two preserve portions. Collaborating with Tribal governments, residents of local rural communities, and wildlife advisory groups (both consumptive and non-consumptive users) will continue to be important facets of wildlife management in the park.

Inholder Access/ Off-Road Vehicle Use

While off-road vehicles are not allowed throughout the park, six and eight-wheeled off-road vehicles (ORV) are used by residents of Anaktuvuk Pass through a special legislative provision that provided access easements to hunt caribou and other prey through the Anaktuvuk Pass Land Exchange. Travel to Chandler Lake and Ernie Pass is possible on easements and allows local residents to use these areas for fishing; gathering edible plants; and hunting sheep, bear, marmot, and caribou. While the purpose of the land exchange provision was to accommodate and control ORV use for subsistence purposes near the village of Anaktuvuk Pass, it was also intended to eliminate the potential for incompatible developments on private lands and to open private lands to dispersed public recreational use.

Limited unauthorized use takes place, but some private in-holders are now requesting summertime (no snow cover) ORV access to their Native allotments within the park (but outside of the land exchange boundary). If authorized, some access right-of-ways could be over 12 miles long. There may also be a possibility for future park access via Alaska Revised Statue 2477 (RS 2477), which could develop new Alaska highways in and near the park.

What more is the park doing about the issue?

Gates of the Arctic recognizes that neighbors within and adjacent to park boundaries make up and contribute to the unique character of the park. Gates of the Arctic has a special relationship with the Tribal government and residents of Anaktuvuk Pass, and regularly updates affected members about park operations. Significantly, the park has a long-tenured ranger duty-stationed in the village during the summer. Park managers also recognize access rights provided for by ANILCA and are in the process of authorizing a park inholder route-finding trip via ORV in 2017. The park will continue its tradition of respectful and fruitful negotiations with Tribal, private, and Native corporation neighbors to resolve future access issues.

Logistical Challenges

Working in the remote and roadless Arctic presents unique logistical challenges. Fieldwork in Gates of the Arctic is hampered by high costs of access and supplies, poor weather, and lack of infrastructure. The park struggles with staff recruitment due its remote nature and arctic climate, lack of housing, difficulty hiring local residents due to low federal wages (compared to the high cost of living in the bush), and slow and expensive telecommunications.

What more is the park doing about the issue?

Gates of the Arctic will continue to explore shared employee arrangements, basing more logistical services out of Fairbanks and Bettles in order to accomplish fieldwork more safely and efficiently and to help offset high turnover rates in Alaska's northern park units.

References

See the [State of the Park Report for the Park website](#) for a more complete list of references to documents and data sets upon which the assessments in this State of the Park report are based. References for several of the key documents cited in this report are as follows:

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See Also:

[Collection of Natural Resource-Related References](#)

[Collection of Cultural Resource-Related References](#)

[Collection of Visitor Experience-Related References](#)

[Collection of Subsistence-Related References](#)

Glossary

See the [State of the Parks home page](#) for a link to a complete glossary of terms used in State of the Park reports. Definitions of key terms used in this report are as follows:

Key Term	Definition
Americans with Disabilities Act (ADA) and American Barriers Act (ABA)	Laws enacted by the federal government that include provisions to remove barriers that limit a disabled person's ability to engage in normal daily activity in the physical, public environment.
Archeological Sites Management Information System (ASMIS)	The National Park Service's standardized database for the basic registration and management of park prehistoric and historical archeological resources. ASMIS site records contain data on condition, threats and disturbances, site location, date of site discovery and documentation, description, proposed treatments, and management actions for known park archeological sites. It serves as a tool to support improved archeological resources preservation, protection, planning, and decision-making by parks, centers, regional offices, and the national program offices.
Arctic Network (ARCN)	One of 32 I&M networks established as part of the NPS Inventory and Monitoring Program . The Arctic Network provides scientific data and expertise for natural resources in 5 parks located in northern Alaska.
Baseline Documentation	Baseline documentation records the physical condition of a structure, object, or landscape at a specific point in time. A baseline provides a starting point against which future changes can be measured.
Cultural Landscapes Inventory (CLI)	A Cultural Landscapes Inventory describes historically significant landscapes within a park. The inventory identifies and documents each landscape's location, size, physical development, condition, characteristics, and features, as well as other information useful to park management.
Cultural Landscape Report (CLR)	A Cultural Landscape Report is the principal treatment document for cultural landscapes and the primary tool for long-term management of those landscapes. It guides management and treatment decisions about a landscape's physical attributes, biotic systems, and use when that use contributes to historical significance.
Curation	National parks are the stewards of numerous types of objects, field notes, publications, maps, artifacts, photographs, and more. The assemblage of these materials comprises a museum collection. Curation is the process of managing, preserving, and safeguarding a collection according to professional museum and archival practices.
Exotic Plant Management Team (EPMT)	One of the ways the NPS is combating invasive plants is through the Exotic Plant Management Team Program. The program supports 16 Exotic Plant Management Teams working in more than 225 park units. EPMTs are led by individuals with specialized knowledge and experience in invasive plant management and control. Each field-based team operates over a wide geographic area and serves multiple parks.
Facility Condition Index (FCI)	FCI is the cost of repairing an asset (e.g., a building, road, bridge, or trail) divided by the cost of replacing it. The lower the FCI number, the better the condition of the resource.

Key Term	Definition
Foundation Document	A park Foundation Document summarizes a park’s purpose, significance, resources and values, primary interpretive themes, and special mandates. The document identifies a park’s unique characteristics and what is most important about a park. The Foundation Document is fundamental to guiding park management and is an important component of a park’s General Management Plan.
Fundamental and Other Important Resources and Values	Fundamental resources and values are the particular systems, processes, experiences, scenery, sounds, and other features that are key to achieving the park’s purposes and maintaining its significance. Other important resources and values are those attributes that are determined to be particularly important to park management and planning, although they are not central to the park’s purpose and significance. These priority resources are identified in the Park Foundation Document and/or General Management Plan. The short-cut name that will be used for this will be Priority Resources.
General Management Plan (GMP)	A General Management Plan is a strategic planning document that outlines the future management of a National Park Service site for the next 15 to 20 years. The plan will set the basic philosophy and broad guidance for management decisions that affect the park’s resources and the visitor’s experience.
Historic Integrity	Historic Integrity is the assemblage of physical values of a site, building, structure, or object and is a key element in assessing historical value and significance. The assessment of integrity is required to determine the eligibility of a property for listing in the National Register.
Historic Resource Study (HRS)	The historic resource study is the primary document used to identify and manage the historic resources in a park. It is the basis for understanding their significance and interrelationships, a point of departure for development of interpretive plans, and the framework within which additional research should be initiated.
Historic Structures Report (HSR)	The historic structure report is the primary guide to treatment and use of a historic structure and may also be used in managing a prehistoric structure.
Indicator of Condition	A selected subset of components or elements of a Priority Resource that are particularly “information rich” and that represent or “indicate” the overall condition of the Priority Resource. There may be one or several Indicators of Condition for a particular Priority Resource.
Integrated Resource Management Applications (IRMA)	The NPS-wide repository for documents, publications, and data sets that are related to NPS natural and cultural resources.
Interpretation	Interpretation is the explanation of the major features and significance of a park to visitors. Interpretation can include field trips, presentations, exhibits, and publications, as well as informal conversations with park visitors. A key feature of successful interpretation is allowing a person to form his or her own personal connection with the meaning and significance inherent in a resource.
Invasive Species	Invasive species are non-indigenous (or non-native) plants or animals that can spread widely and cause harm to an area, habitat, or bioregion. Invasive species can dominate a region or habitat, out-compete native or beneficial species, and threaten biological diversity.
List of Classified Structures (LCS)	LCS is an inventory system that records and tracks the condition of the approximately 27,000 historic structures listed in the National Register of Historic Places that are the responsibility of NPS.
Museum Collection	NPS is the steward of the largest network of museums in the United States. NPS museum collections document American, tribal, and ethnic histories; park cultural and natural resources; park histories; and other aspects of human experience. Collections are managed by professionally-trained NPS staff, who ensure long-term maintenance of collections in specialized facilities.

