National Park Service
U.S. Department of the Interior

State of the Park Report

Wrangell-St. Elias National Park and Preserve

Alaska

2016

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On the cover: Skookum Volcano in the Nabesna area, Wrangell-St. Elias National Park and Preserve

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

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

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

The purpose of Wrangell-St. Elias National Park and Preserve (WRST) is to maintain the natural scenic beauty of the diverse geologic, glacial, and riparian-dominated landscapes, and to protect the attendant wildlife populations and their habitats; to ensure continued access for a wide range of wilderness-based recreational opportunities; and to provide continued opportunities for subsistence use.

The area includes the greatest assemblage of mountain peaks over 14,500 feet in elevation found in the nation, the nation's second highest mountain (Mount St. Elias, at 18,008 feet), several inactive volcanoes, and one active volcano (Mount Wrangell), and an active glacial complex, including some of the largest glaciers in the nation.

Wrangell-St. Elias National Park and Preserve is significant because:

1. Wrangell-St. Elias National Park and Preserve provides superlative scenic beauty.
2. WRST encompasses the nation's largest protected active glacial complex.
3. Encompassing portions of three major mountain ranges, WRST contains vast areas of scenic high mountain terrain from sea level to 18,000 feet and includes nine of the sixteen highest peaks in North America.
4. WRST contains major river systems with more miles (over 1,000) of scenic, free-flowing, glacial rivers in their natural state than are found in any other protected area in the United States.
5. The vast undeveloped expanse of WRST contains diverse aquatic and terrestrial ecosystems, ranging from alpine to marine, and providing natural habitat for populations of Alaskan flora and fauna. Biologically unique subspecies of flora and fauna have developed in the Bremner and Chitina River Valleys. As a result of their isolation by virtue of ice fields and the Copper River, these areas are virtually ecological islands in which development of subspecies is largely unaffected by interchange with outside plant and animal species. Wildlife populations include the largest population of wild mountain sheep in North America, moose, mountain goat, and a non-migratory population of caribou. The area is the only part of Alaska where four of the five identifiable forms of bear occur, including the interior grizzly, the coastal brown bear, the black bear, and the rare blue-color phase of the black bear called glacier bear. Along the coast of the Gulf of Alaska, bald eagles and a large and varied shorebird population occur.
6. The Wrangell-St. Elias Wilderness is the largest unit of the National Wilderness Preservation System, encompassing nearly 10 million acres of remote and geographically diverse mountainous landscapes.
7. Preserved within WRST is abundant evidence of more than 3,000 years of cultural and technological development. This long history reveals a range of human adaptations to changing climates, environments, and economic circumstances.
8. WRST is an inhabited area where local communities and traditional human activities remain integrated with the wilderness setting. Cultural development within the area is of interest to archeologists and historians. Indirect evidence points to 10,000 years of occupation in the park, with direct evidence of sites dating to at least 3,800 years ago. Three Alaska Native language families converge here: Tlingit, Eyak, and Athabascan. In addition, the park's cultural heritage and local communities reflect 100 years of Euro-American exploration and settlement. Mining history is evidenced by the Kennecott Copper works, a National Historic Landmark.

