National Park Service
U.S. Department of the Interior

State of the Park Report
Kobuk Valley National Park
Alaska

2017

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On the cover: Evening light on the Great Kobuk Sand Dunes with the Waring Mountains in the distance. The setting sun creates striking light and shadows on the landscape. 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.

Kobuk Valley National Park (KOVA) is managed as a unit within the Western Arctic Parklands. The purpose of KOVA ("the park") is to maintain the environmental integrity of boreal forest, montane, and riverine ecosystems. The park protects and interprets diverse resources including arctic sand dunes, archeological sites, and subsistence resources.

The summary table, below, and the supporting information that follows, provide an overall assessment of the condition of priority resources and values at KOVA based on scientific and scholarly studies and expert opinion. The internet version of this report, available at http://www.nps.gov/stateoftheparks/kova/, 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		Air quality at KOVA is generally good. Little local data is available. Wet and dry deposition of nitrogen and sulfur are likely to be lower than ecosystem critical loads, based on data from adjacent areas. Heavy metals are at or near arctic baseline levels, based on moss monitoring (Neitlich et al. 2017, Hasselbach et al. 2005).
Geological Resources		Most of KOVA is underlain by permafrost and recent warming has raised permafrost temperatures above -3 °C. Widespread thaw of permafrost is expected in the latter half of the current century if warming continues. KOVA harbors a history of small-scale mining, primarily for gold and jade, and while no activity exists today within park boundaries, mineral exploration and small-scale mining occur nearby. The Alaska Industrial Development and Export Authority has proposed a road linking the Ambler Mining District with the Dalton Highway. The development of Ambler mining resources would be contingent on this road. Development of the mine could bring some potential impacts to water and air quality in KOVA.
Paleontological Resources		A paleontological inventory was completed, but a field-based site assessment to establish baseline resource monitoring needs has not been done. Non-permitted collecting in Western Arctic Parklands has been observed, but has not been officially documented. Fossils in river cut banks are at high risk of being eroded.
Water Resources		Increased drainage due to warming permafrost has decreased the surface area of lakes in the park. Sampling for water quality of lakes and streams is infrequent, but indicates that water quality is good. Timing of peak stream flows has changed in recent decades in response to climate warming, with the timing of peak discharge occurring over 3.5 days per decade earlier since the mid-1970s. Additionally, the timing of river freeze-up in autumn has occurred later by nearly 7 days per decade since the mid-1970s.
Terrestrial Vegetation		Kobuk Valley has the highest number of macrolichen species (225) in the Western Arctic Parklands, probably because of the confluence of boreal forest, alpine, and dune ecosystems. Terrestrial lichen cover, while projected to decline due to eventual shrub increase, is still on the moderate to high end of the potential spectrum. Vascular plant cover has been increasing across the Arctic in recent decades as shrubs and other plants increase in height and density, and this trend is expected to continue in the future. There are no known occurrences of non-native plant species in the park.
Birds		KOVA falls into nationally and internationally recognized bird conservation regions; however, population status information for landbird species in the park is incomplete. Information about the population status of breeding shorebirds in KOVA is lacking. Loss of wetlands—particularly migratory stopover areas outside of Alaska that are important to those species breeding in Alaska—represents the greatest threat to shorebird populations worldwide.

Priority Resource or Value	Condition Status/Trend	Rationale
Terrestrial Mammals		Terrestrial mammals in the park include, but are not limited to: moose, brown bear, caribou, Dall's Sheep, wolves, beavers, and wolverines. The abundance of moose found year-round and the proportion of calves along the Kobuk River is highest downstream, or west of KOVA, but KOVA comprises vast moose habitat. The 2012 population estimate for moose in the lower Kobuk River drainage yielded a density of 0.51 moose per square mile, which is relatively high in northwest Alaska. Brown and black bears occur in and occupy suitable habitat in KOVA. Brown and black bear populations are not monitored by the NPS. According to residents of Unit 23, of which KOVA is a part, brown bear numbers have increased substantially since at least the 1940s or 1950s. The Western Arctic Caribou Herd is currently at the low end of its population cycle and has declined over 50% since 2003. In general, the health and success of the various caribou herds in this region is stable, with some natural fluctuation. Dall's sheep can be found along the northwestern and northern edge of KOVA. Total sheep numbers declined across the Western Arctic Parklands (Cape Krusenstern, Kobuk Valley, and Noatak) by 70% from a peak in 2011 to 2014. All hunts are now closed across Western Arctic Parklands and the western Brooks Range. The few historical estimates of the wolf population size in northwest Alaska are varied and unreliable, but concern of their influence upon the Western Arctic Caribou Herd spurred predator control as early as the 1940s. The wolf population in KOVA has not been estimated in recent years, but many local residents report an increase in observations and a concern for the caribou and public safety.
Fish		Fish species in KOVA include sheefish (Inconnu), other whitefish, Dolly Varden, and chum salmon. Fish are an important subsistence resource. Five species of anadromous whitefish (not including sheefish) inhabit the waters of the Western Arctic Parklands. As a group, they represent the most accessible subsistence resource in the area, and are available from late spring through early winter. Generally, fish diversity and populations are presumed to be good based on their remote location and low levels of anthropogenic impact; however, there exists a lack of rigorous fish data. Anecdotal evidence indicates some species may be declining.
Unique Communities and Features		The Great Kobuk Sand Dunes are the largest high-latitude dune field in North America and host several rare species. The area receives few visitors and there are no known direct threats to the unique plants. The Kobuk River is one of the largest rivers in northwest Alaska. The river contains an exceptional population of sheefish and provides winter range for the Western Arctic Caribou Herd. The Western Arctic Caribou Herd, which has ranged up to half a million animals, has migrated across the Kobuk River for millennia at Onion Portage.
Landscape and Ecosystem Processes		The fire frequency (number of fires) is variable in Kobuk Valley. Fires are most frequent in lower elevation forests south of the Baird Mountains within open and woodland spruce forests. The average number of fires per year is 1.1. Overall greenness of lowland tundra landscapes has increased since records began in the 1980s. This is probably due to the climate warming that occurred in the late 1900s, which involved both longer and warmer summers.

Priority Resource or Value	Condition Status/Trend	Rationale
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 KOVA, 2012 visible infrared imaging radiometer (VIIRS) satellite data, which uses a broadband imaging detector with high sensitivity, indicates that there is no visible upward radiance within the park boundary, and small amounts of upward radiance within a 200 km radius surrounding the park. The largest sources of upward radiance emanate from the Red Dog Mine, just over 100 km from the park's northwest boundary, and from the town Kotzebue, AK just over 100 km from the park's southwest boundary.
Acoustic Environment		The mean acoustic impact level (L_{50} dBA), a measure of noise contributed to the existing acoustic environment by man-made sources, is 0.0 dBA in KOVA, meaning that the acoustic environment is in good condition. Overall, long-term projected increases in ground-based transportation and aircraft traffic indicate a downward 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 KOVA 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 in KOVA, primarily within the Kobuk River corridor and around the Great Kobuk Sand Dunes. According to the Alaska Historic Resources Survey, 50% of the known sites in KOVA—including the Onion Portage National Historic Landscape sites—have determined cultural affiliation. However, the vast majority of the sites have not been evaluated beyond a cursory inventory and assessment against known archeological traditions.
Cultural Anthropology		Although anthropological research has been conducted in the region by scholars, local residents, and federal and state agencies, the park lacks formal baseline documentation to assess condition and adequately protect unknown or undocumented ethnographic resources. Each passing year marks the loss of knowledge bearers and Elders who can contribute to the documentation process.
Cultural Landscapes		Giddings Property and Onion Portage Archeological District were studied in the 1990s and subsequent Cultural Landscape Inventories (CLI) were produced. Five additional cultural landscapes have been identified but not yet documented: Hunt River Dunes, Headwaters of the Salmon River, Coalmine, Quqtikuvik, and the Greater Kobuk Sand Dunes.
Historic Structures		KOVA preserves, studies, and interprets (in cooperation with Alaska Natives) evidence reflecting a continuum of cultural use and adaptation within arctic-interior Alaska spanning thousands of years. The only structure evaluated for the park's historic context is the Giddings Property, which includes a cabin and cache. Documentation of the cabin is incomplete; the cache is due to be inspected in 2017.

Priority Resource or Value	Condition Status/Trend	Rationale
History		KOVA lacks a Historic Resource Study and an Administrative History. Documentation of historic structures is lacking. National Register documentation for resources in the park is lacking.
Museum Collections		The park currently has an adequate amount of research and reports to demonstrate the significance and context of the items in the museum collection; however, the park has the potential for both continued and expanded archeological, ethnological, historical, and natural history studies that would expand understanding. KOVA benefits from substantial support of the National Park Service's Alaska Regional Curatorial Center, located in Anchorage, AK.
Visitor Experience		web ▸
Number of Visitors		The 10-year annual average of visitors for 2003–2012 was 5,260. The park is remote and has no public roads, entrance station of facilities. Non-local visitors rely on concessionaires to get to the park in aircraft. Visitation numbers are estimates by staff who conduct field work in the park. Counts include outside visitors plus local area residents who travel through the park.
Visitor Satisfaction		Park staff does not conduct visitor satisfaction surveys because the park is remote and there is no ability to gather survey data. However, contact with visitors in the Northwest Arctic Heritage Center, community feedback, and social media suggest that people have significant appreciation for wilderness solitude and the effort it takes for a once in a lifetime trip in the park.
Interpretive and Education Programs – Talks, Tours, and Special Events		A small but robust interpretive team conducts many interpretive programs for community children and adults, as well as virtual visitors. The curriculum-based school program garnered the Freeman Tilden award. Many local people attend the special events and listen to the weekly radio show. Increasing the numbers of general walk-in visitors is an ongoing effort—banners and a new Facebook page are planned solutions.
Interpretive Media – Brochures, Exhibits, Signs, and Website		Interpretive media exists only in the Northwest Arctic Heritage Center (NAHC), as there are no facilities in the park. Repairs to the aging exhibits are in progress. New audiovisual presentations are being created regularly. Maintaining the website is a challenge due to internet connectivity issues, but interpreters are spending an increasing amount of time to troubleshoot and create new content.
Accessibility		When the Northwest Arctic Heritage Center opened to the public in 2010, few accessibility features were put in place. Basic accommodations currently exist for mobility, visual, and auditory accommodations.
Safety		The safety of visitors and employees is a priority for KOVA. No visitor injuries have been reported in the Northwest Arctic Heritage Center and the number of accidents in the park is very low. A new system for loaning animal resistant food containers is underway to increase visitor safety and prevent harm to wildlife. A suite of safety courses are offered to permanent and temporary park staff every year.
Partnerships		Volunteer efforts are critical to operation of KOVA. Many long-term community partnerships exist to enhance interpretive efforts for the public. Volunteers need to be skilled in specific disciplines in order to do projects in this remote area, so the numbers of individual volunteers are not high.

Priority Resource or Value	Condition Status/Trend	Rationale
Recreational Opportunities		Vast wilderness covers the park, offering outstanding opportunities for solitude, river floating, birdwatching, wildlife observation, and hiking. Floating down the Kobuk River is a popular activity. Planes can be chartered from several companies to access areas for hiking and floating. Non-local hunters are not allowed to harvest wildlife in the park.
Scenic Resources		Excellent scenic views exist in the park. Primary risks to these views are the Ambler Mining District, potential new roads, potential new train tracks, and development on allotments on the park's borders.
Wilderness Character		web ▸
Overall Wilderness Character		Kobuk Valley is an enduring and wild landscape. This land has provided subsistence and invaluable experiences for generations of local Iñupiaq as well as visitors from around the world. Kobuk Valley is distant from most modern technologies, population centers, and access provided by roads.
Wilderness Stewardship		Although KOVA completed a Wilderness Narrative in 2016, no Wilderness Management Plan exists for KOVA and there is no wilderness monitoring. Without a Wilderness Management Plan to help provide guidance, the wilderness program has lacked consistency, direction, and focus for many years.
Subsistence		web ▸
Overall Condition, Opportunity and Continuity for Subsistence Activities		KOVA has seven primary communities that are affiliated with the park and are heavily dependent on subsistence resources from the park: Kotzebue, Noorvik, Selawik, Kiana, Ambler, Shungnak, and Kobuk. These communities have NPS Resident Zone status. Additionally, residents of Deering, Buckland, Noatak, and Kivalina have NPS Resident Zone status, and some residents of these communities occasionally harvest resources from the park. Sharing of subsistence foods with relatives and friends is an important cultural practice that extends beyond the region. Key wildlife species of primary importance for subsistence use in the region are caribou, moose, and Dall's sheep. Sheep have drastically declined and caribou are declining. This is leading to a compounding situation where there is a decrease in availability of important wildlife resources and an increase in number of subsistence users.

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

- NPS's Arctic Network Inventory and Monitoring Program conducted monitoring in KOVA on vital signs including: Dall's sheep, moose, terrestrial vegetation (including lichen), permafrost, terrestrial landscape patterns, caribou, fire, large lakes, shallow lakes, streams, fire, snowpack, landbirds, and weather and climate.
- NPS partnered with the Alaska Department of Fish and Game to conduct a moose composition survey in the Lower Kobuk/Upper Squirrel River area, including much of KOVA, in fall 2016. A moose population count survey is scheduled for this same area in spring 2017.
- NPS partnered with the U.S. Forest Service to produce a model of the effects of climate change on the habitat of over 200 species of birds and mammals.
- NPS conducted intensive Dall's sheep surveys on a population experiencing sharp decline. NPS worked with partners to close the federal subsistence hunt on sheep in KOVA to allow the population to recover.
- NPS conducted a study of changes in small mammal distributions in response to changing ecosystems.
- KOVA conducted a workshop to describe the properties and uses of the Wild and Scenic Kobuk River for the Wild and Scenic River Program's documentation.

Cultural Resources

- KOVA's archival processing has been brought up-to-date. 205 linear feet of archives with a finding aid were produced for all northwest Arctic parks including Bering Land Bridge, Cape Krusenstern, Kobuk Valley, and Noatak.
- In the summer of 2015, the National Park Service collaborated with Alaska Geographic, Bering Straits Native Corporation, Kawerak Incorporated, Carrie McClain Museum, and UAF Northwest Campus to host Nome Archaeology Camp, an opportunity for Alaskan teens to learn more about the heritage of the Bering Straits region through archeological methods, oral history, and museum studies.
- In 2013, archeologists completed excavation of Igliqtiqsiugvigruaq, a large village site on the Kobuk River. Working with the National Park Service and the Kiana Traditional Council (Federally recognized tribe), archeologists excavated a house, which included the removal and DNA testing of human remains discovered in 2011. The site can tell us more about ancestors of Kiana residents; preliminary results have been shared through a film called *Swift Water Place*

Visitor Experience

- Two Artists-In-Residence have had spectacular experiences in KOVA and produced artwork that traveled around the state for the 50th Anniversary of the Wilderness Act in 2015. One piece (from Constance Baltuck) is an original painting and the other (from Elaine Phillips) is a unique textile collage. Both are on exhibit in the new Northwest Arctic Heritage Center.

Wilderness

- KOVA completed the mapping of current wilderness boundaries and calculation of current wilderness acreage.
- The Western Arctic Parklands compiled the legislative history of Wilderness in Kobuk Valley National Park, Noatak National Preserve, and Cape Krusenstern National Monument.

Subsistence

- NPS released new regulation changes allowing customary and traditional uses of horns, antlers, and plant materials collected from parklands (Federal Register 2017).
- NPS continues to work within a regulatory framework to balance subsistence uses with conservation of wildlife populations. The NPS manages a sheep hunt within and adjacent to KOVA and coordinates with the State of Alaska.
- The Kobuk Valley Subsistence Resource Commission (SRC) meets twice yearly to discuss regulatory wildlife and fisheries proposals and make recommendations, which may address major topics such as eligibility, access, harvest monitoring, methods and means of taking resources, and research needs. Most recently, the SRC met in July 2015, February 2016, and November 2016 and reviewed and discussed hunting and fishing proposals, wildlife survey results and resource reports, the park's General Management Plan, and the park's Hunt Plan. The next meeting is planned for spring 2017.

Key Issues and Challenges for Consideration in Management Planning

Many of the major management challenges facing KOVA are common to all Arctic parks, including: adapting to landscape and ecosystem change driven by climate change, managing for subsistence and wildlife populations, mitigating current and potential impacts from development outside park boundaries, addressing logistical challenges unique to remote parks, and adapting to the increase in shipping in the Arctic. While recognizing that preventing many of these changes is beyond park control, the NPS may consider a suite of adaptations.

Climate-Driven Challenges

The Arctic has been warming at twice the rate of the temperate latitudes, which has led to several observed physical and ecological changes with many more anticipated. Models predict that the Western Arctic Parklands are expected to experience warming of up to 10 °F mean annual temperature over the next 60 years. Sea ice has retreated to historic lows in both extent and thickness, and researchers predict an ice-free summer Arctic Ocean by 2035. With a changing climate comes a host of current and potential issues requiring adaptation in terrestrial and aquatic environments.

Terrestrial: The most dramatic of changes predicted to occur in terrestrial ecosystems in KOVA in the coming decades include: tall shrub increase and the movement of forest into 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 lichens; increases in 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 species; habitat decline for the Western Arctic Caribou Herd; reduction in the availability of and access to key wildlife species hunted for subsistence by local residents, including caribou and moose; and mismatch of migration, forage, and pollination timing because of earlier green-up and longer snow-free season.

Aquatic: As temperatures warm, shallow lakes and ponds have shown a modest decrease in number and size, a trend expected to intensify, reducing aquatic habitat. Rivers will warm and become more filled with sediment seasonally, presenting challenges to arctic fisheries important to subsistence (including chum salmon, sheefish, and several other species of whitefish). As peat decomposes, it is expected to release nitrogen and mercury into surface waters.

Subsistence Opportunity: KOVA was established in part to provide for subsistence opportunity. Subsistence opportunity for caribou is likely to face increasing hardship because the Western Arctic Caribou Herd has declined over 50% since 2003; changes in vegetation due to climate change may alter habitat suitability.

Wildlife-related Challenges

ANILCA mandates protection of habitat for and populations of fish and wildlife, resources related to subsistence needs, and subsistence use by local residents in KOVA. As per ANILCA, wildlife management in the parks as it relates to subsistence includes involvement of local residents and Native Alaskans through Regional Advisory Councils and Subsistence Resource Commissions.

Wildlife Management Challenges: Challenges to wildlife management in KOVA include the park's lack of 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, and providing for non-consumptive uses. This lack of data leaves KOVA unable to appropriately respond to regulatory proposals that affect park wildlife resources, including the management of predators. The NPS lacks critical wildlife data primarily because of the lack of funding for wildlife studies.

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

challenge to provide appropriate staffing to manage logistics of permitting and enforcing wildlife regulations over the extensive area that comprises KOVA.

Key Species-specific Challenges: Species-specific challenges include the fact that the Dall's sheep populations in Western Arctic Parklands declined by 70% between 2011 and 2014 and the populations still appear to be in decline. The decline is related to cold springs, deep snow, and icing events; the decline is likely exacerbated by hunting pressure. The NPS manages sheep hunts and relies on data from NPS surveys to inform harvest management; providing opportunities for subsistence hunting while conserving the population is a significant challenge.

For brown bears and wolves, KOVA lacks population estimates, movement, demographic, and habitat use data for the last 20 years. Meanwhile, wildlife proposals are routinely submitted to State and Federal bodies to increase harvest of brown bears and wolves.

Although western science and traditional knowledge concur that caribou naturally cycle in abundance, the Western Arctic Caribou Herd is currently at the low end of its population cycle and has declined over 50% since 2003.

Moose calf recruitment and population numbers are low in KOVA. The NPS relies on data from cooperative surveys with Alaska Department of Fish and Game to inform population and harvest management.

Wildlife Conflicts: In addition to being important resources for subsistence, wildlife can be the source of conflicts with local residents. For example, some bears break into cabins or take fish from fish racks or nets. Addressing wildlife conflicts is an ongoing management challenge for all Arctic parks.

External Challenges

There are many challenges associated with increased shipping and development. Emerging external challenges include proposed mining and mining access roads, likely increase in regional pollution, increased potential for invasive species introduction, and ongoing illegal activity including looting of archeological and paleontological resources, poaching, and wanton waste.

Logistical Challenges

Working in the Arctic presents unique logistical challenges. Fieldwork in these remote, roadless parks requires access by boat or plane and is hampered by high costs of supplies, poor weather, and lack of infrastructure. The Western Arctic Parklands are understaffed and struggle with high staff turnover, difficulty hiring local residents (due to low federal wages compared to the high cost of living in Kotzebue), lack of housing, and slow telecommunications.

Chapter 1. Introduction

Kobuk Valley National Park (KOVA) is managed as a unit within the Western Arctic Parklands in northwestern Alaska. The purpose of this State of the Park report for Kobuk Valley National Park ("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 by park staff and partners, 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, irrespective of the ability of the park superintendent or the National Park Service to influence it.

Most of the national park units in Alaska, including KOVA, were established or expanded under the Alaska National Interest Lands Conservation Act (ANILCA), which was adopted on December 2, 1980. ANILCA's passage culminated more than 20 years of deliberation on federal land claims after Alaska statehood.