Key Term	Definition
National Register of Historic Places (NRHP)	The National Register of Historic Places is the official list of the Nation’s historic properties worthy of preservation. Authorized by the National Historic Preservation Act of 1966, the National Park Service’s National Register of Historic Places is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect America’s historic and archeological resources. Listing in the National Register of Historic Places provides formal recognition of a property’s historical, architectural, or archeological significance based on national standards used by every state. The National Register is a public, searchable database about the places.
Native American Graves Protection and Repatriation Act (NAGPRA)	A federal law passed in 1990. NAGPRA provides a process for museums and federal agencies to return certain Native American cultural items (e.g., human remains, funerary objects, sacred objects, objects of cultural patrimony) to lineal descendants and culturally-affiliated Indian tribes and Native Hawaiian organizations.
Natural Resource Condition Assessment (NRCA)	A synthesis of existing scientific data and knowledge, from multiple sources, that helps answer the question: what are current conditions of important park natural resources? NRCAs provide a mix of new insights and useful scientific data about current park resource conditions and factors influencing those conditions. NRCAs have practical value to park managers and help them conduct formal planning and develop strategies on how to best protect or restore park resources.
Off-Road Vehicle (ORV)	Includes All-Terrain Vehicles (ATV) and Off-Highway vehicles (OHV).
Priority Resource or Value	This term refers to the Fundamental and Other Important Resources and Values of a park. These can include natural, cultural, and historic resources as well as opportunities for learning, discovery, and enjoyment. Priority Resources or Values include features that have been identified in park Foundation Documents, as well as other park assets or values that have been developed or recognized over the course of park operations. Priority Resources or Values warrant primary consideration during park planning and management because they are critical to a park’s purpose and significance.
Project Management Information System (PMIS)	A servicewide intranet application within the National Park Service to manage information about requests for project funding. It enables parks and NPS offices to submit project proposals to be reviewed, approved, and prioritized at park units, regional directorates, and the Washington Office.
Resource Management	The term “resources” in NPS encompasses the many natural, cultural, historical, or sociological features and assets associated with parks. Resource management includes the knowledge, understanding, and long-term stewardship and preservation of these resources.
Specific Measure of Condition	One or more specific measurements used to quantify or qualitatively evaluate the condition of an Indicator at a particular place and time. There may be one or more Specific Measures of Condition for each Indicator of Condition.
Visitor and Resource Protection (VRP)	VRP includes, among other responsibilities, protecting and preserving park natural and cultural resources, enforcing laws that protect people and the parks, fire management, search and rescue, managing large-scale incidents, and on-the-ground customer service.
Volunteers In Parks Program (VIP)	The Volunteers In Parks Program was authorized by Public Law 91–357 enacted 1970. The primary purpose of the VIP program is to provide a vehicle through which the National Park Service can accept and utilize voluntary help and services from the public. The major objective of the program is to utilize this voluntary help in such a way that is mutually beneficial to the National Park Service and the volunteer. Volunteers are accepted from the public without regard to race, creed, religion, age, sex, sexual orientation, national origin, or disability.
Western Arctic Parklands (WEAR)	The NPS Western Arctic Parklands (WEAR) includes 3 remote arctic parks managed as a group. WEAR includes Cape Krusenstern National Monument, Noatak National Preserve, and Kobuk Valley National Park.
Wilderness	A designation applied to certain federal lands set aside for preservation and protection in their natural condition, in accordance with the Wilderness Act of 1964 .