The summary table, below, and the supporting information that follows, provide an overall assessment of the condition of priority resources and values at WRST based on scientific and scholarly studies and expert opinion. The internet version of this report, available at http://www.nps.gov/stateoftheparks/wrst/, 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 measure 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 ▸
Geologic Features and Processes		Geologic processes, such as volcanic eruptions, landslides, earthquakes, plate tectonics, and isostatic rebound are all actively occurring within the park and a major driver of ecosystem processes. Climate change may be changing the rate of some of these processes, and in particular is responsible for shrinkage in the extent of glaciers and permafrost within the park.
Water Quantity and Quality		WRST contains over 14,000 miles of streams and over 70,000 lakes and ponds. Relatively little long-term data regarding water quality and quantity is available. Climate change may be affecting water quantity and quality but specific effects have not been quantified. The limited data available generally suggests that water quantity and quality is in good condition and relatively stable considering that changes in glacial extent are a natural process.
Air Quality		Toxic contaminants can enter the ecosystem from waterborne sources and/or from airborne sources (Pacyna and Pacyna 2002, Landers et al. 2008, Moynahan et al. 2008). In 2008 in the Western Airborne Contaminants Assessment Project (WACAP), Landers et al. (2008) found that the air sampled at WRST had the lowest number of detected contaminants among the 20 parks in the study and the vegetation samples from the interior sites at the park were at or below the median or were not detected. WRST currently has no other air quality indicators available.
Birds		Trumpeter swans and other waterfowl are specifically mentioned in WRST's enabling legislation. The existing information presented in this report suggests that bird populations are in good condition and stable; however, little is known regarding many or most of the bird species that utilize the area during some portion of their life cycle. Habitat for birds in the unit is generally in a natural condition.
Mammals		ANILCA directs WRST to manage for natural and healthy wildlife populations. In some cases this may mean accepting low population levels or the loss of individual populations if they are driven by natural causes. Predator and prey population dynamics are a natural process as is subsistence harvest that does not drive population fluctuations. Although caribou herds in the area are at low population levels, mammal populations are generally considered to be natural and healthy. Due to climate change, external pressures such as intensive management of predators, and the potential for new disease transmission, cautious management and wildlife monitoring are an appropriate management strategy.

Priority Resource or Value	Condition Status/Trend	Rationale
Fish		There is well-documented annual escapement data for anadromous salmon in the Copper River drainage provided by two NPS-operated salmon weirs in the park and by the Alaska Department of Fish and Game (ADF&G). They show an increase in the number of sockeye salmon and a decrease in the number of Chinook salmon. Few data are available for resident fish other than an ongoing freshwater fish inventory that gives some baseline data about species distribution. Many water bodies in the park have not been sampled. Species abundance work has concentrated on burbot in lakes that are known to support subsistence fishing activities. Recent analysis of fish in four lakes indicates cause for concern about mercury concentrations in some fish species in some lakes, and implies that the risk to park fish, wildlife, and humans is variable across lakes and species.
Vegetation		Overall, vegetation resources in Wrangell-St. Elias are currently stable and healthy. However, invasive species and climate change do pose potential threats that have been documented elsewhere at similar latitudes, which could lead to changes in the future. Anecdotal evidence suggests that some of these vegetation communities will decline (tundra, wetlands, and boreal forest) while others will increase (coastal and shrub). These vegetation community changes will have an impact on habitat available for fish and wildlife, availability of subsistence resources, cultural resources (degradation), viewsheds, and accessibility of the park.
Landscape and Ecosystem Processes		In general, landscape and ecosystem processes are functioning naturally and, with the exception of impacts from climate change, are largely uninfluenced by humans. Fire suppression to protect park infrastructure, historic structures, and private lands, has altered the extent of natural fires. Recent collaboration with local landowners has allowed more flexibility in fire management. Ecosystem contaminants, primarily mercury, from undetermined sources are a cause for concern and should be monitored. Migratory networks are generally intact. The vast size and the diversity of WRST—encompassing habitats ranging from coastal environments to high mountain peaks—provide some of the best protection for landscape and ecosystem processes found in North America.
Dark Night Sky		Night sky quality at Wrangell-St. Elias is in good condition. 2012 visible infrared imaging radiometer satellite (VIIRS) 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. Additionally very little anthropogenic light is detected in an area within 200km radius around the park. Given these very low levels of anthropogenic light, the photic environment of WRST is subject to the natural regime of dark/light patterns allowing visitors to the park to experience pristine night sky resources.