In 1971, Native claims were resolved by passage of the Alaska Native Claims Settlement Act (ANCSA). In addition to providing Native land claims, this act also provided for withdrawal of 80 million acres for possible designation as national parks, fish and wildlife refuges, national forests, and wild and scenic rivers. KOVA is among those park areas first established in 1978 by Presidential Proclamation by President Carter when he withdrew over 100 million acres of federal land, including 56 million acres as national monuments.

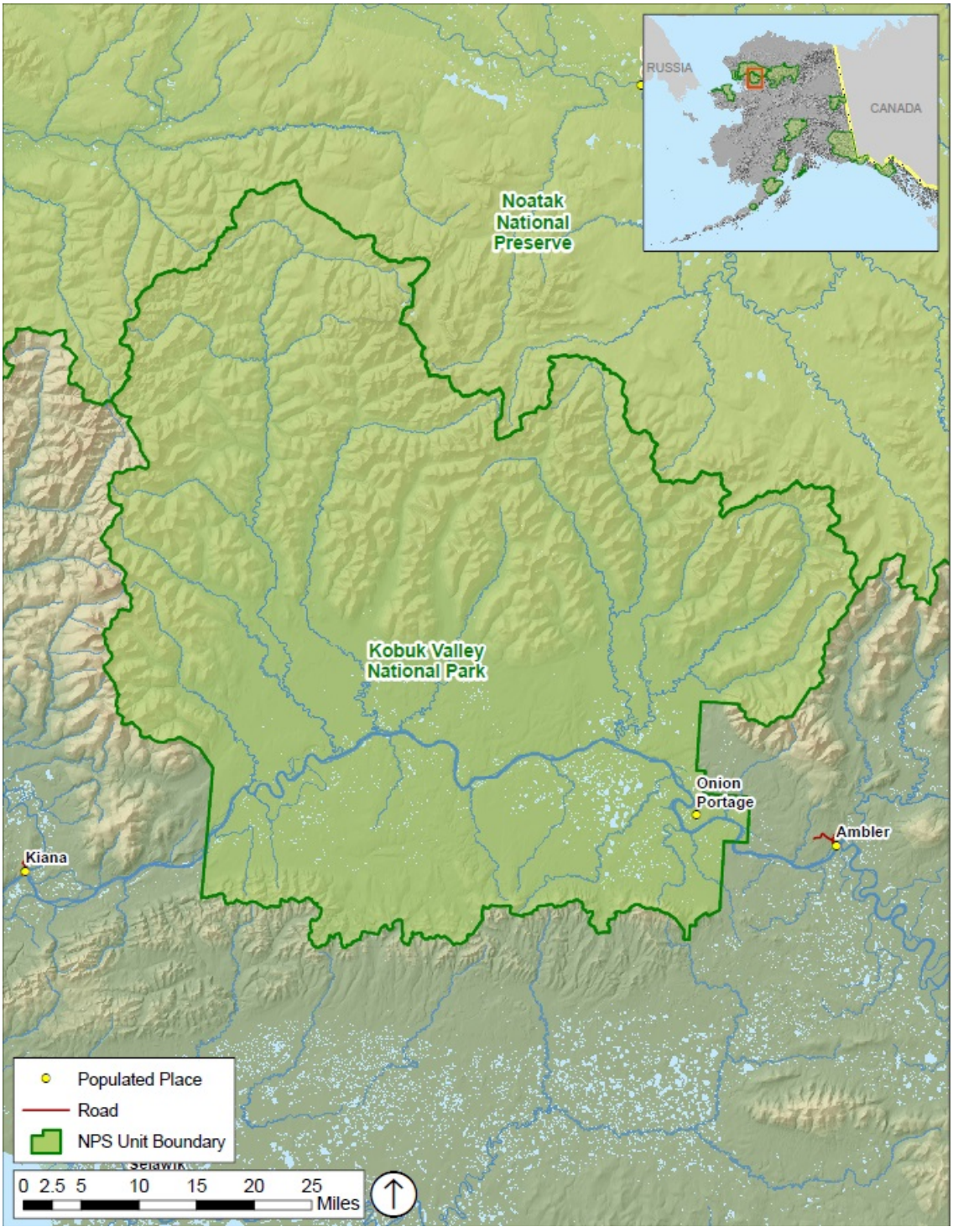
The purpose of Kobuk Valley National Park is to maintain the environmental integrity of boreal forest, montane, and riverine ecosystems. The park protects and interprets diverse resources including arctic sand dunes, archeological sites, and subsistence resources. Guided by legislation and the knowledge acquired through management, research, and civic engagement; statements of significance define what is most important about the park's natural and cultural resources and values. The significance statements are used to guide planning and management decisions to ensure that priority resources and values are preserved. Significance statements for KOVA are:

1. Kobuk Valley National Park preserves the environmental integrity and interprets the ecosystems of the Kobuk River watershed.
2. Kobuk Valley National Park preserves, studies and interprets, in cooperation with Alaska Natives, evidence reflecting a continuum of cultural use and adaptation within arctic-interior Alaska, spanning thousands of years.
3. Kobuk Valley National Park includes 1.7 million acres of public land, all of which is eligible or designated Wilderness.
4. Kobuk Valley National Park protects habitat for and populations of birds, fish, and other wildlife typical to both arctic and boreal forest ecosystems in northwest Alaska.
5. The unfettered migratory movement of the Western Arctic Caribou Herd through Kobuk Valley depends on the undeveloped character, vastness and natural resources of Kobuk Valley National Park.
6. Kobuk Valley National Park protects natural resources that provide the opportunity for local rural Alaska residents to engage in customary and traditional subsistence uses.

In northwestern Alaska, above the Arctic Circle, Kobuk Valley contains more than 1,750,000 acres of road-less land and water. The park includes about 81,000 acres of lands owned by native corporations and the State of Alaska. Covered in boreal forest and tundra, the park is near the center of the vast ecosystem between Selawik National Wildlife Refuge and Noatak National Preserve. Gates of the Arctic National Park and Preserve is 32 miles east of the park.

The park covers a broad, wetland-dominated valley along the Kobuk River on the western end of the Brooks Range. The Great Kobuk Sand Dunes are the largest active Arctic dune field in North America. Together with the Little Kobuk Sand Dunes and the Hunt River Dunes, the present active dune area in the park covers over 20,000 acres.

Park headquarters are at the Northwest Arctic Heritage Center in Kotzebue; about 100 miles (160 km) west of the park on the Bering Sea coast. Seasonal ranger stations are operated along the Kobuk River at Kallarichuk, at the west end of the park, and at Onion Portage at the east end of the park. Access to the area is available by commercial jet flights to Kotzebue, the largest community in the region. Access to parklands is by small charter aircraft, and in winter by snow machine, ATV, and dogsled.



Map of the Park

Chapter 2. State of the Park

The State of the Park is summarized below for five categories—Natural Resources, Cultural Resources, Visitor Experience, Wilderness Character, and Subsistence Use —based on a synthesis of the park's monitoring, evaluation, management, and information programs, and 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 you 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 derive from the in-depth knowledge and expertise of park and regional staff gained from their being involved in the day-to-day practice of all aspects of park stewardship and from the professional experience of the participating 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 NPS strives to incorporate climate considerations in decision-making processes and management planning and consider 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 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 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

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Ozone	Ozone Annual 4th-Highest 8-Hour Concentration		No condition data are available for ozone. However, given the paucity of ozone sources, it is likely that concentrations fall well below advisory thresholds.
Deposition	Nitrogen and Sulfur Wet Deposition		Data from the Bettles National Atmospheric Deposition Program (NADP) monitoring station (nearly 200 miles distant) and adjacent areas suggest that wet nitrogen deposition (ammonium, nitrates) is likely to be in the range of 0.2–0.5 kg/ha/yr level (NADP Monitor ID: AK06, NPS-ARD 2015, Brumbaugh et al. 2016). National and Arctic nitrogen critical loads assessments (Pardo et al. 2011, Linder et al. 2013) rated arctic tundra as extremely sensitive with a critical load of 1 kg/ha/yr of nitrogen deposition. While nitrogen levels in park rivers are currently low (O'Donnell et al. 2015), permafrost thaw may eventually contribute nitrogen to surface waters (Ewing et al. 2015, Sullivan et al. 2011d, Sullivan et al. 2011b). NPS's Air Resources Division estimated that 0.2 kilograms per hectare per year (kg/ha/yr) of wet sulfur deposition were deposited in adjacent Gates of the Arctic National Park and Preserve between 2010 and 2014. A proposed arctic critical load of sulfur at 4.8 kg/ha/yr was generated for vascular vegetation, which is much less sensitive than lichens and aquatic ecosystems (Forsius et al. 2010). Ecosystems in Kobuk Valley were rated as having high sensitivity to nitrogen and sulfur acidification effects relative to other parks (Sullivan et al. 2011b) and moderate sensitivity to nutrient nitrogen effects (Sullivan et al. 2011c). Ecosystems and vegetation types such as the park's remote lakes, tundra lichen communities, and herbaceous communities are sensitive to the effects of both nitrogen nutrient enrichment and acidification. Acidification effects can include changes in water and soil chemistry that impact ecosystem health, lichens, fish, invertebrates, and phytoplankton (Sullivan et al. 2011a, Sullivan et al. 2011c). The degree of confidence in the nitrogen and sulfur deposition status is low because of the large distance to the monitoring sites. No trend data is available due to insufficient monitoring timespan. Regional pollution is likely to increase due to increased shipping traffic through the Chukchi Sea and oil development in the National Petroleum Reserve – Alaska.

Air Quality (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Deposition (continued)	Dry Deposition		Dry deposition of nitrogen, sulfur and metals—while in some cases higher than wet deposition—is likely to be lower than ecosystem critical loads for N and S based on data from adjacent areas (Brumbaugh et al. 2016). Heavy metals are at or near arctic baseline levels based on moss monitoring (Neitlich et al. 2017, Hasselbach et al. 2005). No trend data is available due to insufficient monitoring timespan.
Contaminants	Mercury and Persistent Organic Pollutants		Mercury deposition warrants moderate concern. This status is based on estimated wet mercury deposition and predicted levels of methylmercury in surface waters in other Arctic parks, Gates of the Arctic and Noatak. The 2011–2013 average wet mercury deposition is very low at the adjacent monitoring station in Bettles at 2.1 micrograms per square meter (NADP MDN Monitor ID: AK06) and predicted methylmercury concentrations in surface waters are very low, estimated to be 0.02 nanogram per liter (USGS 2015). While much lower than NPS Air Resource Division benchmarks, there is concern because mercury concentrations in some fish in both parks exceeded thresholds for both subsistence users and wildlife health (Landers et al. 2008, NPS-ARD 2015). Persistent organic pollutants are low in water, air, snow, lake sediment, and vegetation of Noatak, about 200 miles distant. However, concentrations of historically-used pesticides were generally mid-range along the spectrum of western U.S. National Parks. The banned pesticide Dieldrin in long-lived fish such as lake trout exceeded the health advisory threshold for subsistence users while Chlordanes approached the advisory threshold for fish-eating birds (Landers et al. 2008).
Visibility	Haze Index		Based on data from the Bettles monitoring site (nearly 200 miles distant), 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 is low due to the large distance between the park and the visibility monitor. No trend information is available because the monitor has an insufficient number of years of data (IMPROVE Site ID: GAAR1, AK; NPS-ARD 2015). While haze is generally low, the park has also experienced intermittent periods of high particulate haze from local or regional summer fires.

Resource Brief: Historical and Projected Changes in Climate for Kobuk Valley National Park and Preserve

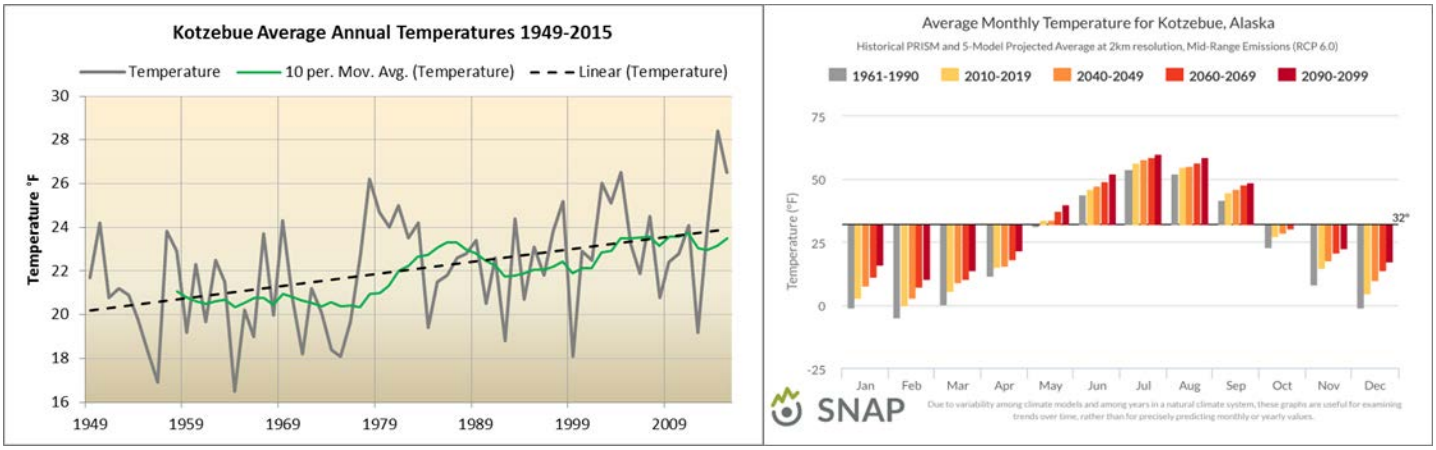
Climate, by determining the temperature and precipitation regimes for any ecosystem, is widely recognized as one of the most fundamental drivers of ecological condition. The climate patterns of Alaska are primarily influenced by latitude, continentality, and elevation. The high latitude drives the seasonal 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).

KOVA is in the eastern most region of the West Coast climate division as defined by Bieniek et al. (2012). The long-term record at Kotzebue provides the climate context for the park. Average seasonal and annual temperatures from the site are shown in the graphs below. For consistency among other park units in the state, observations are from 1949, the time period for which the most reliable meteorological data are available. Temperature and precipitation projections over the next century have been calculated on a monthly time scale for Kotzebue. The projections are based on the PRISM model historical baseline projected at a 2km resolution using the mid-range emissions scenario (representative concentration pathway RCP 6.0). These graphs are useful in looking at overall trends in temperature increases versus specific values due to the uncertainty in models and natural climate variability (SNAP 2016).

Historical trends and future projection for temperature

The observed temperature trend is non-linear, with multi-decadal variations (graph below left). The increase in the mean annual temperature is significant with temperatures warming ≈ 3.8 °F at Kotzebue. Considering just a linear trend masks important variability in the time series; the 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 a warmer phase for the next several decades. 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. 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 in winter (graph below right). There is general agreement among individual climate models in the direction and magnitude of warming over the coming decades.



***Left*: Average annual temperature Kotzebue. The green lines show the 10-year moving averages. The dotted lines show a simple linear regression trend. *Right*: The Scenarios Network for Alaska and Arctic Planning (SNAP) monthly temperature projections for the next century are shown for Kotzebue (SNAP 2016).**

Resource Brief: Historical and Projected Changes in Climate for Kobuk Valley National Park and Preserve (continued)

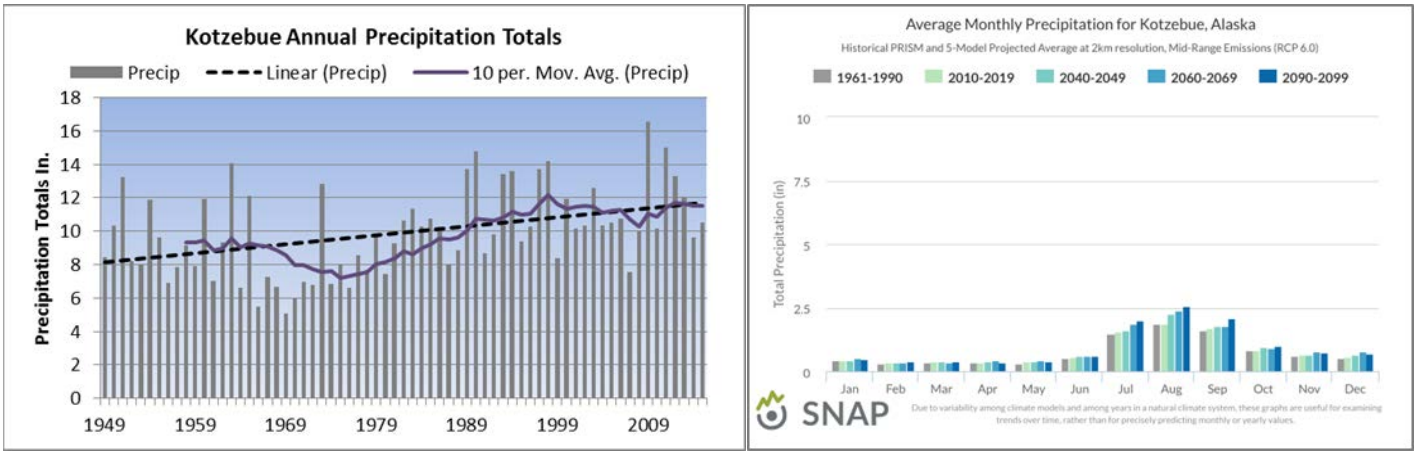
Persistent warm periods and temperatures that reach above freezing in winter can pose problems to an ecosystem that is dominated by snowcover for a good portion of the year: snow turns to rain, which leads to icing, which makes foraging difficult; plants are subject to desiccation because of low or no 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, permafrost 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

Observed annual precipitation totals have increased significantly at Kotzebue, with most of the increase apparent in the winter and spring seasons. Snowfall records show a significant increasing trend for annual and winter snowfall totals. Total annual precipitation is projected to increase throughout the next century, particularly in the summer season (graph below right) (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 Kotzebue; more rain and more intense rain events can lead to flooding, landslides, and soil instability.



***Left*: Total annual precipitation at Kotzebue. The purple lines show the 10-year moving average. The dotted lines show a simple linear regression trend. *Right*: The Scenarios Network for Alaska and Arctic Planning (SNAP) monthly precipitation projections for the next century are shown for Kotzebue (SNAP 2016).**

Other projections:

In addition to warmer mean temperatures and changes in annual precipitation, climate change will exhibit itself in many other ways. Permafrost, which is present in the park, is projected to thaw across large portions of 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 dampening and the positive phase exacerbating overall climate change trends. Significantly, warmer temperatures and a more variable precipitation regime may lead to both droughts that are more frequent and more severe flooding and erosion.

Geological Resources

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Permafrost	Extent of Permafrost, Permafrost Temperature, Thickness of Active Layer		Most of KOVA is underlain by permafrost. Modeling by University of Alaska Scientists (Panda et al. 2014, 2016) and ground temperature observations by NPS (Swanson 2016a) show that permafrost has warmed and the thickness of the seasonally-thawed upper (or "active") layer has increased as a result of climate warming since 1950, but the extent of permafrost has changed little so far. Recent warming has raised permafrost temperatures above -3 °C across much of KOVA. This has reduced the margin of safety protecting permafrost from thaw in the future, and widespread thaw of permafrost is expected in these areas in the latter half of the current century if warming continues.
	Stability of Permafrost Terrain		Climatic warming since 1950 has locally caused ground ice near the surface to melt. Some degradation of ice wedges has been documented in southern KOVA (Swanson 2016b). The loss of lake area in recent decades in KOVA is probably linked to increased breaching of lake shores due to permafrost thaw (Jones et al. 2011, Swanson 2013). Unusual weather in 2004 produced a large number of small landslides in the Alaskan Arctic due to permafrost thaw (Swanson 2014, Balser 2015) but only a few were in KOVA. Most of these landslides have since stabilized and revegetated, though a few have continued to grow. No new major thaw-landslide events have occurred since 2004.
External Development	External Development Threats		KOVA harbors a history of small-scale mining, primarily for gold and jade. While no activity exists today within the park boundary, mineral exploration and small-scale mining occur nearby. The Alaska Industrial Development and Export Authority has proposed a road linking the Ambler Mining District with the Dalton Highway. The development of Ambler mining resources would be contingent on this road. Development of the mine could bring potential impacts to water and air quality in KOVA including: sulfur and nitrogen emissions, heavy metal-bearing fugitive dusts, and water-borne contaminants. In 2013, the village of Kobuk received funding to construct a wood-fired boiler to heat the community's water system. It is anticipated that a significant amount of wood will need to be cut near the borders of KOVA to supply this need. A geodatabase has been developed to allow resource managers to track current and proposed development activity in and around KOVA.

Geological Resources (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
External Development (continued)	Abandoned Mine Lands and Formerly Used Defense Sites (FUDS)		At KOVA, exploratory drilling for placer gold occurred along the Salmon River in the 1940s and 1950s, resulting in abandoned drums of petroleum products. The drums were removed from the park in 2007.