Priority Resource or Value	Condition Status/Trend	Rationale
Acoustic Environment		All physical sound resources, whether they are heard or not, are referred to as the acoustic environment of a park. The quality of the acoustic environment affects park resources and values including wilderness quality, wildlife, and cultural resources and landscapes. The condition of the acoustic environment is assessed by determining how much noise man-made sources contribute to the existing acoustic environment. The human impact on the acoustic environment in WRST is low, meaning that the acoustic resources are 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. However, it should be noted that most of the road traffic and tourism increase take place on one of two state-owned roads and private land; it is not clear how this noise impacts the acoustic environment of the other 12+ million acres of the park.
Cultural Resources		web ▸
Archeological Resources		There are 744 archeological sites recorded in WRST in the Archeological Site Management Information System (ASMIS). Including prehistoric and historic sites, they represent direct evidence of over 4,000 years of sustained occupation. Although little systematic survey has been conducted within the park, most of the known sites are well documented and in good condition. New sites continue to be found, usually as part of a compliance activity for other park actions, and records are being updated regularly.
Cultural Anthropology		Several ethnographic reports have been completed or are underway for WRST. There is an ongoing program to complete baseline ethnographic information through overview and assessments, community histories, and oral histories. Additionally, the park is working to collect updated information on the harvest and use of wild renewable resources by residents of local communities, as authorized by its enabling legislation. The park also actively consults with local tribes on proposed federal actions with the potential to impact them.
Cultural Landscapes		There is a vast array of cultural landscapes in WRST including historic transportation corridors, mining districts, and airstrips. 31 cultural landscapes have been identified in the park and are documented in the Cultural Landscape Inventory database. Continued evaluation and identification of cultural landscapes add to the understanding of the prehistory and history of the park. Deterioration of structures and re-vegetation threaten some of the more vulnerable landscapes, but vegetation management and further documentation protect others.
Historic Structures		There are 264 historic structures within WRST that are listed in the List of Classified Structures (LCS). Historic structures are generally well understood and documented. Although structures in good repair are maintained, others will continue to deteriorate.
History		The history of the park area and of the creation of the park is well understood and documented, and preservation of this information informs park planning efforts and activities. The currency of the information will decrease slightly over time without a historian on staff and as institutional knowledge is lost.

Priority Resource or Value	Condition Status/Trend	Rationale
Museum Collections		Museum collections at WRST include over 480,000 items, including archeological materials, historic artifacts, herbarium and other natural-resource collections, and a vast array of archives. The collections and facilities are in good condition.
Visitor Experience		web ▸
Number of Visitors		The total of 74,722 visitors to the park in 2014 is higher than that of 2013 (69,984) but much lower than that of 2012 (87,158). The 10-year average of annual visitors was 61,939 (2003–2012). WRST has road, trail, water route, and aviation access. Since access is so varied with no mandatory registration, estimations for visitor use are challenging.
Visitor Satisfaction		Based on the standard visitor satisfaction survey conducted each year, the percentage of visitors satisfied in FY14 was 98.0%, which is higher than the average for the previous five years (95.6%) and ten years (95.2%).
Interpretive and Education Programs – Talks, Tours, and Special Events		The park is continuing its efforts to fortify existing programs with new programs. The park is seeking ways to connect with the next generation of park stewards. Education and ranger programs are steadily increasing in availability and attendance.
Interpretive Media – Brochures, Exhibits, Signs, and Website		Most of the park's exhibits and media are a bit dated. They were developed in the 2000s and are in need of updating or refreshing. The park is moving towards digital media, although there is no staff specifically assigned to this task.
Accessibility		The park lacks current infrastructure to accommodate people with mobility, audio and visual impairments. Automatic door opening will be installed this year at the Copper Center Visitor Center, but other areas of the park lack accessibility. The park is working on developing materials that are ADA compliant for the web and park-produced publications.
Safety		The park is committed to promoting safety. Operational Leadership training is being conducted each year for employees along with CPR and First Aid. The park has formed a safety committee to help guide the park in developing safety protocols and encouraging a safety culture at the park. Backcountry safety etiquette information for visitors has been developed to raise awareness about staying safe in the wilderness. Videos have also been developed for visitors to help them stay safe while traveling in the backcountry.
Partnerships		Many of the partnerships the park has continue to be longstanding and beneficial to the park. Volunteer numbers have dipped recently, mainly due to lack of staff to manage volunteer efforts. Each year is different with the amount of staff the park employs and the capacity for volunteers. There may be opportunity for growth with volunteers and partners in the coming years. Commercial services seem to be adequate. Slight growth is occurring in the McCarthy/Kennecott area of the park.

Priority Resource or Value	Condition Status/Trend	Rationale
Park Infrastructure		web
Overall Facility Condition Index		WRST has 374 assets with a 0.096 facility condition index (FCI), which is a good condition status with an improving trend, based on NPS standards. The park continues to stabilize, rebuild, and repair buildings in the Kennecott Mines National Historic Landmark. Vast improvements on Kendesnii campground, continuing work on the Park trails, and ongoing facility maintenance all contribute to the good and upward trend of the park infrastructure.
Wilderness Character and Stewardship		web
Overall Wilderness Character		While generally the condition of WRST wilderness is good, there are hidden threats, particularly to “undeveloped” and “solitude” wilderness character qualities. As use increases, so do associated impacts to wilderness character. Noise and other impacts from motorized use, primarily from recreational snowmachine use, off-road vehicles (ORVs), and aircraft, continue to detract from overall wilderness character. There are several factors impacting the “natural” and “untrammeled” wilderness character qualities that are outside of the control of park management. However, park stewardship of wilderness values and resources is improving in order to meet these challenges, including increased staff awareness and the prioritization of developing a Wilderness Stewardship Plan.
Wilderness Stewardship		Research efforts are underway to better understand impacts to wilderness character as well as visitor use patterns and the perceptions of visitors, subsistence users, concessionaires, and a variety of backcountry users.
Subsistence		web
Subsistence		Residents of rural communities in and around Wrangell-St. Elias are active in the harvest and use of wild foods and other subsistence resources, and there are continued opportunities available to harvest these resources. Local subsistence users are engaged in subsistence management through participation in the Wrangell-St. Elias Subsistence Resource Commission and the Federal Subsistence Program. With the completion of harvest surveys in several local communities, up-to-date information is available to park managers as they make decisions about subsistence management.

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

- Continued wildlife monitoring, fisheries monitoring, better understanding of contaminants, aggressive invasive species management, new glacier and permafrost monitoring, and progressive fire management. WRST leads the Region in successful subsistence management.

Cultural Resources

- Continued excellent consultation relationship with the Alaska State Historic Preservation Office, including the renewal of the Kennecott Mines National Historic Landmark Stabilization, Rehabilitation, Reconstruction, and Maintenance Programmatic Agreement, and development of a programmatic agreement for implementation of the Nabesna Off-road Vehicle Trails program.
- Surveyed residents of eight Copper Basin communities about the harvest and use of wild renewable resources.

Visitor Experience

- Steadily increased the amount of interpretive programs and attendance of programs at the park.
- Completed a schematic design for interpretive exhibits for the Kennecott Mines National Historic Landmark in 2015.

Park Infrastructure

- Continued stabilization, repair, and rehabilitation of the historic buildings at the Kennecott Mines National Historic Landmark, including lead and asbestos mitigation.
- Conducted cyclic painting and maintenance to preserve the historic integrity of these building, while keeping them safe for the public.

Wilderness Character and Stewardship

- Began using the Science in Wilderness Framework for external research permits in designated wilderness in 2011.
- Began using the Minimum Requirements Decision Guide for administrative activities in designated wilderness in 2011.