Paleontological Resources

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Paleontological Resources	Inventory and Understanding		Fossils are non-renewable resources that are irreplaceable windows into the past. Once a fossil is gone, it is gone forever. A cursory paleontological inventory was completed in 2009 (Elder et al. 2009). A database of all known paleontological resources is under development and expected to be completed in 2017. KOVA contains fossils in three contexts: 1) Paleozoic (542–251 million years ago) marine sedimentary rock units along the northern boundary; 2) Cretaceous (145–64 million years ago) marine and non-marine sedimentary rocks along the southern boundary; and 3) Pleistocene and Holocene (2.6 million years ago to present) fossils within unconsolidated deposits exposed along river cut-banks. The marine sedimentary rocks contain generally common marine invertebrate fossils. The Cretaceous non-marine rocks contain abundant plant fossils. Recently, dinosaur tracks were found in similar geologic units south of the park boundary, so there is potential for dinosaur tracks in KOVA. Pleistocene bone fragments are found in the Great Kobuk Sand Dunes and along river gravel bars. Only one site has been discovered that contains a rich collection of Pleistocene fossils (Hamilton et al. 1984, 1993), but other sites may be found in river cut-banks. Park collections contain four paleontological specimens including a fragment of a mammoth tooth and three collections of bone fragments, tentatively identified as elk (Elder et al. 2009).
	Percentage of Known Sites in Good Condition		A paleontological resources inventory and field-based site assessment to establish baseline resource monitoring needs has not been done. Non-permitted collecting in Western Arctic Parklands has been observed, but has not been officially documented. Fossils in river cut banks are at high risk of being eroded.

Water Resources

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Lake Communities and Ecosystems	Surface Area and Number of Lakes		Analyses of lake area change by remote sensing (Swanson 2013) indicate that in recent decades the area of lakes and ponds has been stable or decreasing in KOVA. The decreases have been due to decadal-scale climate variations that could persist into the future. Areas with the most substantial declines in lake area in recent decades are the lowlands of northern KOVA, due mainly to lake drainage in permafrost areas. The declines of 10% to 20% in recent decades have likely reduced habitat for aquatic wildlife; if this continues, it could be cause for significant concern in the future.
	Water Quality (chemistry, temperature, concentration of organics, turbidity)		Lake chemistry in the Arctic is sensitive to the effects of climate change and disturbance (e.g., permafrost thaw and erosion; Vonk et al. 2015). In KOVA, lake chemistry varies spatially across diverse landscape types, including sand dunes, wetlands, and inactive floodplains. Shallow lake surveys in KOVA indicate that lakes are generally in good condition with respect to nitrogen, phosphorous, and organic matter concentrations (Larsen et al. *in prep*). Lake surface area dynamics vary across space and time (Necsoiu et al. 2013), indicating a heterogeneous response to climate and permafrost thaw.
Stream Communities and Ecosystems	Water quality (chemistry, temperature)		Arctic stream chemistry is sensitive to the effects of climate change and disturbance (e.g., permafrost thaw; Vonk et al. 2015). A 2013 survey of 13 streams in KOVA indicates that water quality is presently in good condition with respect to nutrient concentrations, with low nitrogen and phosphorous concentrations across all sites (O'Donnell et al. 2015). However, dissolved organic carbon (DOC) concentrations were highly variable across sites, reflecting spatial differences in watershed hydrology, parent material, and permafrost extent. DOC concentrations ranged from 1.0 mg/l in the Tutuksuk River up to 25.2 mg/ l in Nigeruk Creek (the highest measured concentration measures in Arctic Parks; O'Donnell et al. 2015). Trace metal concentrations in streams were all low, indicating pristine conditions. There are no long-term records for stream chemistry in the KOVA; thus, considerable uncertainty exists with respect to long-term trends and trajectories.

Water Resources (continued)

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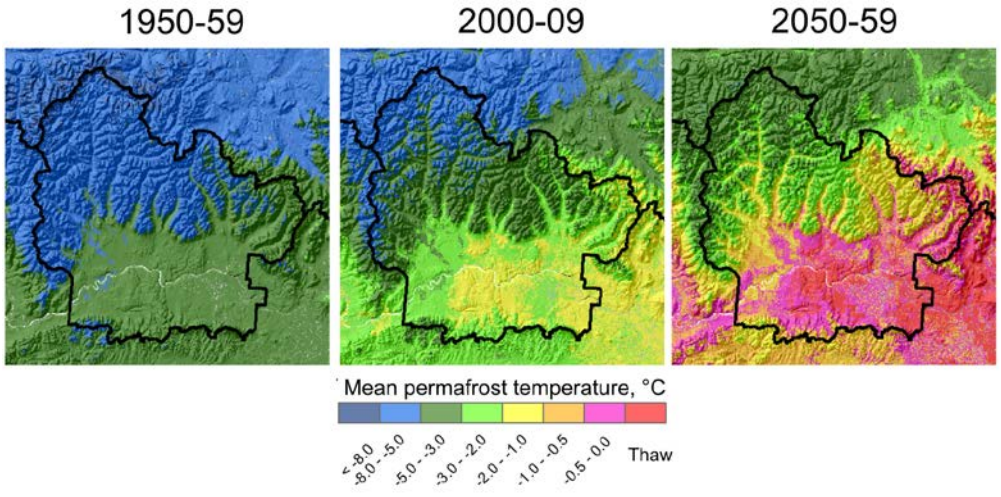
Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Stream Communities and Ecosystems (continued)	Flow (magnitude and timing)		The USGS maintains a river gauge on the Kobuk River near Kiana, just downstream of the western park boundary. Recent analyses indicate that the time of peak discharge during spring snowmelt has occurred earlier by 3.5 days per decade from the mid-1970s to the present (Tape et al. 2016a). The timing of river freeze-up in autumn has occurred later by nearly 7 days per decade since the mid-1970s (O'Donnell et al. 2015), and may be due to increased groundwater discharge associated with permafrost thaw within the basin (Walvoord and Striegl 2007). Together, these observations point toward a significant lengthening of the open-water period on the Kobuk River. The magnitude of annual discharge has not changed during the period of record on the main-stem of the Kobuk River. However, annual discharge has declined since the mid-1980s for Dahl Creek, a small tributary of the Kobuk River. Earlier peak stream flow reflects earlier snowmelt from the terrestrial ecosystem, and may have cascading consequences for aquatic habitat and organisms. However, these mechanisms are complex and poorly understood.

Resource Brief: Permafrost Temperature

Permafrost underlies most of KOVA and affects nearly everything in the ecosystem, from soils and vegetation to water and wildlife. Permafrost is ground that doesn't thaw in the summer due to a cold climate. Permafrost perches water near the surface, making soils wet. The striking polygonal patterned ground so characteristic of the Arctic is due to permafrost. Ice can build up in the ground and then thaw, producing pits, ponds, lakes, and landslides. Permafrost thaw in a warming climate could have far-reaching effects on arctic ecosystems. Ground temperature measurements and computer modeling by University of Alaska scientists and NPS show that warming since the 1950s has caused the permafrost in KOVA to warm, and in the southern lowlands it is within one degree of thawing. With the continued warming expected in the coming decades, permafrost in KOVA is expected to warm and start to thaw in parts of the southern lowlands, causing subsidence, formation of new depressions and enlargement of existing thaw pits.



Historic and projected permafrost temperature across KOVA. Maps courtesy of Santosh Panda, University of Alaska Fairbanks.

Terrestrial Vegetation

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Native Plants	Terrestrial Lichen Cover, Caribou Lichen Winter Range		Terrestrial lichen cover, while projected to decline due to eventual shrub increase, is still on the moderate to high end of potential spectrum in Kobuk Valley (Holt and Neitlich 2010). It is likely that terrestrial lichen cover has declined slightly due to shrub increase in tundra habitats (Swanson 2015), and this trend is expected to continue. The primary areas of lichen habitat are the tundra ecosystems of the Baird Mountains, and the spruce-lichen woodlands of the lowlands. Lichens have the potential to increase with the decline of the Western Arctic Caribou Herd (Joly et al. 2010). Increasing forest cover in the future is likely to promote higher cover by epiphytic lichens (i.e., lichens growing on trees). If KOVA experiences increases in fire frequency and area burned due to the continued warming and the increase in lightning strikes, this will impact late successional lichen cover. Landscape units burned in the past 60 years had only one quarter of the lichen abundance of unburned units in the Western Arctic Caribou Herd's historic winter range (Joly et al. 2010). A greater presence of fire on the landscape is likely to place more of the landscape into earlier successional states with less lichen abundance (Joly et al. 2009, Racine et al. 2006).

Resource Brief: Lichen

Lichens are a conspicuous and abundant component of the flora in Arctic parklands. Lichens are fragile, slow-growing, and sensitive to air pollutants. Forage lichens—i.e., the dominant lichens of the low shrub and alpine tundra—form the bulk of the winter diet for caribou and domesticated reindeer, and are also consumed by muskoxen. Over the past decade, NPS studies have documented 491 species of macrolichens in the Arctic parklands (Holt and Neitlich 2010). Scientists have estimated the presence of a similarly large number of crustose lichens. NPS cooperators recently described 3 new lichen species of *Hypogymnia* (or Tube Lichens) from Beringia, based in part on specimens gathered on the Seward Peninsula (McCune 2008).

Reindeer lichens can frequently form a co-dominant landcover in the Western Arctic Parklands and are a preferred caribou winter forage. NPS Photo by Peter Neitlich.

One expected impact of climate change is increased shrub dominance and spread of forest into tundra habitats (Swanson 2015). In the long term, this may turn lichen-rich dwarf and low shrub tundra into denser shrub thickets and woodlands. These communities tend to smother terrestrial lichens with litter fall and therefore have lower biomass of the forage lichens needed to sustain large ungulate herds (Joly et al. 2010). Such a pattern has been demonstrated on the Seward Peninsula, with black spruce encroachment (Lloyd et al. 2003). The future state of northern Alaska lichen communities may more closely resemble the lower lichen biomass mixed forest-alpine communities of southern or interior Alaska. These climate driven changes, in combination with a decreased fire-return interval, may result in substantial declines in lichen biomass. While lichen biomass may eventually decline, lichen diversity may actually increase with greater tree and shrub cover.

Terrestrial Vegetation (continued)

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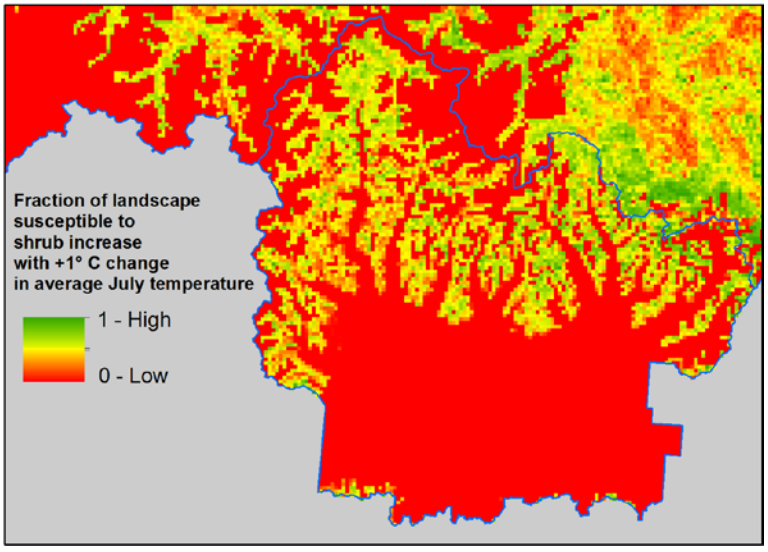
Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Native Plants (continued)	Lichen Species Diversity		Kobuk Valley has the highest number of macrolichen species (225) in the Western Arctic Parklands, probably because of the confluence of boreal forest, alpine and dune ecosystems (Holt and Neitlich 2010). The mean lichen species richness on an acre plot (38) was also high compared to other parks in the Arctic (Holt and Neitlich 2010, Nelson et al. 2015). Diversity may potentially be at a relatively high level now because of the ecotones of alpine, forest, and riparian ecosystems; diversity may decline if alpine systems shrink. KOVA currently has no trend data on lichen diversity but has no basis to suspect changes.
	Vascular Plant Diversity		KOVA has a relatively high vascular plant diversity, with 402 species identified to date, of which 14 are classified as rare or imperiled (S1, S2, or S3) at the State of Alaska level by the Alaska Natural Heritage Program (AKNHP 2016, Parker 2006). At present, these plants are naturally rare and are not threatened with extinction by human actions. Climate change and associated changes in ecological disturbance regimes such as fire and flooding are expected to alter the abundance of many plant species, but significant changes in overall diversity of vascular plants are not expected to occur in the next few decades.

Resource Brief: Shrub Extent and Expansion into the Tundra

Shrubs have grown taller and expanded into new areas of arctic tundra in recent decades (Tape et al. 2006). This shrub expansion is due mainly to climate warming, and it has far-reaching consequences. Shrubs provide forage for browsing species (moose, hares, and ptarmigan); they also can: reduce erosion by vegetating bare areas along streams, increase snow depth by capturing windblown snow, and shade out plants of lower stature (such as lichens). Shrubs react quickly to climate warming because they are relatively fast-growing and already present across the arctic tundra and adjacent boreal forests—though often stunted by wind and cold.



Landscape susceptible to shrub increase.
Map from Swanson (2015).

Shrub expansion can be detected by comparing aerial photographs from the 1950s or 1980s with more recent photos or satellite images. These comparisons have shown that, while shrub expansion is clearly visible, it has covered modest total areas as yet and has occurred mainly in the tundra areas with the warmest summers. July average temperatures above 10 °C (50 °F). Multiple tall shrub species can grow on well-drained soils with neutral pH, while only a few tolerate the cold-wet, acid soils common in the Arctic. Thus in the future shrub expansion is expected to be most apparent on well-drained soils in places with tundra vegetation where, as a result of warming, the July average temperatures have risen above 10 °C. The highlands of northern KOVA just above the present tall shrub thickets contain the land in the Park most susceptible to future shrub expansion with climate warming. The lowlands of southern KOVA are already warm enough for tall shrub thickets, and there shrubs are limited by wetness or competition from trees.

Terrestrial Vegetation (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Native Plants (continued)	Area of Open Tundra		Vascular plant cover has been increasing across the Arctic in recent decades, as shrubs and other plants increase in height and density, and this trend is expected to continue in the future (Tape et al. 2006, Verbyla 2008). Local declines in plant cover due to fires are short-lived, as vascular vegetation cover is quickly re-established. The cover, density, and height of shrubs have increased in tundra areas of KOVA, as has occurred elsewhere in the Arctic. Comparison of aerial photographs from 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 shrub thickets still cover only about 6% of the total area (Swanson 2013). Most of the increase in shrubs is occurring in the relatively warm and well-vegetated 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 open arctic tundra landscape and harm some of the species that depend on it (Marcot et al. 2015). Expansion of trees onto arctic tundra has also been documented in the National Parks of northern Alaska (Suarez et al. 1999, Swanson 2013). Tree expansion has been slower and less widespread than shrub expansion. In coming decades it is likely that white spruce (*Picea glauca*) will expand very gradually up in elevation in KOVA. KOVA contains the boundary between boreal forests to the south and arctic tundra to the north. This line is expected to move north gradually over the coming century.
Invasive Plants	Presence/Absence		There are no known occurrences of non-native plant species in the park. Terrestrial invasive plant species have been recorded at airports in Nome, Quartz Creek, Kotzebue, Dahl Creek, and Bettles. These airports are frequently used to access the park, and KOVA's greatest concern is that plants could be inadvertently transported from these locations into the park. Future monitoring of the floatplane landing areas for aquatic invasive species is warranted. The main aquatic plant of concern is *Elodea*, a freshwater aquatic plant that has become established in southern and interior Alaska. It is unknown *whether Elodea* can survive in the brackish water of the Kotzebue floatplane lagoon.

Birds

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Landbirds	Populations		KOVA falls into nationally and internationally recognized bird conservation regions (Conservation Region 2, BPIF 1999 and the Arctic Avifaunal Biome, Rich et al. 2004). However, population status information for landbird species in KOVA is incomplete. Fifty-three species of montane-nesting birds were observed during a 2001–2003 inventory of national parks in the Arctic. The following are species of high conservation concern because most, if not all, of their Western Hemisphere populations breed in Alaska: short-eared owl, McKay's bunting, Smith's longspur, snowy owl, snow bunting, hoary redpoll, and Lapland longspur. Species associated with shrub habitat may be vulnerable to climate-induced expansion of woody vegetation into open landscapes. For example, in a study of passerine assemblages in Denali National Park from 1995–2013, Mizel et al. (2016) documented pervasive upslope shifts in the distributions of shrub-associated passerine species. In particular, species associated with high elevation, open shrub habitats, including Arctic warbler, savannah sparrow, and golden-crowned sparrow, showed relatively large upward shifts in their optimum elevation.
Shorebirds	Populations		Information about the population status of breeding shorebirds in KOVA is lacking. Loss of wetlands, particularly migratory stopover areas outside of Alaska that are important to those species breeding in Alaska, represents the greatest threat to shorebird populations worldwide. 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).

Terrestrial Mammals

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Moose	Distribution		Moose in the Arctic are limited by winter range, defined by access to shrubs in excess of 1m in height (Tape et al. 2016b). 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). Moose inhabited KOVA by the 1950s (LeResche 1974, Tape et al. 2016b). Moose in KOVA primarily utilize habitat in the boreal forest that flanks the Kobuk River and its tributaries.
	Abundance		The abundance of moose found year-round and the proportion of calves along the Kobuk River is highest downstream, or west of, the park, but KOVA comprises vast moose habitat. The 2012 population estimate for moose in the lower Kobuk River drainage yielded a density of 0.51 moose per square mile, which is relatively high in northwest Alaska. More recent observations by biologists, however, indicate that moose densities are currently low. In addition, the Alaska Department of Fish and Game is currently not recommending reauthorization of an antlerless moose (i.e., cow moose) harvest in Game Management Unit 23 of which KOVA is a part (B. Saito, personal communication). Sport hunting is prohibited in the National Park, but subsistence harvest and predation are sources of mortality.
Bears	Distribution and Abundance		Brown and black bears occupy suitable habitat in KOVA. Brown and black bear populations are not monitored by the NPS. According to residents of Unit 23, of which KOVA is a part, brown bear numbers have increased substantially since the 1940s or 1950s (Westing 2013). Brown and black bears are allowed to be harvested by federally-qualified subsistence users within KOVA. On surrounding land, current ADF&G regulations allow 3 black bears to be taken annually by residents and non-residents. 1 brown bear is allowed to be harvested annually by residents and 1 by non-residents (ADF&G 2016). The communities of Ambler, Shungnak, Kobuk, Kiana, Noorvik, and Selawik use areas that overlap KOVA for bear hunting (Georgette and Loon 1990). Local residents have reported bear-related damage to cabins, taking of fish from fish drying racks, and a general concern for human safety.

Resource Brief: Caribou

Many residents of northwest Alaska are Natives that identify themselves as “caribou people.” The caribou is ingrained in the history, traditions, and psyche of this region. Approximately 15,000 caribou are harvested annually from the Western Arctic Herd (WAH) by local rural residents; most of whom still live a subsistence lifestyle. The herd has been one of the largest herds in the world and numbered 490,000 animals in 2003. The herd has declined since then to 201,000 animals in 2016 (Parrett 2016). This decline has resulted in restrictions in sport and subsistence harvests. The herd’s ecological impact on the Arctic Parklands is not fully appreciated; a herd of this size can substantially impact its habitat, which covers all of northwest Alaska (over 360,000 km^2), 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 use 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.

NPS monitoring of WAH caribou 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 5 Arctic park units (Bering Land Bridge, Cape Krusenstern, Gates of the Arctic, Kobuk Valley, and Noatak). During September and October, KOVA is heavily utilized by WAH caribou, while Bering Land Bridge National Preserve is also heavily used as winter range. The herd calves 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 WAH movements. New analyses confirmed the importance of lichens as winter forage for WAH caribou (Joly 2012).

Caribou swimming the Kobuk River. NPS Photo.

Terrestrial Mammals (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Caribou	Migration		Climate change is anticipated to affect mammals in myriad ways, including the timing of migration. Caribou in northwest 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 and Cameron 2015).
	Population		The Western Arctic Caribou Herd is currently at the low end of its population cycle. In 2016, the population was estimated at 201,000, down from 490,000 in 2003 (Parrett 2016). In general, the health and success of the various herds in this region is stable, with some natural fluctuation.
Dall's Sheep	Abundance		Dall's sheep can be found along the northwestern and northern edge of KOVA, but habitat is marginal and covers only ≈ 20% of KOVA. The majority of the Dall's sheep population in the Western Arctic Parklands is in Noatak National Preserve. Total sheep numbers declined across Western Arctic Parklands by 70% from a peak in 2011 to 2014. All hunts are now closed across Western Arctic Parks and the western Brooks Range.
	Distribution		Distribution of Dall's sheep in KOVA has likely decreased with decreasing sheep populations across Western Arctic Parklands. The recent decline and marginal habitat may have resulted in contraction of populations; local observations have indicated that a contraction has occurred.
Wolves	Abundance		The few historical estimates of the wolf population size in northwest Alaska are varied and unreliable, but the concern of their influence upon the Western Arctic Caribou Herd spurred predator control by means of poison and aerial shooting as early as the 1940s (Kelly 1954) and liberal harvest quotas since. From 1987–1992, wolves were radio-collared to study their demographics and predation rates; it was determined that hunting, trapping, and rabies comprise the most significant sources of mortality (Ballard and Krausman 1997). The wolf population in KOVA has not been estimated in recent years, but many local residents report an increase in observations and a concern for the caribou and public safety.