Subsistence

- WRST continues to manage salmon in the Copper River in collaboration with the state of Alaska to ensure opportunities for subsistence harvest for local rural residents.
- Provided additional subsistence harvest opportunities for local rural residents by establishing two new federal subsistence hunts: a winter moose hunt in a portion of Game Management Unit 11 and a hunt for the Chisana Caribou herd in a portion of Game Management Unit 12.

Key Issues and Challenges for Consideration in Management Planning

Wrangell-St. Elias National Park and Preserve is truly a land so spectacular it defies description. A long list of superlatives still does not adequately describe this vast land. Management of this spectacular landscape presents many challenges. The Alaska National Interest Lands Conservation Act (ANILCA) was carefully crafted to maintain subsistence opportunity, private lands, and traditional means of access in the park. WRST staff is excited that visitation by the global community continues to grow, but park visitors need adequate infrastructure to support them during their visit.

Since acquisition of the Kennecott Mines National Historic Landmark (NHL) in 1998, WRST has had to balance active stabilization of the historic structures with the NHL to maintain their integrity and run an interpretive program, all in the midst of a thriving, living community made up of diverse local and tourist populations. Increasing tourism and desire to explore the 100-year old historic structures presents new safety challenges.

Retreating glaciers, thawing permafrost, and longer growing seasons present clear evidence of the park's changing climate. Modeling results predict the park's climate will warm over the coming century. Not only does climate change transform the natural and cultural

landscapes of national parks, but it also is very likely to impact the visitor's park experience by changing wildlife and glacier viewing opportunities. Glacier shrinkage will also affect downstream river dynamics, alter existing geohazards, and create new terrestrial and marine landscapes. Increased wildland fire frequency, severity, and area burned will increase the number of smoky days. As the scope and intensity of climate change increase, the historical or "natural" conditions in parks will be difficult or impossible to maintain.

Access to WRST is a challenge. While there are 90 miles of state managed road within the unit's exterior boundary, most of the park is accessible only by foot, aircraft, boat, all-terrain vehicle, or snowmachine. In addition, there are nearly 700,000 acres of privately-owned lands within the unit and landowners are entitled to adequate and feasible access to their property.

At 9.6 million acres of designated wilderness within 13 million acres of National Park and Preserve, WRST is the largest wilderness unit in the United States and comprises over 10 percent of the entire National Wilderness Preservation System. Section 707 of ANILCA says that "except as otherwise expressly provided for in this Act wilderness…shall be administered in accordance with…the Wilderness Act…" The Wilderness Act mandates that wilderness be managed to preserve wilderness character. The challenge to the park is balancing the preservation of wilderness character with provisions of ANILCA that recognize the unique nature of Alaska parks and wilderness.

Off-road vehicle (ORV) use has been occurring since before the establishment of the park. Since 1986, the park has conducted two major studies of ORV impacts and mitigation and a detailed survey and inventory of physical conditions along the major existing trails. These studies demonstrated that ORV use over wet areas leads to trail braiding and widening. The National Parks Conservation Association, Alaska Center for the Environment, and the Wilderness Society filed a lawsuit against the NPS regarding recreational ORV use on nine trails within WRST. Today the park is working hard to restore trail conditions and allow use on some of these trails.

Valid patented and unpatented mining claims exist within WRST. Owners of these claims may operate in accordance with an authorization to mine issued by the NPS Alaska Regional Director. WRST has many valid mining claims. Typically mine operators need to transport equipment and supplies across the park unit to their claims, which may involve a wide range of impacts. Mining operations are conducted in accordance with an NPS mining plan of operations; however, environmental impacts still occur from these operations.

Unlike many places across the lower 48 states, Wrangell-St. Elias can proudly say that it has large, intact ecosystems, many of which are untouched by invasive species. However, 45 species of invasive plants have been detected within the park and new arrivals and expansion of existing populations are documented annually. To date, most infestations are contained along roadsides, trailheads, and the occasional airstrip, but with invasive plants hitching rides on every mode of human conveyance and with some wildlife, the threats are numerous. Elodea, an aquatic invasive plant that poses some threat to salmon fisheries, has been rapidly spreading through the state via floatplanes and floatplanes are known to be flying from infested lakes to pristine lakes in the park.

Situated on the south side of the Chugach Mountain Range, along the North Pacific coastline and separated from the rest of the park both geographically and from the standpoint of daily park operations, the Yakutat District faces unique challenges with regard to effective park management. Based in the community of Yakutat, the district encompasses an incredible array of marine, tidal, and inland resources and is host to sport, subsistence, and commercial take of fish and wildlife. For park staff to travel from headquarters to Yakutat involves a four hour drive to Anchorage, a one hour commercial airline flight from Anchorage to Yakutat, and then travel by fixed-wing aircraft across Yakutat Bay to land on the beach and finally access the park. Management and protection of these spectacular coastal resources is a constant challenge.

Managing such a spectacular unit in the face of these complex challenges makes WRST a rewarding place to work. Current and future park staff, stakeholders, and partners have many opportunities to make a difference in the future of WRST by seeking solutions to these challenges.

Chapter 1. Introduction

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

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

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

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

Even with multiple lines of evidence that Alaska is warming, predicting the nature and impacts of future 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.

Retreating glaciers, thawing permafrost, and longer growing seasons present clear evidence of the park's changing climate. Scientists who observe the Earth's climate have documented a warming trend caused in large part by human activity (IPCC 2013). Modeling results predict the park's climate will warm over the coming century. Five recent global climate models, assuming a moderate emissions scenario, recently predicted that, by the 2060s, summertime average temperature in the park will increase by 2 °C and the wintertime precipitation average will increase by up to 25 cm in most areas, and up to 50 cm in the coastal mountains (Loso et al. 2014). Not only does climate change transform the natural and cultural landscapes of national parks, but it also is very likely to impact the visitor's park experience by changing wildlife and glacier viewing opportunities. Increased wild-land fire frequency, severity, and area burned will increase the number of smoky days. These changes and impacts already are being experienced at Wrangell-St. Elias.

As the scope and intensity of climate change increase, the historical or "natural" conditions in parks will be difficult or impossible to maintain.

The largest national park in the system, Wrangell-St. Elias includes the greatest assemblage of mountain peaks over 14,500 feet in elevation found in the nation, the nation's second highest mountain (Mount St. Elias, at 18,008 feet), several inactive volcanoes and one active volcano (Mount Wrangell), and an active glacial complex, including some of the largest and longest glaciers in the nation. The high mountain peaks and glaciers offer an excellent opportunity for glaciological studies. Thermal features in the area include the mud cones and hot springs on the western base of Mount Drum.