Terrestrial Mammals (continued)

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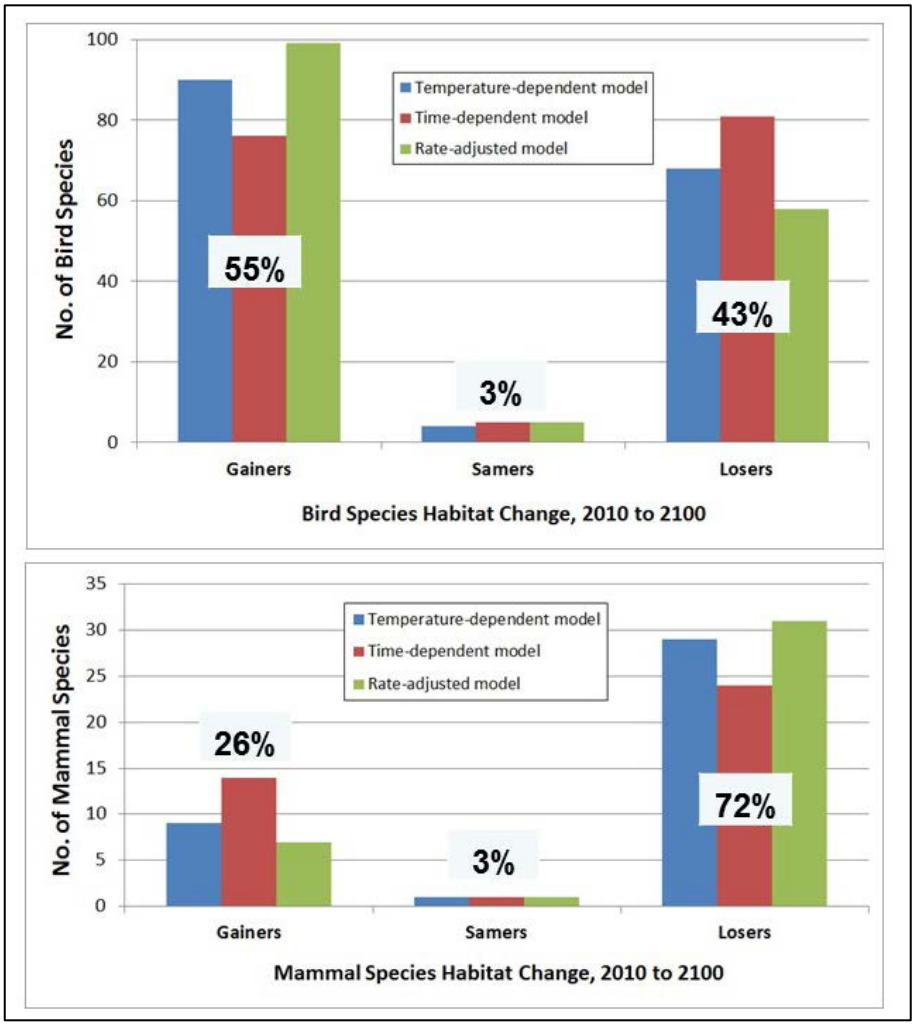
Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Wolverines	Abundance and Distribution		The NPS does not monitor wolverines in KOVA. Wolverines naturally occur at low population densities and have low reproductive rates. Wolverine populations have been shown to be very sensitive to harvest. An investigation of radio-collared wolverine (including 2 in Alaska) concluded that populations in these areas would decrease without immigration from untrapped populations (Krebs et al. 2004). In KOVA, wolverines are available for harvest under hunting regulation from 1 September to 1 March. Trapping season goes from 1 November–15 April. Although local hunters intensively pursue wolverine for their fur, the cost of gasoline in recent years may have reduced local effort to take wolverine (Westing 2013). Although it does not capture all of the harvest, sealing records from 1988–2011 data from Unit 23 indicate an average wolverine take of 24 per year. More than half of sealed wolverines were taken in the Kobuk drainage. Community harvest surveys from 2011–2012 indicate that villages in Game Management Unit 23 harvested 46 wolverines per year.
Beavers	Abundance and Distribution		Once common in the Kobuk drainage and present in the archeological record, beavers were extirpated in the late 19th century (Burch 2006). Anecdotal reports and increased conflicts with humans lend evidence to a successful recolonization, if not expansion of their range. Beaver are known as a keystone species and ecosystem engineers, creating wetlands that are used by insects, amphibians, waterfowl, passerines, and moose. Because most beaver dams in KOVA are found in smaller order streams, high runoff and storms damage and wash out dams seasonally; however, fish species found in KOVA are capable of passing through dam structures (Brown and Fleener 2001) and the impoundments have been shown to foster higher species diversity and more abundant, faster salmon smolt production (Pollack et al. 2004). A documented increase in shrub cover on the tundra is expected to expand beaver habitat over time (Swanson 2015, Tape et al. 2016a). Surveys have not been conducted to generate a beaver population estimate in KOVA. The fluctuating interest, effort, and skill of trappers in the region will influence abundance.

Resource Brief: *Wildcast*

The NPS Wildcast project modeled the likely effects of climate warming in northwest Alaska on the extent of 60 habitat types for 162 bird and 39 mammal species known (or expected to occur regularly) in the region. The project was a partnership with cooperators including U.S. Forest Service, U.S. Fish and Wildlife Service, and several universities. The project developed three models based on studies of historic changes in vegetation, mean annual air temperature, and influences of 23 biophysical drivers (such as permafrost melt and tundra fire). Researchers project that shrub, woodland, and forest habitats of 53% of the 201 wildlife species will increase, habitats of 3% will have no change, and lowland shrub, meadow, grassland tundra and other habitats of 44% will decrease (Marcot et al. 2015). In addition, habitat for 86 species of birds (43% of total bird species) and 28 species of mammals (72% of total mammal species) is likely to decline (Marcot et al. 2015). Changes in wildlife habitats will likely affect the composition and function of the ecosystem; of particular significance are the predicted declines in habitats of most small mammals, as these form the prey base for mid-sized carnivores and raptors and serve ecosystem engineering functions of burrowing and soil and nutrient turnover. Habitat is also likely to decline for 25 of the 50 bird and mammal species harvested for subsistence (including greater white-fronted goose, tundra swan, rock and willow ptarmigan, caribou, muskoxen, Arctic fox, muskrat, American beaver, and northern river otter), with habitat increases for grouse, some waterfowl, cranes, moose, black bear, and American marten.

The Wildcast project will help NPS managers design better adaptation strategies by projecting the future composition of the ecosystem. Tomorrow's ecosystem will more closely resemble that of the subarctic coast and the boreal forest, with tundra restricted to the alpine. Caribou, in particular, are expected to lose a significant portion of their lichen winter range to shrub and forest communities. This will have profound influences on the ecosystem and subsistence hunting opportunity.



Winners and losers with changing habitat. Adapted from Marcot et al. 2015.

Projected Habitat Losers. Adapted from Marcot et al. 2015.

Fish

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Chum Salmon	Abundance		Chum salmon are the most abundant salmon species in the region, and the Kobuk River supports a significant annual run. Chum represent the bulk of the commercial fishery in the downstream Kotzebue Sound area. Since no fish processors operate in the area, commercial catch is heavily influenced by cargo space on commercial flights and demand from commercial buyers (Menard et al. 2015). Catch data are therefore a poor indication of run strength or abundance. Chum are also an important subsistence fishery, forming a substantial portion of the total subsistence catch for villages along the Noatak and Kobuk Rivers, as well as Kotzebue and the surrounding area (Whiting 2006, Menard et al. 2015). Chum runs vary greatly from year to year. Escapement on the Kobuk River is estimated as cumulative catch per unit effort (CPUE) by ADF&G in a fishery near Kiana. CPUE between 1993 and 2013 varied from 490 to 2,698 with an average of 1,392 chum. A record CPUE of 4,105 chum was recorded in 2014 (Menard et al. 2015). Aerial surveys of the Kobuk River drainage from 1990 to 2014 varied from 3,447 chum in 2003 to 131,105 in 1996. 2014 included the second highest aerial survey count at 65,653 (Menard et al. 2015). Commercial harvests suggest chum runs the last six years have been strong (Scanlon 2015). Subsistence catch data are not collected consistently from year to year and form an incomplete picture of the fishery.
Sheefish	Abundance/Spawning Estimates		Inconnu (sheefish) are an important subsistence resource in the region (Georgette and Loon 1990, Whiting 2006). Inconnu are in the salmon family. They spawn in the upper Kobuk River and overwinter in the Hotham Strait/Kotzebue Sound area. Unlike salmon, inconnu reproduce approximately every 2–3 years and can live more than 20 years. High reproductive success may be intermittent. The subsistence harvest dwarfs the small commercial and sport harvests (Menard et al. 2015). Population numbers are not known. Spawning estimates on the upper Kobuk River 1995–1997 were 32,273; 43,036; and 26,800 respectively (Taube and Wuttig 1998). Minimum estimates of subsistence harvest on the Kobuk River 2012 and 2013 were 11,693 and 22,109 respectively (Menard et al. 2015). Overall 15,000–25,000 sheefish are taken annually in northwest Alaska, but many of these are from the non-spawning population in Hotham Inlet. Anecdotal evidence suggests the fish remain abundant (Scanlon 2015). Sheefish may be especially vulnerable to climate change driven by spring break-up intensity and discontinuous permafrost melt (Durand et al. 2011).

Fish (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Whitefish	Abundance		Five species of anadromous whitefish (not including sheefish) inhabit the waters of the Western Arctic Parklands. As a group, they represent the most accessible subsistence resource in the area, and are available from late spring through early winter. Traditionally, whitefish were harvested to feed both people and sled dogs. As dog teams are used less, the demand for dog food has decreased substantially. Both eggs (roe) and meat are still prized by people (Georgette and Shiedt 2005). Whitefish do not die after spawning, reproduce several times over their lifetime, and can live more than 20 years. Their movements between nearshore marine waters, brackish waters, and the rivers, streams and lakes of the region are very complex and dependent on life stages. Robust abundance data on whitefish are scarce. In a traditional ecological knowledge survey in Kotzebue and nearby villages, elders generally agreed whitefish were abundant and could not recall a time they were not (Georgette and Shiedt 2005). There was less agreement on whether abundance was increasing, decreasing or stable, though they did indicate whitefish were more consistent annually than salmon. Escapement data are not available, but limited ADF&G observations and fishermen interviews also do not indicate declining populations (Menard et al. 2015). Estimated subsistence harvests from the villages of Noorvik, Kiana, Ambler, Shungnak, Kobuk and Noatak from 1997–2003 ranged from 39,754 to 84,851 fish and averaged 54,407 (Georgette et al. 2004 in Georgette and Shiedt 2005). Importantly, subsistence harvests seem to be influenced more by weather and water conditions than fish abundance (Georgette and Shiedt 2005).
Dolly Varden	Abundance		Dolly Varden (known locally as “trout”) are members of the salmon family that feed in the ocean and spawn in rivers and streams (Scanlon 2015). They inhabit most coastal streams and large rivers in the Kotzebue Sound area. Dolly Varden are important subsistence fish in many villages after chum, sheefish and other whitefish (Whiting 2006), though in some villages they outrank other fish (Menard et al. 2015). Known for their large size in the area, Dolly Varden are also targeted by sport fishermen, though subsistence harvests are much greater. However, very few data are available on escapement, spawning or abundance (Scanlon 2015).

Unique Communities and Features

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
The Great Kobuk Sand Dunes	Condition of Unique Community		The Great Kobuk Sand Dunes are the largest high-latitude dune field in North America and host several rare species, including species endemic to the dunes (the milkvetch, *Oxytropis kobukensis*, and a sand-specializing isolated population of tiger beetle, *Cicindela limbata nympha*) and some unique sandy barrens, steppe, calcareous lichen communities, and lichen-woodland environments. The area receives few visitors and there are no known direct threats to the unique plants. In the long term (half a century or more), climate-driven changes to the vegetation of the Great Kobuk Sand dunes are likely, but the nature of these changes is as yet unknown.
Kobuk River	Condition of Unique Community		The Kobuk River is in good condition with respect to nutrient loading and trace metal concentrations. Longitudinal sampling efforts conducted in 2013 and 2014 suggest that dissolved oxygen and nutrient concentrations do not shift significantly from the headwaters (in Gates of the Arctic National Park and Preserve) to mid-river (near Kavet Creek) to down-river near Kiana. Chemical analyses of under-ice winter flow indicate that groundwater comprises a large fraction of discharge in the Kobuk, and this groundwater originates from large, sub-permafrost aquifers. The Kobuk River system has extensive spawning habitat for resident and anadromous fish species (Durand et al. 2011), which may be vulnerable to the direct effect of warming and indirect effects on hydrology and surface water chemistry. In 2014, extensive fish kills were observed along the Kobuk during the fall chum salmon run. High escapement of chum salmon may have reduced dissolved oxygen concentrations in the river, causing the die-off.
Salmon River	Condition of Unique Community		The Salmon River is designated as a National Wild and Scenic River, and appears to be in good condition with very low nutrient and organic matter concentrations. The Salmon River supports substantial chum and pink salmon runs, and large resident grayling populations. Long-term data are limited.

Unique Communities and Features (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Onion Portage	Condition of Unique Caribou Migration and Human History Site		The Western Arctic Caribou Herd, which has ranged up to half a million animals, has migrated across the Kobuk River for millennia at Onion Portage. Named for the wild onions growing on the banks of a large bend in the river, native people portaged using a series of small ponds as they lined their canoes upriver. For ten thousand years or more, Iñupiaq hunters have waited at Onion Portage for caribou to hunt, as have other predators such as wolves and bears. Where the Iñupiaq waited, they left behind a rich history of artifacts that now constitute one of the most significant cultural resource sites in the region. The archeological stratigraphy where these artifacts were found has helped establish region-wide cultural chronology—vital to deciphering the cultural and archeological history of the region. To this day, Onion Portage remains an important place for rural residents to hunt caribou.

Resource Brief: Great Kobuk Sand Dunes

Great Kobuk Sand Dunes. NPS Photo by Dave Swanson.

The Great Kobuk Sand Dunes are the largest high-latitude dune field in North America and the centerpiece of Kobuk Valley National Park. The dunes form a series of approximately parallel ridges up to about 40 meters (130 feet) high. They are a relic of much larger dune fields that were present in Alaska during the height of the last ice age. These ice-age dunes have grown over with vegetation in most other parts of Alaska, but the cold, windy climate of this area and very dry, alkaline sandy soils of the Kobuk Sand Dunes has kept them mostly free of vegetation. Several rare plants grow in this unique habitat, including the Kobuk locoweed (*Oxytropis kobukensis*), which grows only on sandy soils in this part of the Kobuk Valley (Parker 2006).

The desert-like dune landscape forms a fascinating contrast with the surrounding densely vegetated boreal forest and wetlands. The dry sandy surface disguises water-saturated sediments beneath fed by water that percolates into the dunes. This water comes to the surface in extensive wetlands that stretch from the dunes north and east to the Kobuk River. Dry, sandy soils adjacent to the sand dunes support open woodlands of dwarf spruce trees with a luxuriant ground cover of lichens. Paleoecological studies (Mann et al. 2002) show that vegetation has both encroached on the dunes and died back and been buried by sand repeatedly over the thousands of years since the last ice age. The dunes expanded during the Medieval Warm Period (AD 900–1400), the most recent warm period prior to the present warming, and again during the colder Little Ice Age just before 1900, but vegetation has encroached on the dunes somewhat over the last 80–100 years. The response of the Great Kobuk Sand Dunes to future climate change will depend on what happens to windiness and dryness of the climate in the area. NPS has vegetation plots, photographs, and satellite images to monitor the future expansion or contraction of the Great Kobuk Sand Dunes.

Landscape and Ecosystem Processes

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Fire	Frequency		The fire frequency (number of fires) is variable in Kobuk Valley. Fires are most frequent in lower elevation forests south of the Baird Mountains within open and woodland spruce forests. The average number of fires per year is 1.1, using data from 1950–2015 (WFMI data). Fires appear to have been most frequent during the 1970s. Seven fires have affected the park between 2010 and 2015.
	Total Area Burned		On average, 7,229 acres in KOVA burned per year between 1950 and 2015. Numerous large fires occurred in and around the park in the 1970s and 1980s. Due to the variability in area burned there is no detectable change in area burned over the past 65 years. Since the mid-1980s areas adjacent to the Kobuk River have been under full fire suppression to protect allotments and inholdings. It is likely that some reduction in area burned over the past thirty years is due to fire suppression efforts.
Landcover	Match of Seasons to Historic Norms (snow-free season, green-up, peak greenness, senescence)		Overall greenness of lowland tundra landscapes as measured by satellite has increased since records began in the 1980s. This is probably due to climate warming that occurred in the late 1900s, which involved both longer and warmer summers. More detailed satellite records since 2000 provide specific information on the timing of snow cover loss, spring green-up, and fall. This shorter time period is dominated by year-to-year fluctuations. Higher greenness indicates higher shrub cover, which implies a decrease in caribou winter range lichen habitat; the earlier dates of snow melt has the potential to bring mismatches in the timing of wildlife migration and foraging.

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 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 Kobuk Valley National Park, 2012 visible infrared imaging radiometer (VIIRS) satellite data, which uses a broadband imaging detector with high sensitivity, indicates that there is no visible upward radiance within the park boundary, and small amounts of upward radiance within a 200-km radius surrounding the park. The largest sources of upward radiance emanate from the Red Dog Mine, just over 100 km from the park's northwest boundary, and from the town Kotzebue, AK just over 100 km from the park's southwest boundary.

Resource Brief: Night Sky Resources at KOVA

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. Kobuk Valley National Park is a harbor of dark skies.

Condition and Functional Consequences

Night sky quality at KOVA 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 no upward light within the park. Further, very little anthropogenic light is detected in an area within a 200-km radius surrounding the park except for a small amount of upward radiance from the Red Dog Mine, just over 100 km from the park's northwest boundary, and from the town of Kotzebue, AK just over 100 km from the park's southwest boundary. Given the absence of anthropogenic light originating within the park boundaries, and low to moderate upward radiance within 200 km of the park, the photic environment of Kobuk Valley National Park 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 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.

Learn more in the document Recommended Indicators of Night Sky Quality, and the NPS Natural Sounds & Night Skies Division website.

***Left*: Green curtains and rays above the Brooks Range. NPS Photo by D. Lummerzheim**

Acoustic Environment

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Acoustic Impact Level	Mean Acoustic Impact Level		The mean acoustic impact level (L_{50} dBA) in KOVA, calculated as the difference between nationwide models of existing and natural ambient, is 0.0 dBA. This indicates that the acoustic environment is in good condition. Statewide increases in development and steady tourism pressure throughout the state of Alaska (McDowell 2014) also indicate a downward trend in acoustic conditions.

Resource Brief: Acoustic Environment

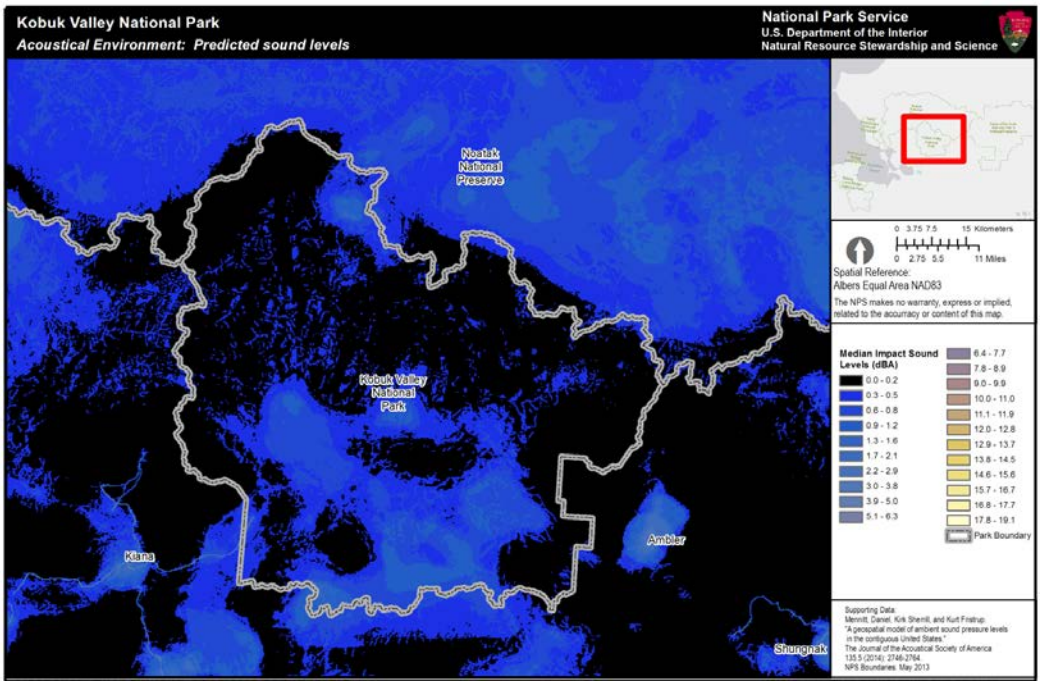
To characterize the acoustic environment, the NPS has developed a national model of noise pollution (Mennitt et al. 2014). This model predicts the increase in sound level due to human activity on an average summer day. The model is based on measured sound levels from hundreds of national park sites and 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 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 at the NPS Natural Sounds & Night Skies Division website (http://www.nature.nps.gov/sound/)

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 ≤ 30%*
	1.5 < Threshold ≤ 3.0 *Listening area reduced by 30 – 50%*
	3.0 < Threshold *Listening area reduced by > 50%*

Condition thresholds for the acoustic environment in non-urban parks

Criteria for Condition Status/Trend

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 urban areas typically experience more interference from noise sources. Based on these assumptions, all Alaska parks are assessed using the non-urban criteria. Condition thresholds are listed in the table (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.



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

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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 archeological resources to the historic contexts for the park.		Major themes/historic contexts in KOVA 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 relatively small proportion of all documented sites have been subject to detailed investigations. The Onion Portage Archeological District National Historic Landmark, located on private inholdings within the park, has helped define the cultural history of northwest Alaska more than any other site in the region. Occupations of this site span the entire Holocene and represent almost all known archeological cultures in the region. Outside of Onion Portage, fewer than 2% of the sites have had test excavations.
	Archeological resources are identified and evaluated using appropriate anthropological and historical contexts.		A substantial amount of archeological inventory has been conducted in KOVA, primarily within the Kobuk River corridor and around the Great Kobuk Sand Dunes. According to the Alaska Historic Resources Survey, 50% of the known sites in KOVA—including the Onion Portage National Historic Landmark sites—have determined cultural affiliation. However, the vast majority of the sites have not been evaluated beyond a cursory inventory and assessment against known archeological traditions.
	Number of archeological context statements.		No park-wide context statements have been produced to date. By default, the Onion Portage monograph produced by Doug Anderson (1988) is the most substantial document providing context for most resources in the park. 23% of the known sites in KOVA have a historic and/or proto-historic component, while 82% have a prehistoric component; at least 7% of the sites have had multiple occupations by cultures from different timeframes. Only 42% of the prehistoric sites represent a known archeological culture. Only 5 sites (5%) within KOVA have associated radiocarbon dates (Shirar 2012).
	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.		Sufficient inventory has been done to firmly establish archeological resources as a fundamentally important park resource. The protection and interpretation of archeological resources is identified in the park's enabling legislation. The most significant site within the park boundaries is Onion Portage, owned by NANA Regional Corporation. The Onion Portage Archeological District is a National Historic Landmark that extends beyond the main site, encompassing NPS land and private parcels. Current research, such as the recent Igliqtiqsiugvik excavation, is providing new insights into the lifeways and genetic affinities of late-prehistoric people who lived in this area.

Archeological Resources (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge (continued)	Percentage of archeology baseline documents with current and complete information.		KOVA lacks an Archeological Overview & Assessment. A portion of the park known as the Dunes Study Unit recently had an archeological and ethnographic Overview & Assessment completed (Shirar 2012). This document is current and complete for the section of the park covered.
	The mechanisms affecting site stability and taphonomic influences are understood.		While the mechanisms affecting site preservation and stability are generally known, they are not precisely understood due to the extreme environmental conditions that characterize the park (high latitude, mountain, and riverine settings) and may impact archeological sites. Climate change further complicates the park's ability to predict impacts and prioritize preservation efforts. New threats (e.g., loss of frozen organic remains due to warming soils) are emerging and are only beginning to be recognized. Work is needed to better identify significant sites that are threatened.
	Percentage of sites/archeological landscapes that are tied to information regarding influences from the physical and social environment.		For the Kobuk, 87% of the sites have general environmental information recorded. 50% of the known sites are on the river. These are all clearly threatened by flooding, changing flows, ice break-up, and general erosion. Another 36% are found around the Great Kobuk Sand Dunes; these dunes have the potential to completely bury sites along their margins. There is documented expansion of the dunes in some areas (Mann, et al. 2002). The number of sites that are part of the social environment is unknown, but there are numerous allotments within the park and inholders travel, hunt, fish, and camp all along the river corridor. More detailed analyses of environmental and social influences on site stability are warranted.
	Percentage of sites with known date ranges associated with a research theme.		The cultural history of northwest Alaska is fairly well established and understood. Onion Portage played a key role in determining the succession of cultures and their time spans. However, only 6 sites within the park boundaries have been radiocarbon-dated (Shirar 2012). 23% of the known sites in KOVA are historic and represent occupations by inland Iñupiaq or Athabascans. 42% of the prehistoric sites have diagnostic artifacts that allow them to be assigned to an archeological culture with a defined timespan. Very few studies—outside of the Onion Portage investigations by Giddings, and later by Anderson—have studied or dated sites with a developed research theme in mind.

Archeological Resources (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Inventory	Percentage of park intensively surveyed.		The percentage of the park that has been intensively surveyed is less than 1%. This is due to the fact that the park is large in size and difficult to access. At least 15 different survey reconnaissance trips have been conducted in the park since Giddings' initial survey of the Kobuk River corridor in 1940. There have been 11 NPS-sponsored surveys since 1989. Five of these surveys targeted the Kobuk Sand Dunes. Only two surveys are reported from the tributaries in the north of the park. More precise data on areas inventoried is being produced each year as personnel employ GPS technology to track their survey efforts.
	Percentage of survey data included in the Geographic Information System (GIS).		The park has archeological GIS data; however none of the archeological GIS data meets current cultural resources standards. In order to meet current standards, the park needs to enter legacy geospatial data, including survey locations.
	Percentage of archeological resources with complete, accurate, and reliable data in the Archeological Sites Management Information System (ASMIS).		Of the site records in ASMIS, 66 (91%) are complete and 6 (9%) have missing fields that need to be entered. At least 21% of the known sites have legacy location data and need to be updated with GPS-derived coordinates. Reliability of the GPS-derived coordinates is considered low for most of the entries. Efforts in collecting and reporting accurate and reliable data continue to improve, but there is a backlog for updating data fields.
Documentation	Percentage of known sites with adequate National Register documentation.		Within KOVA, 26% of the sites have adequate National Register documentation. Six sites—almost all associated with Onion Portage—are listed on the National Register and another 13 are recommended eligible. One site is recommended ineligible. The remaining 74% of sites lack determination of eligibility evaluations.
	Percentage of archeological materials cleaned, conserved, studied, cataloged, and properly stored.		According to the 2015 Collections Management Report, 31% of KOVA's archeological materials are cleaned, conserved, studied, cataloged, and properly stored. Lack of documentation is a problem in getting these collections cataloged.

Archeological Resources (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Documentation (continued)	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.		The park has a set of 1:63,360 quadrangles annotated with known sites and survey lines as of 2004. Survey lines have not been digitized. Site locations are available in a GIS layer although not all locations reflect the most current, accurate information. Efforts should be made to update ASMIS with the most accurate locational data, and ASMIS should be used as the master file from which to populate GIS. ASMIS records indicate 79% of the known sites in KOVA have coordinates derived from a GPS unit. Locational and spatial data methods are improving every year and are expected to continue into the near future. Efforts to relocate known sites and update position data are ongoing.
	Percentage or number of sites without assessed and defined threats and damages.		26% (n=20) of the sites are unassessed for defined threats and damages. 57% of the sites have been disturbed by general erosional forces. Efforts to complete condition assessments and re-evaluate threats and disturbances are ongoing.
	Percentage of archeological reports and publications entered in the Integrated Resource Management Applications (IRMA) database with appropriate restrictions for access to sensitive information.		There have been at least 23 archeological projects within KOVA over the past 75 years. Only two reports are listed in IRMA. This percentage is very low and does not adequately reflect the scope of archeological research that has occurred in the park.
Certified Condition	Percentage of archeological resources certified as complete, accurate, and reliable in the Archeological Sites Management Information System (ASMIS) in good condition.		In ASMIS, 40% of the KOVA sites are listed in “Good” condition.

Resource Brief: Recent Archeological Investigations at Igliqtiqsiugvigruaq

Kiana residents viewing excavation and talking with archeologists at Igliqtiqsiugvigruaq in 2013. NPS Photo by Dan Odess.

Situated along a bend of the Kobuk River, the pre-contact village of Igliqtiqsiugvigruaq has been the subject of local lore and cautionary advice for generations. The extensive site was first mapped by NPS archeologists in 1996 with the aim of documenting the extent of its features, as well as estimating the rate of loss through erosion during annual cycles of ice scouring, overflow, and undercutting.

Beginning in 2010, Brown University researchers led a three-season archeological research project to further knowledge of Iñupiaq lifeways within the region. With support from the local Kiana Traditional Council, NPS granted researchers a permit to excavate two house features within the extensive village site with the goal of gaining a better understanding of human occupation and trade in the region during the late 18th and early 19th centuries, a period not well documented in the archeological record.

Funded by the National Science Foundation, the research team conducted geophysical mapping and testing as well as excavation of two house pits. Radiocarbon dates initially placed the site with a timeframe of AD 1780 to 1800, which suggest it was inhabited just prior to direct contact with Euro-Americans. Although the researchers expected to find a wide range of animal bones, they were surprised to find that the people living in the village seemed to have relied almost solely on fish. European-manufactured glass beads as well as a few fragments of metal suggested the people of the region were engaged in vast trade networks extending to Siberia. At the end of the field project in 2011, human remains were identified in the lower levels of the excavation, which required stoppage per the Native American Graves Protection and Repatriation Act (NAGPRA).

The final excavation season took place in 2013 following extensive consultations with the Kiana Traditional Council, which fully supported research at the site. It is hoped that DNA and other permitted analyses of remains will shed light on nutritional and health issues faced by some of Igliqtiqsiugvigruaq's residents. The Brown University team and NPS encouraged tribal member visits to the site to share information and local knowledge. NANA Regional Corporation produced a documentary film (entitled "Swift Water Place") about the project and the researchers' legacy. Initial findings indicate that Igliqtiqsiugvigruaq may have been the most important village site in the middle-lower part of the Kobuk River.

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.		Although anthropological research has been conducted in the region by scholars, local residents, and federal/state agencies, the park lacks baseline documentation to assess condition and/or adequate protection of unknown or undocumented ethnographic resources. Completion of a comprehensive Ethnographic Overview and Assessment, with collaboration from other Arctic parks, is a top park anthropology research priority. Ethnographic studies would enhance and inform ongoing archeological field research and traditional ecological studies.
	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.		The park lacks sufficient baseline documentation of ethnographic resources. A pilot Traditional Use/Cultural Affiliation Study is underway with one of the park's seven affiliated tribes to begin addressing this gap.
	Percentage of cultural anthropology baseline documents with current and complete info.		KOVA currently lacks an Ethnographic Overview and Assessment and relies on disparate existing sources of information.
Inventory	Appropriate studies and consultations document resources and uses, traditionally associated people, and other affected groups, and cultural affiliations.		The park will complete the initial phase of a three-phase Traditional Use/Cultural Affiliation Study with one of the seven affiliated tribes in 2016. Additional studies must be undertaken with the six remaining tribes; each passing year marks the loss of knowledge bearers and Elders who can contribute to the documentation process.
	Traditionally associated groups, and the legislative, regulatory, or policy basis for relationships with them, are identified.		Traditionally associated groups have been identified through years of engagement with local communities and organizations and are regularly consulted under Section 106, NAGPRA, and other laws and regulations.
	Resources eligible for the National Register of Historic Places as traditional cultural properties (TCPs) are identified.		KOVA has not yet identified any TCPs.

Cultural Anthropology (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
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.		General ethnographic information is included in park planning documents. These documents include discussions of subsistence use, allotments, and other ethnographic information.
	Research results are disseminated to park managers, planners, interpreters, and other NPS specialists and incorporated into appropriate park planning documents.		Limited anthropological research has been conducted by NPS, but those data along with results of independent and pre-park research are shared with management, interpretation, and other NPS specialists. Regional and park-based anthropologists provide expertise in review and development of park planning documents.

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.		Giddings Property and Onion Portage Archeological District were studied in the 1990s and subsequent Cultural Landscape Inventories (CLI) were produced in 2004 and 2005. Five additional cultural landscapes have been identified in KOVA: Hunt River Dunes, Headwaters of the Salmon River, Coalmine, Quqtikuvik (which have no projected CLI completion date), and the Greater Kobuk Sand Dunes (which has a projected CLI completion date of 2020).
	Cultural landscapes are identified and evaluated using appropriate historical contexts.		All of the park's cultural landscapes have been identified and two have been evaluated using the park's established historical contexts.

Cultural Landscapes (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge (continued)	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.		The two completed CLIs for KOVA are completely scoped and the two cultural landscapes are either fundamental resources or other important resources. The additional five identified cultural landscapes remain incompletely scoped. NPS managers, recognizing the special relationship of the landscapes to local people, consult with the I.R.A. Councils, Elders Councils, the City Councils, and the Native Corporations of the villages on a regular basis concerning management issues within the park.
Inventory	Percentage of landscapes eligible for the National Register in the Cultural Landscapes Inventory (CLI) with certified complete, accurate, and reliable data.		2/7 cultural landscapes (Giddings Property and Onion Portage Archeological District) have current and complete CLI information. There are no cultural landscape reports for KOVA.
	Percentage of landscapes eligible for the National Register in the Cultural Landscapes Inventory (CLI) with certified complete, accurate, and reliable data.		2/2 completed landscape records in the CLI database (Giddings Property and Onion Portage Archeological District) currently have certified complete, accurate, and reliable data. The other 5 cultural landscapes have not been evaluated for eligibility for the National Register.
Documentation	Percentage of Cultural Landscapes Inventory (CLI) data included in the Geographic Information System (GIS) meeting current cultural resource standards.		Both the Onion Portage Archeological District CLI and Giddings Property CLI have been documented in GIS but do not meet current cultural resource standards. Other identified cultural landscapes that have not been formally documented are not included in GIS.
	Percentage of cultural landscapes with adequate National Register documentation.		No cultural landscapes have adequate National Register documentation. The Onion Portage Archeological District (1988) nomination and listing does not include cultural landscape features; therefore, documentation is inadequate.
	Percentage of cultural landscapes with Determination of Eligibility (DOE) documentation.		2/7 cultural landscapes (Giddings Property and Onion Portage Archeological District) have completed DOEs and have been determined National Register Eligible with State Historic Preservation Officer Consensus Determinations.

Cultural Landscapes (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Documentation (continued)	Percentage of cultural landscape reports and publications entered in the Integrated Resource Management Applications (IRMA) database.		No Cultural Landscape Inventory reports have been uploaded to IRMA.
	Research results are disseminated to park managers, planners, interpreters, and other NPS specialists and incorporated into appropriate park planning documents.		Research materials and CLIs have been broadly disseminated both within the park and to the broader academic community.
Certified Condition	Percentage of cultural landscapes certified as complete, accurate, and reliable in the Cultural Landscapes Inventory (CLI) in good condition.		1/2 of certified cultural landscapes is in good condition. The Giddings Property is currently listed in good condition, while the Onion Portage Archeological District is currently listed in fair condition. Only two of the seven identified park cultural landscapes have received condition assessments. The condition of the remaining landscapes has not been evaluated.

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 Giddings' property structures are the only structures evaluated for the park's historic context. The Giddings' property structures include a cabin and cache.
	Historic Structures are identified and evaluated using historical contexts.		Most historic structures have been identified, but not all have been evaluated using historical contexts.

Historic Structures (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge (continued)	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 scope of historic structures in the park is not understood and no determination has been made whether or not they are a fundamental or other important resource. The shelter cabins throughout the park need to be evaluated.
	Percentage of historic structure baseline documents with current and complete information.		Both structures currently listed on the LCS are documented using a Historic Structure Report: Giddings' Cabin and Cache Historic Structure Report (2006).
	Adequate research exists to document and preserve the historic structure's physical attributes that contribute to historical significance.		Adequate research does not exist to document and preserve the historic structures' physical attributes that contribute to historical significance.
	Percentage of List of Classified Structures (LCS) data included in the Geographic Information System (GIS) meeting current cultural resource standards.		GIS data exists, but 0% meets current cultural resource standards.
Documentation	Percentage of historic structures with adequate National Register documentation.		No historic structures in KOVA have adequate National Register documentation. Giddings' Cabin and Cache have been determined eligible for the National Register through a CLI in 2006, but a National Register Nomination Form has not been completed for this property.
	Percentage of historic structures with Determination of Eligibility (DOE) documentation.		Giddings' Cabin and Cache have been determined eligible for the National Register through a CLI in 2006.
Certified Condition	Percentage of historic structures certified as complete, accurate, and reliable in the List of Classified Structures (LCS) in good condition.		LCS certifications/conditions expire on a six year cycle. The Giddings' Cabin and Cache are both currently listed in Good Condition. However, the cabin certification is out of date and needs to be assessed and certified. The cache certification expires in 2017.

Resource Brief: Giddings' Cabin and Cache

The Giddings' Cabin and Cache Complex is located on the Kobuk River, within the Onion Portage Archeological District and the boundary of Kobuk Valley National Park. The complex is roughly 15 miles west of Ambler, Alaska. The Giddings' Complex is associated with James Louis Giddings, a renowned archeologist known for his contributions to the field of northwestern Alaskan archeology, providing the foundational knowledge of the origin and development of the Native Alaskan culture. Initial use of the land as a base camp by Giddings and his team began in 1961 and the cabin was completed in 1964 (Houston and Peterson 2006, Curran and Foster 2005).

J. Louis Giddings assisted the field of archeology with the discovery of the Ipiutak culture at Point Hope in 1941. He is credited with the identification of a new culture at Iyatayet in Norton Sound. Giddings identified 5,000 years of Alaska cultural history in the horizontal stratigraphy of the beach ridges along the Chukchi Sea. Giddings' most notable work was conducted at Onion Portage where excavations led to the discovery of stratigraphic bands exhibiting that the Iñupiaq culture flourished inland.

Giddings intended to use the site in retirement, which led to him applying for a home site in June of 1964. He hired Nelson Greist Sr. and crew to construct the cabin on the 1.3 acre lot. The 18'x 26' cabin was built from harvested local white spruce that was rafted to the site. The cabin is constructed in a traditional Iñupiaq style. Wooden pegs were used to join the wall logs and moss was used to fill in gaps. The original roof to the cabin was made of sod. Once the cabin was completed, the 10'6" x 8' cache was constructed to the west of the site. In 1966 an arctic entry was added to the front of the cabin.

Louis lived in the cabin from August of 1964 until the end of the digging season in September 1964. He worked on his last book, "Ancient Men of the Arctic" during this time. In December of 1964, Giddings passed away unexpectedly. His research was continued by colleagues who used the complex as a base camp until 1968. Giddings' widow had the land patented, and in 1996 the land was sold to the NPS. In 2007, rehabilitation work was done to the cabin and cache and the site is now used by NPS staff and Alaska Department of Fish and Game for research, outreach, and patrols.

This backcountry cabin and cache in Kobuk Valley National Park was built by the famous archeologist J. Louis Giddings, prior to the establishment of the park. NPS Photo.

History

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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.		General research has been conducted, but KOVA lacks a Historic Resource Study. There is a region-wide history of NPS subsistence management for Alaska (Norris 2002) and the book *Arctic Citadel* (Allan 2013), which focuses on early exploration history in the Brooks Range. Aspects of mining history have been documented (Saleeby 2000).
	Sufficient research is conducted to establish the reasons for park establishment and a history of the NPS management of the site.		The park currently lacks a historic theme study, historic resource study, or other work to inform management and future research endeavors. BIA ANCSA 14(h)(1) studies undertaken in the 1970s and 1980s identified historic and cemetery sites of note.
Inventory	Cultural resources are inventoried and evaluated in consultation with State Historic Preservation Officers (SHPOs).		The park actively engages and consults with the SHPO on matters related to archeological, ethnographic, and historic resources.
Documentation	Percentage of historic properties with adequate National Register documentation.		Percentage is not an accurate representation of the National Register work at KOVA. Six sites are listed on the National Register—almost all associated with Onion Portage. The Onion Portage Archeological District (1988) nomination and listing does not include cultural landscape features. A baseline of needs for National Register documentation has not been developed for this park.
	Percentage of historic properties with adequate Determinations of Eligibility (DOE) documentation.		For the 13 recommended eligible archeological sites, DOEs have not been completed or lack concurrence from the SHPO. 2/7 cultural landscapes (Giddings' Property and Onion Portage Archeological District) have completed DOEs and have been determined National Register Eligible with SHPO Consensus Determinations. Giddings' Cabin and Cache have been determined eligible for the National Register through a CLI in 2006.

Resource Brief: William S. Blood Sketch Book and Diary

William Blood (left) in Seattle before setting off for Alaska. NPS Collections.

Anna Blood, daughter-in-law of William Blood, generously gifted his diary, sketch book, and photographs to the park, and they have been formally added to the museum collection.

As a young man, William Blood, from Nottingham, Ohio, arrived in Seattle looking to board a schooner to go prospecting in Alaska. His first diary entry is Thursday, May 19, 1898:

"Tug tied to the ship at 8:30 P.M. nice clear evening stars shining brightly, at 11:15 left the wharf in tow of the tug Robarto which will tow us as far as Cape Flattery about 140 miles from Seattle everybody anxious to get away having been delayed so long. Will now crawl in my bunk for the night."