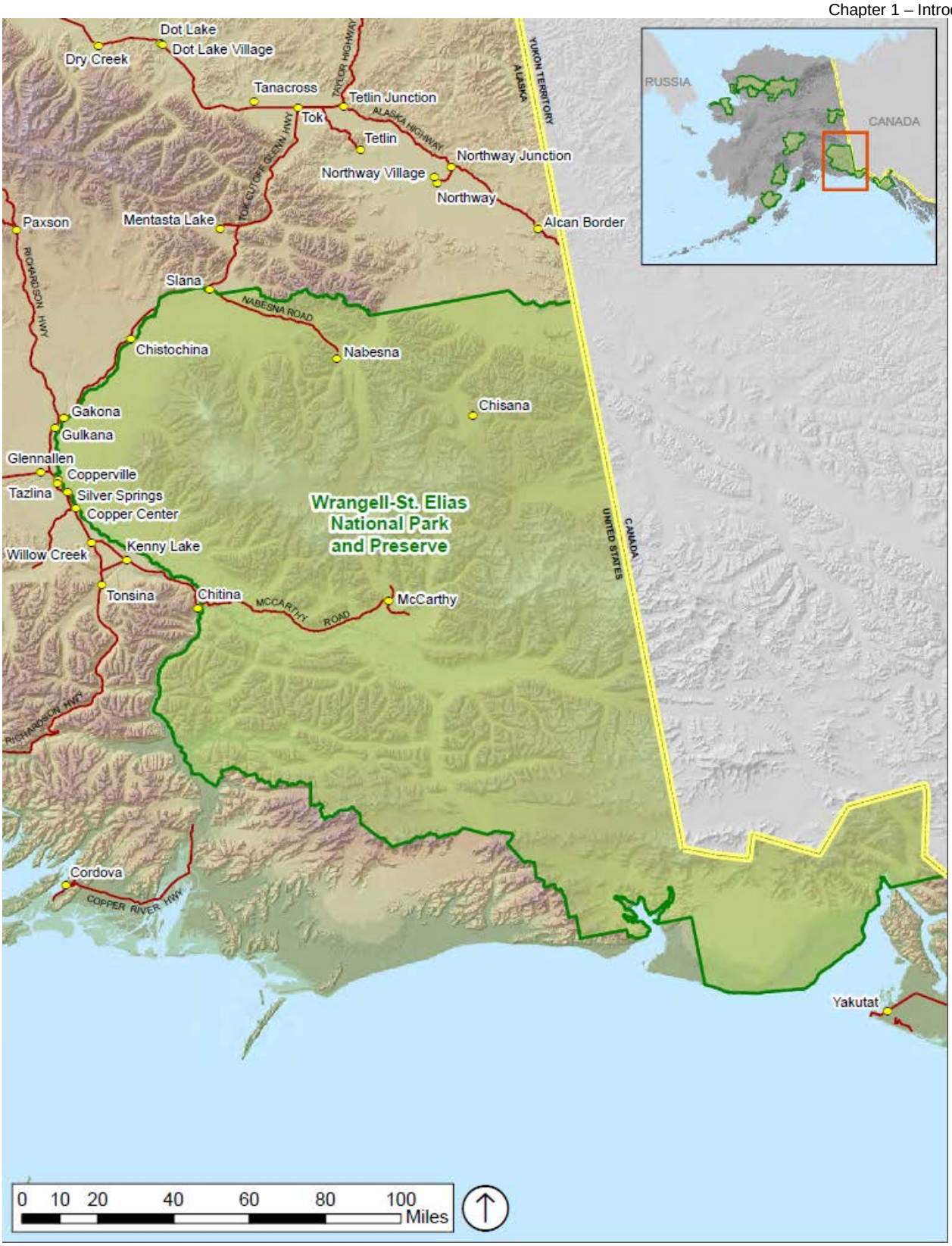
The purpose of WRST is to maintain the natural scenic beauty of the diverse geologic, glacial, and riparian dominated landscapes; to protect the attendant wildlife populations and their habitats; to ensure continued access for a wide range of wilderness-based recreational opportunities; and to provide continued opportunities for subsistence use.

Section 201 of the Alaska National Interest Lands Conservation Act (ANILCA) states that the park shall be managed for the following purposes, among others:

- To maintain unimpaired the scenic beauty and quality of high mountain peaks, foothills, glacial systems, lakes, and streams, valleys, and coastal landscapes in their natural state.
- To protect habitat for, and populations of, fish and wildlife including but not limited to caribou, brown/grizzly bears, Dall's sheep, moose, wolves, trumpeter swans and other waterfowl, and marine mammals.
- To provide continued opportunities, including reasonable access for mountain climbing, mountaineering, and other wilderness recreational activities.
- Subsistence uses by local residents shall be permitted in the park, where such uses are traditional, in accordance with the provisions of title VIII.