The names of forty-two men are listed in Blood's diary, all passengers on the Schooner G.W. Watson of San Francisco, bound for Kotzebue Sound. On Saturday, July 2, 1898, Blood wrote:

"We went into Kotzebue Sound today but there was too much ice so had to turn back so have been cruising around all day…"

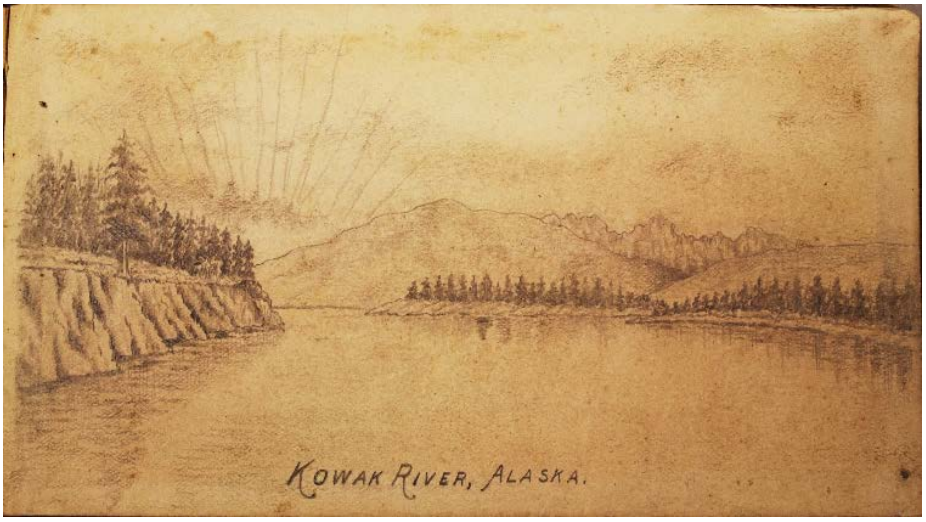
On Tuesday, July 5, 1898, the group finally dropped anchor. Blood wrote:

"We dropped anchor at 9:25 A.M. about 3 miles from shore and commenced at once to get all our boats in the water so as to soak them up 3 canoes loaded with Indians came on board to trade furs, boots, parkas etc. they were very friendly we continued to unload the provisions after dinner and kept it up all night until the ship was unloaded, we were the 2nd ship in here the Moonlight beat us by 1 day."

Thus began Blood's journey up the Kobuk River and an account of his life as a prospector. His final entry is dated Friday, May 26, 1899 and states:

"River all clear of ice, first boat from up the river passed here this afternoon on their way down the river. Weather fine."

It is unknown how long Blood remained in Alaska, but he did eventually return to Ohio. In the early 1900s, Blood went to work at Nela Park, General Electric's Lighting Division in East Cleveland, as a commercial artist. His artistic skill is evident in the meticulous drawings recorded in his sketch book.



Kobuk River, Alaska, as drawn by William Blood. NPS Collections.

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).		The park currently has an adequate amount of research and reports to demonstrate the significance and context of the items in the museum collection; however, the park has the potential for both continued and expanded archeological, ethnological, historical, and natural history studies that would expand understanding.
	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.		KOVA has a current Scope of Collections Statement, signed in 2013, that received great input from the park staff.
	Percentage of museum collection baseline documents with current and complete information.		70% of museum collection baseline documents have current and complete information. Baseline documents currently needed include a Collections Management Plan and a Collections Condition Survey. The Alaska Regional Curatorial Center (ARCC), located in Anchorage, is the official repository for the KOVA museum collection.
Inventory	Archival and manuscript collections are surveyed and described in the Interior Collections Management System (ICMS) and finding aids are produced.		The majority of KOVA's archival collections are surveyed and described in ICMS. All archives for KOVA, and some multi-park archives (that may involve KOVA) are listed under a unique directory (NWAK, Northwest Alaska Management Unit). A finding aid is also available.
	Percentage of existing collection that is accessioned and cataloged.		According to the 2015 Collections Management Report, the percentage of KOVA museum collections accessioned and cataloged is 44%. The backlog of items awaiting catalog addition includes archeology and biology items.
	Scope of Collection is consistently implemented; items or objects are researched to determine their appropriateness for inclusion in the museum/archive collection.		Since 2010, there has been consistent implementation of the Scope of Collections Statement.

Museum Collections (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Documentation	Accession and deaccession files are complete with all appropriate signatures.		All accession and deaccession files are complete with appropriate signatures.
Certified Condition	Percentage of museum collection reported in Collections Management Report (CMR) and checklist report in good condition.		Overall, the museum collections are in good condition and the storage area is environmentally stable and very secure. 95% of the collection cataloged in ICMS is in good condition or better; there are 2,045 records in ICMS with 15% reported as excellent condition and 80% reported as good condition.

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 total of 16,875 visitors to the park in 2013 is higher than the 11,485 visitors in 2011. The 10-year annual average of visitors for 2003–2012 was 5,260. The park is remote and has no public roads, entrance station, or facilities. Non-local visitors rely on concessionaires for access to the park by aircraft. Visitation numbers are estimates by staff who conduct field work in the park. Counts include outside visitors plus local area residents who travel through the park. Web presence has increased actual visitation in the last 5 years.
Visitor Satisfaction	Percent of visitors who were satisfied with their visit		Park staff does not conduct visitor satisfaction surveys because the park is remote and there is limited ability to gather survey data. However, contact with visitors in the Northwest Arctic Heritage Center, community feedback, and social media suggest that visitors have significant appreciation for wilderness solitude and the effort it takes for a once in a lifetime trip in the park.

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		Park rangers go to classrooms to deliver in-person programs at 11 villages in northwest Alaska. K–12 students and their teachers get experiential, curriculum-based programs on science, history and the mission of the NPS. The 5-year average (2010–2014) is 2,669 students served per year (Western Arctic National Parklands Servicewide Interpretive Report).
Ranger Programs	Number and quality of programs and attendance		Park rangers deliver formal and informal interpretive programs such as a weekly film series, workshops on local medicinal plants, science talks about current research, and impromptu map talks.
Junior Ranger Programs	Number and quality of programs and attendance		Park rangers deliver a unique suite of Junior Ranger programs that enable youth to earn rewards by participating in Roving Rangers around Kotzebue, art classes, and completing activity booklets. The 5-year average (2011–2015) is 613 participants per year.

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

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Special Events	Variety and longevity of events, community involvement		Park rangers, along with natural and cultural resource staff, cooperate to deliver special events around the community of Kotzebue and other villages. Events include subsistence resource commission meetings, training, and science workshops. The 5-year average (2011–2015) is 195 participants per year.
Visitor Center	Contacts with park staff in the visitor center		The park makes contacts with visitors who come to the Northwest Arctic Heritage Center for general information, as well as attendees at public meetings coordinated by local groups. Local meeting numbers are stable, but general walk in numbers are down due to the fact that the visitor center building and exhibits need significant repair. A new welcome banner outside and a new Facebook page to highlight public events are in development to increase local visits. The 5-year average (2011–2015) is 4,363 visitors per year.
Community Programs	On and off-site programs in local community		Park rangers and staff cooperate to deliver community programs around the village of Kotzebue and other villages. Events include birdwatching trips, teacher in-service classes, KOTZ radio show, and a 4th of July education booth on current topics such as the Wilderness Act anniversary, bear safety, and muskox ecology. The 5-year average (2011–2015) is 1,889 participants per year.

Resource Brief: Northwest Arctic Heritage Center

The Northwest Arctic Heritage Center opened its doors to the public in December 2009. Both a winter and spring celebration welcomed the community and state dignitaries. Modern exhibits on cultural lifeways, the Western Arctic Parklands, and natural history bring people in the door to learn more. Many community members in nearby villages volunteered their time to tell stories that are now featured in listening stations (exhibits) for everyone to enjoy. Because the building is virtually the first facility seen after leaving the Kotzebue airport, the Heritage Center attracts nearly everyone who visits the village of Kotzebue. The opportunity to provide high quality interpretive services to all visitors is rewarding.

Northwest Arctic Heritage Center in Kotzebue. NPS Photo.

In addition to interpretive activities for visitors, community groups and other agencies use the facility for select purposes. In 2010, seven conferences from outside entities were held at the center and three events took place that were co-sponsored by the NPS.

Interpretive Media – Brochures, Exhibits, Signs, and Website

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Wayside Signs	Condition and currency of signs		A landscape plan is currently being designed to provide visitors with a brand new outdoor learning space next to the Northwest Arctic Heritage Center. A select number of KOVA landscape and cultural features will be interpreted on a variety of signs within the ½ acre space. The landscaping and signage will be complete in 2017.
Exhibits	Heritage Center Exhibits		Exhibits in the Northwest Arctic Heritage Center are displayed in 3 main spaces. • Lobby – maps & native tools to orient visitors to the Western Arctic Parklands and indigenous Iñupiaq people. • Exhibit Hall – diorama of artwork, landscape features, taxidermy animals, ethnographic stories, and archeological resources to tell the story of regional natural and cultural history. • Meeting Room – rotating exhibits on all park resources. Dry air and hard use by visitors is degrading the quality of exhibits in the Exhibit Hall. Vandalism has occurred. Exhibits are functional in the lobby and meeting room. Lighting in all exhibit areas needs repair and replacement bulbs.
Print Media	Accuracy and Availability of Primary Park Publications		Park maps are available at Northwest Arctic Heritage Center and online. Park brochures are accurate, up-to-date, and inventoried. Interpretive staff manages a large supply of other applicable publications, including information about Arctic research and the natural/cultural history of KOVA.
Audio-visual Media	Orientation Films		Online videos about specific park resources are growing yearly. No feature-length film exists for KOVA yet, but a professionally produced orientation to travel to the Great Kobuk Sand Dunes is available online. Media specialists have been hired yearly for the last 3 years. Park orientation digital slideshows are available for visitors.
	Multi-media Development		A bank of 150 films on regional and worldwide conservation issues (with more added every year) exists and is shown to visitors regularly. Rangers give special attention to all locally made films. iPads are available with story maps, park videos, a new Iñupiaq legend video game (called “Never Alone”), and educational applications for kids and adults.
	Local Radio Spots		Interviews on local radio stations are frequently conducted in conjunction with press releases for special events, changes to regulations, and as other public information become available. Many local people listen to the weekly KOTZ radio show.

Interpretive Media – Brochures, Exhibits, Signs, and Website (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Websites	Currency and Scope of Website; Number of Website Visitors		The park website was recently updated for the NPS Centennial. Park staff regularly adds content, and website views are slowly increasing. Poor data speed/ connectivity impede progress, but new high speed fiber-optic cable is anticipated in the future.
	Social Media: Facebook updates and "likes," overall activity		Twitter and Flickr accounts exist for Kobuk Valley National Park. A Northwest Arctic Heritage Center Facebook page will begin soon, and will provide up-to-date information on the Western Arctic Parklands, including KOVA. One blog exists and another will begin soon.

Accessibility

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Mobility	ADA compliance		The park is a remote area managed as wilderness, with no roads, trails, or facilities. Accessibility is challenging for all visitors. An Accessibility Assessment was completed in 2014. At the Northwest Arctic Heritage Center, a ramp provides accessibility to the front door, a wheelchair is available to visitors, and bathrooms are accessible.
Visual Accommodation	ADA compliance		No signs or facilities exist in the park, so there are no associated visual accommodations. In the Northwest Arctic Heritage Center, subtitles are available for film programs. A braille translation of the park map exists. Park staff plans to increase the Northwest Arctic Heritage Center exhibit visual accommodations based on an Accessibility Assessment completed in 2014.
Auditory Accommodation	ADA compliance		No signs or facilities exist in the park, so there are no associated auditory accommodations. In the Northwest Arctic Heritage Center, assisted listening devices exist for AV programs. A licensed American Sign Language interpreter is available locally by contract if a visitor requests the service. Park staff plans to increase the Northwest Arctic Heritage Center exhibit auditory accommodations based on an Accessibility Assessment completed in 2014.
Multi-lingual Resources	Audio and print materials in multiple languages Bi-lingual staff		The park map exists in a Russian translation. Requests for multi-lingual materials at the Northwest Arctic Heritage Center are rare. Park staff plans to increase NAHC multi-lingual accommodations for more audio and print materials based on an Accessibility Assessment completed in 2014.

Safety

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Visitor Safety	Recordable Incidents		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. No visitor injuries due to dangerous facilities or staff negligence have been reported in the Northwest Arctic Heritage Center. Park staff is working to address ramp icing at the Northwest Arctic Heritage Center. Park staff is also developing a system for bear barrel loans.
Staff Safety and Training	Completion of Required Safety Training		Because of the remote wilderness setting of the park, specialized training courses are required, including aviation management, wilderness first aid, and firearm safety. Operational Leadership Training has been completed by park staff; new seasonal staff receives training each year; and CPR, First Aid, and AED training are offered to staff on a space-available basis. Job Hazard Analysis is conducted before projects take place throughout the park. Safety messages are regularly given and distributed to staff members and a new safety committee is working to address current safety issues.

Resource Brief: Kotzebue Trade Fair

Drums, dancing, and doughnuts. Crafts, Chukotkans, and competition. Potlucks, performances, and pulls. Fur, food, and fashion. Every two years, a week-long trade fair and festival called Qatnut is held in Kotzebue. It honors the days when people on both sides of the Chukchi Sea gathered at the site of present day Kotzebue to trade things like seal oil, caribou meat, and birch baskets. People from many villages travel many miles to participate.

In 2013, NPS staff helped to make the biannual event a success. The NPS Shared Beringian Heritage Program made a big contribution by funding visa-free travel for 17 Russians to come from Uelen and Larentiya.

The event featured a wide variety of entertainment, including:

- A competition for best regional delicacies (Russian visitors entered fish soup, seal meat, and doughnuts in the competition)
- Dance performances (including a marvelous squirrel dance performed by a Russian-born Kotzebue resident)
- A messenger race and stick pull

Throughout all the traditional dancing, games, and art displays, people applauded the competitors and shared traditional food to create a family atmosphere for kindred spirits. The next festival is scheduled for July 2017.

A Savoonga resident passes out muktuk to many people eager for a bite. NPS Photo by Elizabeth Shea.

Partnerships

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Volunteers	Number of Volunteers and Hours Contributed		Volunteer numbers (including Volunteers-in-Park and interns) go up every year. In the past 5 years, volunteers have donated 10,630 hours to the Western Arctic Parklands, including KOVA. Volunteers in the park require highly specialized skills to assist rangers and scientists in remote backcountry locations and indigenous communities. Volunteers contribute complex products such as ethnographic stories of traditional skills in the form of video productions (WEAR VIP annual activity & expense report).
Partnerships	Number of Partnerships		Community partnerships are very active, and local groups rent the Northwest Arctic Heritage Center meeting room often. Arctic parks have a strong 16-year relationship with the Northwest Arctic Borough School District. A partnership with Sulianich Art Store provides opportunities for cross-cultural training. Cooperative education programs are planned in with Selawik National Wildlife Refuge and the Alaska Department of Fish and Game. The park hopes to increase collaboration with Borough tourism and local craft experts for increased community workshops. Consultation-related partnerships include: • 13 Local City Governments • Local and Regional Native Corporations (KIC, NANA) • Northwest Arctic Borough • Permit cooperation with ADF&G • Other federal agencies • State Agencies • 13 Traditional Village Councils • Universities • Regional Native non-profit (Maniilaq Assoc.)

Recreational Opportunities

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Sport Hunting and Fishing	Quality of Recreational Opportunities		Non-local hunters are not allowed to harvest wildlife in the park, but are allowed to fish with an Alaska State fishing license. Arctic char, sheefish, and grayling attract a small number of non-local anglers to the rivers and lagoons in the summer. There are no entrance stations to count visitors, but recreational use is assessed by backcountry ranger patrols, business client counts, and observations by interpreters.
Flightseeing, Hiking/ Backpacking, Floating	Quality of Recreational Opportunities		Designated and eligible wilderness cover a wide area of the park, so there are many opportunities for solitude, floating, and hiking. Floating down the Kobuk River is a popular activity. Planes can be chartered from several companies to access areas for hiking and floating. No signs or trails exist, so visitors must navigate on their own and possess wilderness survival skills. Flightseeing tours enable visitors to view natural flowing rivers and unique permafrost features on the landscape. There are no entrance stations to count visitors and no backcountry permits are required.
Birding and Wildlife Observation	Quality of Recreational Opportunities		There are opportunities to see unique arctic wildlife such as large bird migrations, caribou herds, and even small animals like wood frogs. Bears and wolves follow the Western Arctic Caribou Herd as they migrate; wildlife tracks can be seen on the Great Kobuk Sand Dunes. Planes can be chartered from several companies to access areas for wildlife viewing.

Scenic Resources

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Scenic Views	Scenic Views Quality & Protection		KOVA is notable for its pristine and natural character. Scenic resources at the park are in good condition, but development may result in scenic impairments. Primary risks to the scenic resource quality of KOVA are: (1) potential development of a new road to the Ambler Mining District and (2) mineral exploration activities.

2.4. Wilderness Character and Stewardship

Much of the southern portion of the park, south of the Kobuk River, is managed as the Kobuk Valley Wilderness (174,545 acres). The Wilderness Act of 1964 requires the NPS to maintain wilderness character, including the qualities of being "…untrammeled by man…undeveloped…natural," and allowing for "…solitude or primitive and unconfined recreation." The Kobuk Valley Wilderness Character Baseline Assessment (Landres 2016) has more detail about the Kobuk Valley Wilderness; readers are encouraged to read more there. A summary of wilderness character for the park is summarized below.

Overall Wilderness Character

web

Wilderness Quality	Condition Status/Trend	Rationale
Natural		Wilderness with natural character maintains ecological systems that are substantially free from the effects of modern civilization. The natural quality of wilderness character assesses the integrity of local ecosystems and their freedom to change and develop without human manipulation. Monitoring ecosystem changes inside wilderness is key to understanding how human actions impact the natural quality of wilderness. With the increasingly widespread effects of human activities, many impacts to the natural environment come from a combination of global and regional sources. Climate change, as well as proposed development and subsequent effects on natural systems, including air and water quality, threaten the natural quality of Kobuk Valley. Increased visitation and climate change threaten to bring non-native plant species to the region, such as quackgrass and *Elodea*. As technologies have changed, new developments and other human activities that affect the natural environment have become possible in the Northwest Alaskan Arctic, a place where many of these activities were previously infeasible (Landres 2016). The effects of humans on the natural environment have increased since 1980, resulting in a downward trend of the natural quality of the Kobuk Valley Wilderness (Landres 2016). The downward trend in natural quality should be interpreted with caution due to the fact that there is a lack of comprehensive natural resource research and data for the area.
Untrammeled		Untrammeled wilderness is essentially unhindered and free from modern human actions that intentionally control or manipulate the community of life. Rivers flow freely through Kobuk Valley with no human-made diversions and no bridges spanning the rivers. The entire Kobuk River watershed is unfettered, meandering freely across its floodplain. As wildlife move through the landscape as they have for centuries, their paths are unobstructed by roads or trails. No human-made barriers, roads, or trails, confine these lands. The untrammeled quality of KOVA wilderness has been relatively unchanged since 1980, as very few trammeling actions have occurred since then. The primary exception is collaring caribou, which has occurred regularly since 1988. Wildfire suppression also occurs in Kobuk Valley on occasion; the area contains a relatively high number of inholdings in comparison to other NPS areas in the region, and inholdings often have more stringent fire suppression requirements than the surrounding areas. There is also a history of timber harvest in Kobuk Valley, typically from inadvertent actions when users are unable to distinguish the park boundary. Timber harvest, if increased in magnitude, could potentially constitute trammeling action in the future (Landres 2016). Even with these existing factors, the untrammeled quality of Kobuk Valley is fundamentally intact as these actions take place infrequently and have not increased since 1980.

Overall Wilderness Character (continued)

web

Wilderness Quality	Condition Status/Trend	Rationale
Undeveloped		An undeveloped wilderness retains its primeval character and influence, and is essentially without permanent improvements or modern human occupation. With few improvements on the landscape, Kobuk Valley has retained its natural character and remained without permanent developments over the millennia. The undeveloped quality of wilderness is the most familiar and recognizable quality of wilderness for many people. Without buildings, evidence of other humans, or improvements on the landscape, the undeveloped quality of wilderness speaks to "man himself as a visitor who does not remain" and the absence of lasting improvements to the landscape that would change this visitor relationship. Motor vehicles, motorized equipment, and mechanical transport also affect how humans interact with wilderness landscapes. These uses likewise diminish the primeval character and influence of wilderness, and are correspondingly monitored within the undeveloped quality of wilderness character. While most of the developments and motorized uses are relatively small in comparison to the 1.7 million acres of wilderness, they represent a distinct change from the developments and motorized use present in 1980 (Landres 2016). Motorized use by park administration has remained relatively constant since wilderness designation in 1980. Motorized use by local residents via snowmachine or boat has likely increased since 1980 because of increased availability of motorized transport methods, and other societal and regional factors. Given the remote nature of the Kobuk Valley Wilderness, most access is by fixed-wing aircraft or helicopter. All administrative structures and other shelters currently in the wilderness were present prior to 1980. One primary source of new installations in wilderness is research activities. Research activities should be examined for their effects to wilderness character, while recognizing that research is a fundamental purpose of the Kobuk Valley Wilderness.
Solitude or Primitive and Unconfined Recreation Opportunity		A continuum of solitude extends between the northern and southern regions of KOVA. In the south, the sand dunes act as islands of accessibility in comparison with the rest of the wilderness. In addition, use of the Kobuk River and motorized uses there significantly affect the remoteness of the area. The Baird Mountains in the northern portion of the wilderness, however, are a rugged testament to Alaskan wilderness—isolated, severe, and expensive to access. Across this landscape, visitors' experiences are likely to be quite different. Still, in comparison to the range of experiences and solitude across wilderness nationwide, the entirety of Kobuk Valley offers incredible opportunities for solitude and connection with the land. Opportunities for primitive and unconfined recreation have remained essentially unchanged since 1980 (Landres 2016). Visitors are still able to travel the Kobuk Valley Wilderness in the same ways as people did 35 years ago. In particular, the Baird Mountains remain very difficult to access. The sand dunes receive greater levels of use, but in comparison to the vast surrounding area the impacts are relatively few. Increased use by non-local visitors, as well as the role of the Kobuk River as a primary thoroughfare for local travel and transport, have the potential to impact opportunities for solitude. In part due to its remoteness from population centers, many concerns that other wilderness areas face relating to recreation are not as prominent in KOVA.

Overall Wilderness Character (continued)

web

Wilderness Quality	Condition Status/Trend	Rationale
Other Features and Values		Wilderness may possess physical, site-specific features of value that are integral to wilderness character and make the area's meaning and significance as wilderness clearer and more distinct. The history of Kobuk Valley forms a rich current within the wilderness, underlying all activities that take place today and spanning cultural, ethnographic, archeological, paleontological, and historical resources. Kobuk Valley has supported continuous human use for thousands of years. Over the millennia, human behavior and actions in KOVA have maintained remarkable continuity, where the same hills, ridges, and streams that draw visitors today are often the same features that attracted the Iñupiaq in years past.

Wilderness Stewardship

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Stewardship to Preserve Wilderness Character	Key Information		KOVA receives key information about Wilderness management from the National Park Service's Alaska Regional Office. KOVA does not have a Wilderness Management Plan or Wilderness Character Monitoring Program.
	Management Operations		The park National Environmental Protection Act (NEPA) coordinator and members of the compliance team make efforts to evaluate each project for impacts to natural resources, cultural resources, subsistence, and Wilderness. For example, a Wilderness Minimum Requirements Analysis (MRA) is used for those projects thought to have a moderate or greater impact.
	Status of Plans		The park completed a Wilderness Narrative in 2016. No Wilderness Management Plan exists for KOVA and the park does not conduct wilderness character monitoring.
	Completed Training		The park has not completed wilderness training for all staff members.

2.5. Subsistence

Overall Condition, Opportunity and Continuity for Subsistence Activities		web ▸

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		KOVA has seven primary communities that are affiliated with the park and are heavily dependent on subsistence resources from the park: Kotzebue, Noorvik, Selawik, Kiana, Ambler, Shungnak, and Kobuk. These communities have NPS Resident Zone status. Additionally, residents of Deering, Buckland, Noatak, and Kivalina have NPS Resident Zone status, and some residents of these communities occasionally harvest resources from the park. Sharing of subsistence foods with relatives and friends is an important cultural practice, even extending beyond the region. Each of these communities has a baseline comprehensive community household harvest survey. In addition, several communities have more focused surveys related to use of specific subsistence resources, as well as sharing and trading activities. These studies roughly span the last thirty years; many of the more recent studies were completed within several years. There is also extensive anthropological and historical literature, which provides descriptive information about subsistence resources.
Opportunity and Continuity for Subsistence Activities	Proportion of users who are able to engage in all the subsistence uses they would like to pursue		The opportunity to pursue key subsistence activities is decreasing. This is due to four primary reasons: 1) declines in the biological status of several important wildlife species (caribou and moose); 2) reduction in access to resources due to climate change (lack of snow cover for winter travel); 3) a regulatory system that often conflicts with traditional harvest practices; and 4) increasingly higher costs of pursuing subsistence activities. (Arctic Council 2009b).
	Subsistence users are engaged in subsistence management		Opportunities exist for local subsistence users to participate in a number of federal and state advisory groups (Federal Regional Subsistence Councils, Local Fish and Game Advisory Committees, and NPS Subsistence Resource Commissions) and special groups established for targeted recommendation (Western Arctic Caribou Herd Working Group, Unit 23 Working Group, and Statewide Sheep Management Group), which make recommendations to the regulatory boards (Federal Subsistence Board and State Boards of Fish and Game). During public meetings, many subsistence users state that they are insufficiently represented in the actual decision making bodies, and/or they should share decision making responsibility through some other regulatory structures, such as co-management arrangements (ICC 2014).

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

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Opportunity and Continuity for Subsistence Activities (continued)	Continuity of Subsistence Uses		There is strong continuity of subsistence uses in outlying villages, in terms of resources as well as the cultural systems of beliefs and practices in which those uses are embedded. The adoption of new technologies—such as snowmachines replacing dogsleds and use of rapid fire firearms—represents the most noticeable change in subsistence. Adoption of technology may reshape the harvest patterns. Continuity of subsistence uses is less strong in regional centers—such as Nome and Kotzebue—where populations have greater ethnic and cultural variety. However, these regional centers contain significant components of the underlying regional culture, which remains strong.
Harvest of Fish, Wildlife, and Vegetation	Fish Resource Availability		Fish of several species comprise very significant components of the subsistence harvest for all the communities in the region. Overall, fish remain available (Menard et al. 2015), but no rigorous fish monitoring data have been collected. Changes in run timing of anadromous species and changes in weather patterns (which disrupts processing fish harvests)—both potentially linked to climate change—pose significant concerns for subsistence users. In the long term, ocean acidification may also impact fisheries and subsistence resource availability.
	Terrestrial Wildlife Resource Availability		Wildlife species of primary importance for subsistence users in the region are caribou, moose, and Dall's sheep. Sheep have drastically declined and caribou have been declining over the past decade. Moose are at the northern limits of their range and tend to remain at a fairly low density. This has resulted in regulatory attempts to lower harvest by shortening seasons, closing seasons, reducing overall estimates of harvestable surplus, and restricting individual harvest by reducing the individual harvest limits and/or reducing the number of harvest permits that are made available. The result is a situation where the availability of important wildlife resources is being reduced for an increasing number of subsistence users (Dau 2013, Schmidt and Gorn 2013). This may also result in increased competition for whatever subsistence resources remain available.

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)	Vegetation Resource Availability		Vegetation resources (such as berries and greens) generally remain available, although there have been fluctuations in abundance and/or timing of availability of individual species. Climate change may lead to an increase in these fluctuations, as number of shrubs (including berry-producing shrubs) increases.

Resource Brief: Subsistence as a Way of Life in Northwest Alaska

Subsistence as a Way of Life

Since people first entered Alaska, they have (until very recently) depended upon the harvest of naturally occurring living resources (fish, wildlife and plants) from the land and sea. The majority of Alaska's rural residents still depend upon these resources. This necessity of hunting, fishing, and gathering has given rise to both an economy and a way of life often referred to today as "subsistence." Even today, given the increasingly rapid cultural change and globalization, subsistence remains at the core of life for the majority of northwest Alaska's residents, most of whom are Alaska Natives.

The economic and nutritional importance of wild foods is significant; in 2012, residents of Arctic Alaska harvested 438 pounds per person of wild foods, and residents of Anchorage harvested 17 pounds per person (ADF&G 2014). The estimated replacement cost of those harvested wild foods ranges between approximately $44 million and $88 million (ADF&G 2014). Wild foods also contributed 280% of the minimum required protein and 39% of the required calories for people in Arctic Alaska, compared to 11% and 2% respectively in the Anchorage area (ADF&G 2014).

Less apparent is the fact that subsistence is entwined in the broader social and cultural patterns of the rural communities of northwest Alaska. The procurement of wild food helps shape the social organization and structure of a community, as well as its beliefs, attitudes, values, behaviors, and even the mental health of its members. Consider the role and place of an esteemed whaling captain, a skilled caribou hunter who brings in meat enough for many in the community, and a skilled seamstress who can convert caribou skins into clothing items. Elders are respected as repositories of the traditional knowledge that has ensured the survival of families and communities for countless generations. Subsistence lifestyles are also associated with a holistic view of the world as a system of interrelated elements (including people), held together by behavioral norms of sharing, respect, and mutual obligations.

Iñupiaq subsistence skills, such as fish cutting, are taught at Camp Sivu. Source: NPS Photo.

Resource Brief: Subsistence as a Way of Life in Northwest Alaska (continued)

Subsistence is characterized by a number of distinctive features:

- it is heavily focused around a strong sense of place; harvesting is largely focused on the resources closer to home when they are adequate to support the group;
- practices related to the harvesting, processing, distribution and consumption of resources generally take place within the framework of kinship and community ties;
- cultural practices, beliefs and values related to subsistence are based on tradition, and are transmitted across generations largely by observation and practice supported in the oral traditions of stories, myths, and legends;
- it facilitates a very detailed knowledge and understanding of the environment of the local area, which is made possible only by very close and sustained contact and interaction with that environment over a very long time;
- as an economic system, it tends to be marked by efficiency; the methods and means of harvest as well as resource selection tend to favor maximizing the harvest amount while reducing the harvest effort, given the available technology and the characteristics and nature of the resource;
- it features the utilization of a very wide range of different resources; and
- it focuses on the community and not on the individual.

The importance of subsistence in the lives of people of and from the region can be seen in the persistence of two behavioral characteristics: (1) the expectation that a young hunter will give his first kill to an elder outside of his own family, thus reinforcing the value of sharing and the role of community provider and (2) the strong need to provide traditional foods to relatives who have left the community for any number of reasons, illustrating the great degree to which traditional foods are a part of who they are as a people.

The activities of subsistence users in northwest Alaska are largely structured around a cycle of biological events that make available for harvest the food resources that are needed by communities. These events include the spring and fall migrations of the Western Arctic Caribou Herd, as well as its distribution on the winter range; the summer runs of salmon up rivers and streams in the region; the spring and fall migrations of key marine mammal resources, such as whales and walrus; the spring and fall migrations of waterfowl; the winter freeze of sea ice, allowing access to polar bears and seals; the spring and early summer gathering of plant greens; and the summer ripening of berries.

Men retrieving seal harvested for various uses including meat, seal oil, and the hide. NPS Photo.

The Communities

There are three park units in northwest Alaska centered around Kotzebue: Cape Krusenstern National Monument, Kobuk Valley National Park, and Noatak National Preserve. These parks have eleven closely associated communities (Kotzebue, Buckland, Deering, Kivalina, Noatak, Selawik, Noorvik, Kiana, Ambler, Shungnak and Kobuk) totaling 7,156 people, predominately Alaska Natives (about 89%). Excluding of Kotzebue – the regional center, which has a population of 3,209 people, including about 74% Alaska Native—the communities range in size from Deering (132 residents, about 87% Alaska Native) to Noorvik (668 residents, about 88% Alaska Native) (Population Data: Alaska DCCED 2016). In addition, there are occasionally some residents from outside of the area with customary and traditional use determinations who also seek resources from the parks. These eleven communities are almost entirely located either along a coastal area adjacent to marine waters, or inland and adjacent to major rivers. Because the availability of subsistence resources can vary significantly across both time and space, and because the harvest of resources tends to be locally focused, each community has a distinctive harvest pattern.

Resource Brief: Subsistence as a Way of Life in Northwest Alaska (continued)

Three communities are described here to illustrate the patterning (Harvest Data ADF&G CSIS 2016):

1. Kotzebue (population 3,209, 74% Alaska Native) is located at the tip of Baldwin Peninsula, which juts out into the Chukchi Sea. A 1991 harvest study found that fish, large land mammals, and marine mammals accounted for 97% of Kotzebue's total subsistence harvest. Fish of several species were the top contributor to the subsistence harvest (just over 40% of total harvest weight). Large land mammals comprised nearly 30% of total harvest, and in marine mammals comprised nearly 27%.
2. Kobuk (population 151, 90% Alaska Native) is located inland, 151 air miles northeast of Kotzebue on the bank of the Kobuk River. A 2012 harvest study indicated that fish and large land mammals contributed to about 93% of the total harvest. Fish of several species (57% of total harvest weight) were the leading contributors to the subsistence harvest. Large land mammals (predominately caribou with some moose) comprised just over 36% of the total harvest weight. The same survey estimated that 16,173 pounds of caribou were harvested, compared to 1,936 pounds of moose. This clearly suggests that a resource failure of caribou could adversely impact the community's ability to meet its subsistence needs.
3. Kiana (population 361, just over 90% Alaska Native) is located 51 air miles east of Kotzebue on the bank of the Kobuk River. A 2006 harvest survey indicated that fish of several species contributed to about 53% of the total harvest. Large land mammals comprised almost 38% of total harvest (caribou at nearly 41,612 pounds compared to moose at 8,629 pounds), and plants provided an important (but quantitatively weak) 4% of total harvest.

The Future – Challenges
The subsistence way of life will likely face significant challenges in the coming years. The three major threats to subsistence are:

1. *Global climate change*. Climate change may be the greatest long-term threat as ecosystems are transformed, including potentially significant changes in the abundance and distribution of key subsistence resources. In addition, there may be climate-associated difficulties in accessing resources (increased frequency and severity of storms, coastal erosion, thinning ice, longer periods of open water, and reduced snow cover limiting the use of snowmachines). Will people be able to adapt and still maintain a subsistence way of life?
2. *Development*. Development in the Arctic—such as mining, oil and gas development, and increased shipping activity through the Bering Strait—may have impacts from construction, operations, and accidents (ship collisions, groundings, oil spills into key habitat areas).
3. *External Influences*. The increasing influence of external management and regulatory systems that are disruptive or counter to subsistence practices may result in the erosion of the subsistence way of life. One example of this is that most Euro-American harvest limit restrictions in hunting are focused on the individual hunter (one moose per year, five caribou per year) whereas in subsistence-based communities, a relatively small number of hunters may be harvesting enough animals to meet a community's needs.

The challenges faced by subsistence users will be reflected in the challenges park managers also face as they continue to implement Federal Law in the form of Public Law 96-487 (ANILCA of December 1980). ANILCA mandates the NPS to provide the opportunity for rural residents engaged in a subsistence way of life to continue to do so in accordance with recognized scientific principles of fish and wildlife management and the purposes for which each park unit was established.

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

- NPS Arctic Network Inventory and Monitoring Program conducted monitoring in KOVA on vital signs including Dall's sheep, moose, caribou, landbirds, terrestrial vegetation (including lichen), terrestrial landscape patterns, permafrost, fire, large lakes, shallow lakes, streams, weather and climate, and snowpack.
- NPS partnered with the Alaska Department of Fish and Game to conduct a moose composition survey in the Lower Kobuk/Upper Squirrel River area, including much of KOVA, in fall 2016. A moose population count survey is scheduled for this same area in spring 2017.
- NPS partnered with the U.S. Forest Service to produce a model of the effects of climate change on the habitat of over 200 species of birds and mammals.
- NPS conducted intensive Dall's sheep surveys on a population experiencing sharp decline. NPS worked with partners to close the federal subsistence hunt on sheep in KOVA to allow the population to recover.
- NPS conducted a study of changes in small mammal distributions in response to changing ecosystems.
- KOVA conducted a workshop to describe the properties and uses of the Wild and Scenic Kobuk River for the Wild and Scenic River Program's documentation.
- Old fuel pods predating the establishment of the park were removed from KOVA to prevent escape of hazardous materials.
- Over 20 scientific publications were featured in peer-reviewed journals on the topics above.

Cultural Resources

- KOVA's archival processing has been brought up-to-date. 205 linear feet of archives with a finding aid were produced for all northwest Arctic parks including Bering Land Bridge, Cape Krusenstern, Kobuk Valley, and Noatak.
- In the summer of 2015, the National Park Service collaborated with Alaska Geographic, Bering Straits Native Corporation, Kawerak Incorporated, Carrie McClain Museum, and UAF Northwest Campus to host Nome Archaeology Camp, an opportunity for Alaskan teens to learn more about the heritage of the Bering Straits region through archeological methods, oral history, and museum studies.
- In 2013, archeologists completed excavation of Igliqtiqsiugvigruaq, a large village site on the Kobuk River. Working with the National Park Service and the Kiana Traditional Council (Federally recognized tribe), archeologists excavated a house, which included the removal and DNA testing of human remains discovered in 2011. The site can tell us more about ancestors of Kiana residents; preliminary results have been shared through a film called *Swift Water Place*.
- In a 2015 study by University of Alaska Fairbanks anthropologists, interactions between local and non-local caribou hunters were analyzed and linked to traditional Iñupiaq management of access and use of resources. This study examined changes in caribou migration and the effect on local caribou hunting success, which have been perceived to be the result of interaction with non-local hunters and commercial aircraft operators transporting non-locals.
- The NPS financially supported several place name documentation projects in the region during the 1970s and 1990s. For a number of years, NPS staff has been working to identify existing Iñupiaq place names data sets that may be suited for digitization into a Geographic Information System (GIS). Although issues of cultural sensitivities may limit the degree to which the data is distributed and shared, Native communities who created the data will certainly benefit from the consolidation of this type of information into a GIS format.

Visitor Experience

- The park brought high school students out for a challenging four-day camping trip on the Great Kobuk Sand Dunes. Rangers and biologists partnered with science teachers at the local school district to bring Iñupiaq youth for a science camp to help students understand the job of a field biologist and inspire them to pursue scientific careers.
- A park volunteer and park biologist designed a research project to learn about bears without capture, tags, or radio collars. The park brought in wildlife detection dogs that had been trained specifically to look for black bear scat. Scat was collected and analyzed for important DNA and diet information.
- Two Artists-In-Residence have had spectacular experiences in KOVA and produced artwork that traveled around the state for the 50th Anniversary of the Wilderness Act in 2015. One piece (from Constance Baltuck) is an original painting and the other (from Elaine Phillips) is a unique textile collage. Both are on exhibit in the new Northwest Arctic Heritage Center.

Wilderness

- KOVA completed the mapping of current wilderness boundaries and calculation of current wilderness acreage.
- NPS Western Arctic Parklands compiled the legislative history of Wilderness in Noatak National Preserve, Kobuk Valley National Park, and Cape Krusenstern National Monument.
- KOVA completed a Wilderness Character Narrative.
- KOVA selected measures for wilderness character monitoring.

Subsistence

- NPS released new regulation changes allowing customary and traditional uses of horns, antlers, and plant materials collected from parklands (Federal Register 2017).
- NPS continues to work within a regulatory framework to balance subsistence uses with conservation of wildlife populations. The NPS manages a sheep hunt within and adjacent to KOVA and coordinates with the State of Alaska.
- The Kobuk Valley Subsistence Resource Commission (SRC) meets twice yearly to discuss regulatory wildlife and fisheries proposals and make recommendations, which may address major topics such as eligibility, access, harvest monitoring, methods and means of taking resources, and research needs. Most recently, the SRC met in July 2015, February 2016, and November 2016 and reviewed and discussed hunting and fishing proposals, wildlife survey results and resource reports, the park's General Management Plan, and the park's Hunt Plan. The next meeting is planned for spring 2017.
- KOVA, in conjunction with the other Western Arctic Parklands, continues to support the Western Arctic Caribou Herd Working Group, which was established to "ensure conservation of the Western Arctic Caribou Herd, safeguard the spiritual and cultural well-being of Alaska Natives and the interests of all users of the herd, and integrate indigenous knowledge with Western Science."
- KOVA, in conjunction with the other Western Arctic Parklands, continues to support and participate in the Unit 23 Working Group, whose goal is to protect subsistence uses and identify and minimize user conflicts resulting from the influx of fall hunters to Game Management Unit 23.

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

Kobuk Valley National Park is managed as a unit within the Western Arctic Parklands (WEAR), which protect a northwest Alaskan Arctic landscape of rugged beauty. WEAR includes Cape Krusenstern National Monument, Kobuk Valley National Park, and Noatak National Preserve. Together, these parks represent over 9 million acres of arctic tundra and boreal forest atop permafrost, and large expanses of the Brooks Range, lowlands, and coastal plains. These parklands are well-known for their abundant wildlife including the Western Arctic Caribou Herd (one of the largest caribou herds in North America), brown bears, Dall's sheep, moose, and migratory birds from five continents. Included in these holdings are 300 km of world-class soft-sediment coastlines comprised of fractal-patterned lagoons teeming with waterbirds, salt-marshes, brackish wetlands, and a wide assortment of arctic marine mammals. Established by ANILCA in 1980, these parks not only protect habitat for and populations of fish and wildlife, but also provide opportunities for the continuing subsistence and cultural heritage of the Iñupiaq people who have lived here for millennia.

As the issues of the outside world reach these remote parks, the NPS must adapt. Landscape and ecosystem change driven by climate change is beginning and is likely to catalyze fundamental changes to the appearance and function of these parks. In the future, the NPS may find itself in the incongruous position of managing a boreal landscape set aside to protect arctic tundra and free-roaming caribou herds when they may no longer occur there. The rise of the arctic shipping industry brings a large set of challenges and risks to coastal and aquatic ecosystems. Managing for subsistence and wildlife amidst this transformation is complex both philosophically and practically.

As the Western Arctic Parklands move forward in changing times, the major management challenges facing these parks include:

- The effects of climate change on ecosystem parts, processes, and services
- Wildlife management
- Current and threatened impacts from outside park boundaries
- Logistical challenges unique to WEAR parks

4.1 Climate-driven Challenges

The Arctic has been warming at twice the rate of the temperate latitudes, which has led to several physical and ecological changes with many more anticipated. Downscaled models (Rupp and Loya 2009a, b, c) predict that these parklands are expected to experience warming of up to 10 °F mean annual temperature over the next 60 years. Sea ice has retreated to historic lows in both extent and thickness, and researchers predict an ice-free summer Arctic Ocean by 2035. With a changing climate comes a host of current and potential issues requiring adaptation in terrestrial and aquatic environments.

4.1.1 Terrestrial

There are myriad changes predicted to occur on KOVA's ecosystem over the coming decades and within the century. The most dramatic of these include:

- Tall shrub increase and the movement of forest into much of KOVA'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 lichens
- Increases in 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 species
- Reduction in the availability of and access to key wildlife species hunted for subsistence by local residents, especially caribou
- Mismatch of migration, forage and pollination timing because of earlier green-up and longer snow-free season

While recognizing that preventing many of these changes is beyond park managers' control, the NPS may consider a suite of adaptations.

Vegetation and Ecosystem Change

Arctic warming has led to the increase of tall shrubs on previously dwarf-shrub tundra throughout the world's Arctic ecosystems (Tape et al. 2006). Currently, about a quarter of vegetation plots sampled by the NPS showed modest shrub increase and afforestation since 1980 (Swanson 2013), with changes concentrated in lowlands habitats. A recent vegetation model concluded that a large proportion of WEAR is likely to experience increase in tall shrub cover during coming decades (Swanson 2015). A recent pan-arctic study showed significant ice wedge degradation (Liljedahl et al. 2016) in the circumpolar north and NPS research (Swanson 2013) showed minor degradation on 10% of plots with wedges present.

Future climate scenarios forecast Arctic ecosystems that are drastically different from those that occur now (Murphy et al. 2010). Open tundra habitats within KOVA that currently support abundant and diverse lichen communities will likely be replaced by taller shrublands and forests which host far less lichen biomass (Marcot et al. 2015, Walker et al. 2006). Increasing fire frequency is likely to compound this problem. Lichen winter range is the key winter forage for the Western Arctic Caribou Herd and other ungulate species. Without this extensive winter range, herds are more likely to be smaller and spatially isolated as is the case with the herds in interior Alaska.

Potential Adaptation: NPS should consider how to obtain the best predictive data on ecosystem change and develop a suite of possible mitigation strategies. Supporting landcover monitoring and research by the NPS and a broad consortium of partners is a key first step. Promoting discussions on adaptive management of landscape change with stakeholders including local communities, federal and state agencies, and the broader public is quickly rising in importance along with rising temperatures.

Caribou and Habitat

The Western Arctic Caribou Herd is a major subsistence resource for northwest Alaska and reached 490,000 animals in 2003 (Western Arctic Caribou Herd Working Group 2011). The population has declined over 50 percent since 2003. In 2016, the population was estimated at 201,000 animals (Parrett 2016). The heritage, traditions, and subsistence needs of Alaska Natives in approximately 40 local communities have been shaped by the availability of the caribou (Western Arctic Caribou Herd Working Group 2011). The presence and relative abundance of the Western Arctic Caribou Herd has substantial impacts on the populations of wolves, bears, and wolverines in the area. Arctic herds of caribou are known for their large population fluctuations. Although this characteristic of arctic caribou herds is well known by local area residents, it provides little solace when this important subsistence resource becomes scarce.

Available habitat for the Western Arctic Caribou Herd is likely to decline under predicted climate change scenarios (Marcot et al. 2015). Primary forage for caribou includes leaves, grasses, and sedges in the summer and lichen in the fall and winter (Miller 2003). These food sources are likely to decline over the long term, with a warming climate due to tall shrub and tree increase in open tundra communities (Holt and Neitlich 2010, Joly et al. 2009). Lichen winter range may potentially suffer additional decline from more frequent wildfire (Racine et al. 2006). Models investigating the effects of climate and fire on Western Arctic Caribou habitat project a fire-mediated decrease in the extent of caribou winter range and an increase in moose habitat due to a decrease in lichen and an increase in shrubs (Joly et al. 2012). Lichen winter range may also decline due to increasing inputs of nitrogen and sulfur from regional development and shipping (Linder et al. 2013). Caribou are parasitized by blood-sucking insects including mosquitoes, botflys and warble flies. Activity and harassment of caribou by these parasites are correlated with warmer temperatures (Witter et al. 2012). Under severe conditions, these parasites can impact foraging by caribou and impact their fat reserves.

Historically, caribou arrive on the calving grounds and give birth to their calves synchronously in early summer when vegetation is at its most nutritious. Increasingly early green-up may place these cycles out of sync (Post et al. 2008), potentially impacting the energetics and reproductive success of caribou.

Potential Adaptation: NPS should continue to engage with partners to continue to study and manage caribou and their habitat in a changing ecosystem.

Fire

Data suggest that fires are increasing in frequency, extent, and severity in northern Alaska, including those in tundra areas. Fire can exert strong landscape-scale effects on vegetation, wildlife, permafrost, nutrient cycling, carbon storage, hydrology, and water and air quality. In some instances, a repeat fire regime can favor a landscape dominated by early successional vegetation (e.g., grasses and sedges) and reduce the dwarf shrub-lichen tundra components key to ungulate forage.

Potential Adaptation: NPS should continue to consider the implications of fire suppression options in order to save lichen winter range.

Permafrost

Most of the Western Arctic Parklands are underlain by continuous permafrost (soil that remains frozen for two or more years). Under current climatic conditions and projected global climate change scenarios, permafrost is vulnerable to thawing (Jorgenson and Osterkamp 2005) and evidence of this thaw is especially evident in KOVA. The rate of permafrost degradation is expected to increase and the consequences of this thaw include:

- Thermokarst formation (i.e., subsidence, collapse, erosion, and ground surface instability caused by thawing permafrost)
- Land surface drying (and subsequent ecosystem changes)
- Disappearance of many shallow lakes and formation of a much smaller number of new lakes
- Altered stream flow with increased sedimentation and erosion
- Release of stored carbon, methane, and contaminants (e.g., mercury)
- Formation of thaw slumps (small landslides)

Potential Adaptation: NPS should continue to monitor permafrost and could increase research of thaw-driven landscape change.

Winter Icing Events

Climate projections for northern Alaska predict that winter temperatures will increase by over 35% (Rupp and Loya 2009a, b, c). The combination of greater precipitation and warmer temperatures provides greater potential for icing events following rain-on-snow events or mid-winter thaws. The WEAR parks, including KOVA, have experienced 3–4 thaw-refreeze events/year over the last decade (Wilson et al. 2013). Mammalian herbivores face challenges obtaining adequate winter forage during years with particularly bad winter icing. Winter icing events have increased over the past decade and this trend is expected to continue.

Potential Adaptation: NPS could consider multi-agency partnerships to identify areas less prone to icing events as critical areas for caribou and other wildlife species.

Life Cycle Mismatches

Potential mismatches may occur for caribou and their summer forage, ptarmigan and hare and their camouflage (color camouflage timing problems due to earlier snow melt, Zimova et al. 2014), migratory birds and their prey (van Gils 2016, Clausen and Clausen 2013), and co-occurrence of pollinators and flowers.

Potential Adaptation: NPS could consider multi-agency partnerships to identify the extent of mismatches occurring and projected for caribou and other species.

Wildlife Winners and Losers

A recent modeling effort (Marcot et al. 2015) provided a predictive framework describing how climate change may affect habitat, wildlife species, and ecosystems in the future. With the increase in forest and tall shrub ecosystems and decline in open habitats, 26 mammal species and 68 bird species are expected to face habitat decline and population decrease. Some species, such as moose and boreal forest birds may experience a population increase with better habitat.

Potential Adaptation: NPS should continue to participate in international conservation efforts; this is key to building the network for migratory species, especially birds, facing habitat decline from climate, development, and pollution. Assisted migration has also frequently been proposed as a solution for plants and animals challenged by changing climate and distributional limitations. NPS may potentially be faced with some decisions on assisted migration either as a donor or recipient.

4.1.2 Aquatic

In parallel with changes on the land, KOVA's aquatic resources are expected to change dramatically, presenting a number of management challenges. Shallow lakes and ponds have shown a modest decrease in number and size, a trend expected to intensify. Aquatic habitat for birds will be accordingly reduced. Rivers will warm and become more filled with sediment seasonally, presenting challenges to arctic fisheries. As peat decomposes, it is expected to release nitrogen and mercury into surface waters.

Fisheries

Local residents rely on fisheries for subsistence, particularly chum salmon, sheefish, and several other species of whitefish from lagoons. 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. Release of nutrient nitrogen from permafrost thaw may influence the abundance of primary producers, dissolved oxygen levels, and ultimately fish. 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 (Healey 2011).

Potential Adaptation: The Western Arctic Parklands do not currently have a fish biologist, but need to work more proactively with other NPS fish biologists and cooperators to develop a robust fisheries program.

Contaminants

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 Arctic parks (Landers et al. 2008) found that concentrations of methyl-mercury in lake trout in these lakes were higher than recommended for human consumption. Thawing 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.

Potential Adaptation: NPS should continue to monitor fish for toxic substances and communicate advisories with local communities.

Waterbirds

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. As described above, participation with national and international conservation efforts is paramount.

Potential Adaptation: NPS should consider increasing international cooperation on migratory species.

Loss of Cultural Resources

As the interior watersheds in KOVA are systematically impacted by erosion, an important record of human land use is being erased at an unprecedented rate. Landscape erosion along river banks may accelerate with storm surge events, high spring floods, thawing permafrost, and dune deflation.

Potential Adaptation: Although poorly funded, the Western Arctic Parklands are currently conducting an inventory to identify the parks' most significant and at-risk cultural and paleontological resources along the parks' coasts and interior watersheds. This effort will aid park managers in understanding threats to these resources, and help them develop survey and mitigation priorities. The Western Arctic Parklands need to explore other potential partnerships as rapidly as possible to assist in this endeavor.

4.1.3 Subsistence

KOVA was created in part to provide for subsistence opportunity for local residents. Whitefish, including the locally endemic sheefish, are a key subsistence resource for local communities (Georgette and Shiedt 2005). Coastal erosion as a result of climate change has the potential to alter the coastal subsistence fisheries for whitefish, because new dynamics of lagoon breaching will alter overwintering patterns of whitefish (Whiting et al. 2011). Local fishermen have observed the loss of "countless numbers" of whitefish in some areas of Kotzebue Sound, emphasizing the need to understand factors driving such perceived declines. Furthermore, increases in shipping and development in the region have increased risks of oil spills and coastal modification due to activities such as: maritime transport associated with oil and gas activities, consideration of deep-water ports in the region, and international shipping along the Northern Sea Route.

On land, subsistence opportunity for caribou is likely to face increasing hardship as the herd numbers have dropped over 50% from approximately 500,000 and the Western Arctic Caribou Herd is likely to face habitat constriction due to changing vegetation. The Western Arctic Caribou Herd'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 protect subsistence opportunity.

Potential adaptations: NPS subsistence managers should continue to be regularly engaged with local communities and advisory groups to discuss adaptation to climate change.

4.2 Wildlife-related Challenges

Protecting habitat for and populations of fish and wildlife is a central tenet of ANILCA. ANILCA also protects resources related to subsistence needs; provides for subsistence use by local residents in Kobuk Valley; and provides for non-consumptive uses including recreation in all park units.

Wildlife management in the park must balance the multiple uses provided for by ANILCA within the resource management framework unique to parks created by ANILCA. Like other park units in the nation, the Western Arctic Parklands are overseen by a Superintendent; national parks in Alaska, however, also include management that involves local stakeholders.

As per ANILCA, wildlife management in the parks as it relates to subsistence includes involvement of local residents and Native Alaskans through Regional Advisory Councils (RACs) and Subsistence Resource Commissions (SRCs). RACs are composed of residents of the region and provide a forum for expressing opinions, making recommendations, evaluating proposed regulations, and participating in decisions related to subsistence uses of fish and wildlife within the region. KOVA falls under the purview of the Northwest Arctic RAC. KOVA has an additional layer of involvement in park management because it also has an SRC. The SRC is composed of local residents that engage in subsistence uses within the park, and they recommend a program for subsistence hunting and use of resources (i.e., wood gathering, plant gathering) within KOVA.

4.2.1 Wildlife Management Challenges

There are several important challenges to wildlife management in KOVA and the other Western Arctic Parklands. The parks lack 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, and providing for non-consumptive uses. Aerial surveys and monitoring are conducted for moose, brown bears, and Dall's sheep to determine population trends over time. Aerial surveys alone, however, do not provide information on movement, demographics, and habitat use that are key to managing populations. This lack of data leaves the parks unable to appropriately respond to proposed State and Federal wildlife regulatory proposals that affect park wildlife resources, including the management of predators. The Western Arctic Parklands lack critical wildlife data primarily because of the lack of funding for wildlife studies. Although, the parks are highly visited, especially by local residents, the parks do not generate user fees. For many parks, user fees help fund wildlife and other projects. Also, the Western Arctic Parklands compete for wildlife funding from a limited pot of money with other parks that are able to fund projects from visitor fees.

Additional challenges stem from divergent park uses including subsistence hunting and gathering, recreational boating, and wildlife watching. Some of these uses can be at odds with others, which presents management 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 >9 million acres comprising the Western Arctic Parklands.

Potential Adaptations: KOVA and the other WEAR parks could advocate for the need to secure funding for wildlife projects in order to better respond to proposed wildlife actions and to protect habitat for and populations of fish and wildlife. To better fund wildlife projects, the Western Arctic Parklands could point out the inconsistency of non-fee based parks competing with fee-based parks for limited funds of money.

4.2.2 Key Species-specific Challenges

Dall's Sheep

The majority of Dall's sheep within the Western Arctic Parklands parks occur in Noatak, though some occur in Kobuk Valley. Although sheep populations fluctuate naturally, based on information from aerial surveys, the sheep population in WEAR declined by 70% from a peak in 2011 to 2014. 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). Aerial surveys are used to estimate sheep populations (Schmidt et al. 2012); and determine population trend; however, there have been no focal studies to elucidate the drivers of population change and offer mitigations.

Potential Adaptations: NPS should perform studies of survival, recruitment, and habitat condition to inform population recovery and management.

Brown Bears

Important information gaps exist for brown bears in the Western Arctic Parklands, including KOVA—reliable population estimates, movements, demographics, and habitat use information have not been produced in over 20 years. As of this writing, there are five wildlife proposals under consideration by the Alaska Board of Game to facilitate or increase bear harvest in Game Management Unit 23, of which KOVA is a part. A significant management challenge is for the Western Arctic Parklands to respond to these proposals without data. Most brown bears in Unit 23 are harvested out of the Noatak drainage; impacts of the Red Dog Mine have caused den abandonment and direct mortality (Ayres 1991), and future pressures include nearby mining prospects, plans to develop a wind farm along the Delong Mountain Transportation System (DMTS), and a proposed road from Ambler to the DMTS. During the last 20 years, the Arctic has warmed, leading to phenological changes, and the commercial salmon fishery has declined causing more salmon to reach spawning areas far inland; both of these factors may have changed bear habitat use. Residents of Unit 23 report seeing more bears, suggest bears are contributing to the decline of the Western Arctic Caribou Herd through predation, and consider bears a nuisance or threat. Brown bears are a NPS Arctic Network Vital Sign; five parks are slated for population census via aerial survey once every 4–5 years. Aerial survey data, however, cannot provide information about habitat use, movements, demographics, or whether parks are acting as population sources or sinks.

Potential Adaptations: NPS should conduct studies of habitat use, movements, demographics, and predation to better inform wildlife management decisions related to bears, their prey, and potential mitigations of human-bear conflict.

Caribou

Caribou present a management challenge for the Western Arctic Parklands due to their importance for subsistence hunting, cultural continuity for Iñupiaq people, and sport hunting. During the mid-1970s the population reached an all-time low of 75,000 caribou (Dau 2011), but then steadily increased to 490,000 animals in 2003 (Dau 2011). The Western Arctic Caribou Herd is currently at the low end of its population cycle. Since 2003 the herd has declined over 50 percent and now numbers 201,000 animals (Parrett 2016). Residents of Unit 23 report seeing more bears and wolves, suggest bears and wolves are contributing to the decline of caribou through predation, and consider these predators a nuisance or threat. In general, however, the health and success of the various caribou herds in the region is stable, with some natural fluctuation.

The Western Arctic Caribou Herd moves fluidly across the boundaries of many jurisdictions and harvest and management requires involvement of many groups. Because of the importance of the herd as a resource, the Western Arctic Caribou Herd Working Group (WACH WG) was established to "ensure conservation of the Western Arctic Caribou Herd, safeguard the spiritual and cultural well-being of Alaska Natives and the interests of all users of the herd, and to integrate indigenous knowledge with Western Science" (WACH WG 2011.

Potential Adaptations: NPS should continue to support the work of the WACH WG and ensure that staff is involved in research and monitoring studies of the Western Arctic Caribou Herd that will inform management decisions related to caribou and their habitat.

Moose

Moose occur in all of the Western Arctic Parklands, but calf recruitment and population numbers are low throughout much of Unit 23 (Westing 2012), of which KOVA is a part. Of the WEAR park units, moose abundance is highest along the Kobuk River downstream (west) of KOVA; in general, KOVA comprises vast moose habitat. Sport hunting is prohibited in KOVA, but subsistence harvest and predation remain a significant source of mortality. Management challenges for moose include better understanding which factors—other than predation and harvest, such as browse condition—may contribute to population declines.

Potential Adaptations: NPS should continue aerial population and composition surveys and conduct studies of range condition to look at factors other than predation and hunting that might be limiting moose populations.

4.2.3 Wildlife Conflict

Wildlife, in addition to being important resources for subsistence, can be the source of conflicts with local residents. Addressing wildlife conflicts in a non-lethal way is a management challenge for the Western Arctic Parklands. For example, local residents believe that there are numerous bears in Game Management Unit 23. Local residents have reported bears damaging cabins, bears taking fish from drying racks, and a general concern for human safety. People have also expressed concerns over wolves becoming more brazen near villages and more numerous in general.

Potential Adaptations: NPS should convene a wildlife conflicts working group that includes participation from and solicits input from various agencies and local groups. WEAR could develop a plan on how it will manage conflicts on parklands in cooperation with other agencies.

4.3 External Challenges

A number of current impacts and future threats to KOVA's natural resources come from external sources. Challenges include proposed mining and access roads, increased regional pollution, increased potential for invasive species introduction, and ongoing illegal activity such as looting of archeological and paleontological resources and wanton waste.

The Alaska Industrial Development and Export Authority has proposed a road linking the Ambler Mining District with the Dalton Highway. The development of Ambler mining resources would be contingent on this road. Development of the mine could bring potential impacts to water and air quality in KOVA including: sulfur and nitrogen emissions, heavy metal-bearing fugitive dusts, and water-borne contaminants. Regional pollution throughout northwest Alaska is likely to increase significantly as both shipping and onshore oil development (in National Petroleum Reserve – Alaska) increase. While invasive species are not yet an issue, terrestrial and aquatic invasives have been reported in Alaska and there are obvious potential vectors into the parks. Finally, there is a great deal of collection of Pleistocene fossils (e.g., mammoth remains) and human artifacts in the region and NPS suspects that materials are being illegally removed from park lands.

4.4 Logistical Challenges

Working in the Arctic presents unique logistical challenges. Fieldwork in these remote, roadless parks requires access by boat or plane and is hampered by high costs of supplies, poor weather, and lack of infrastructure. The Western Arctic Parklands are understaffed and struggle with high staff turnover, difficulty hiring local residents (due to low federal wages compared to the high cost of living in Kotzebue), lack of housing, and slow telecommunications. Parks have started to test creative arrangements for basing certain operations (e.g., aviation management, law enforcement, science, administration) more centrally in Alaska, which may help WEAR and other remote Alaska park units.

Potential Adaptation: NPS should continue to explore shared employee arrangements, basing more logistical services from NPS primary hubs, and other creative solutions to high staff turnover.

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:

Americans with Disabilities Act (ADA)	Law enacted by the federal government that includes 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 five parks located in 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.
Climate Friendly Park	The NPS Climate Friendly Park designation requires meeting three milestones: completing an application; completing a comprehensive greenhouse gas (GHG) inventory; and completing a Climate Action Plan, which is the actions, policies, programs, and measures a park will put into place to reduce its GHG emissions.
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.
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.
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.

National Historical Landmark (NHL)	National Historic Landmarks are nationally significant historic places designated by the Secretary of the Interior because they possess exceptional value or quality in illustrating or interpreting the heritage of the United States. Today, fewer than 2,500 historic places bear this national distinction.
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.
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.
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)	WEAR is a group of 3 remote, Arctic National Park units managed by one team. WEAR includes Cape Krusenstern National Monument, Kobuk Valley National Park, and Noatak National Preserve. Before 2016, the group also included Bering Land Bridge National Preserve, which now has its own dedicated staff.
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.