WRST contains a significant landscape with the following qualities:

1. WRST provides superlative scenic beauty.
2. WRST encompasses the nation's largest protected active glacial complex.
3. Encompassing portions of three major mountain ranges, WRST contains vast areas of scenic high mountain terrain from sea level to 18,000 feet and includes nine of the sixteen highest peaks in North America.
4. WRST contains major river systems with more miles (over 1,000) of scenic, free-flowing, glacial rivers in their natural state than are found in any other protected area in the United States.
5. The vast undeveloped expanse of WRST contains diverse aquatic and terrestrial ecosystems, ranging from alpine to marine, and providing natural habitat for populations of Alaskan flora and fauna.
6. The Wrangell-St. Elias Wilderness is the largest unit of the National Wilderness Preservation System, encompassing nearly 10 million acres of remote and geographically diverse mountainous landscapes.
7. Preserved within WRST is abundant evidence of more than 3,000 years of cultural and technological development. This long history reveals a range of human adaptations to changing climates, environments, and economic circumstances.
8. WRST is an inhabited area where local communities and traditional human activities remain integrated with the wilderness setting.



Map of the Park

Chapter 2. State of the Park

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

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

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

2.1. Natural Resources

Geologic Features and Processes

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Glacial Features and Processes	Glacial extent and volume		The reference condition of glaciers in WRST is the historical natural record of glacial extent prior to climate change. The date climate change began is ambiguous, but most glaciers were mapped for the first time in the 1950s, with additional measurements of glacier volume beginning in the 1990s. Approximately 35% of WRST is covered by glaciers (4.6 million acres or approximately 7,100 square miles), making it the largest aggregation of glaciers in North America. These glaciers constitute the largest contiguous nonpolar icefield on the planet. WRST accounts for 60% of all ice-covered area in the Alaska parks, and has the most glaciers (3,100+) of any Alaskan park. Glacial cover has diminished over the last half-century (Molnia 2007), with an estimated decrease at WRST of 5% (Loso et al. 2014). Over the recent period 2000–2007, glaciers in the Wrangell Mountains have thinned, due to volume loss, at a much faster rate than during the four preceding decades, with a spatially-averaged rate of loss of more than 10 inches of ice per year (Das et al. 2014).

Resource Brief: The Hubbard Glacier and Russell Fjord Outburst Floods

Hubbard Glacier, the largest calving glacier on the North American Continent (25 percent larger than Rhode Island), advanced across the entrance to 35-mile-long Russell Fjord during June 2002, temporarily turning the inlet into a lake (Trabant et al. 2003). Hubbard Glacier has been intermittently advancing for more than 100 years and this was the second time it closed the entrance to Russell Fjord within a 16-year period. Squeezing and pushing submarine glacial sediments across the mouth of the fjord, water flowing from mountain streams and glacier melt was trapped, and the level of Russell Lake began to rise. During both the 1986 and 2002 glacier-damming events, the dam failed before the lake rose enough for water to spill over a low pass at the far end of the fjord and into the Situk River drainage, a world class sport and commercial fishery near Yakutat, Alaska. The outward edge of the Hubbard Glacier forms the boundary of WRST; however, the Park Superintendent and the Tongass National Forest Supervisor have a long-standing agreement that when the Hubbard Glacier strikes land, the terrestrial portion of the glacier is considered to be within the Tongass National Forest.

The Hubbard Glacier in 2002, when it had surged and made contact with Gilbert Point on Forest Service land, effectively creating a dammed lake.

Geologic Features and Processes (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Cave and Karst Features and Processes	Undisturbed unique features		Most of the cave karst resources in the park occur within the 200 linear miles of outcropping Chitistone Limestone. WRST caves are well known to Alaskan cavers and are gaining popularity. Some WRST caves get very regular use, often from very large exploring groups. Increased traffic may result in disturbance of the caves' unique features.

Resource Brief: Caves in Wrangell-St. Elias

Looking out from Leprechaun Cave in Wrangell-St. Elias

Caves in Wrangell-St. Elias include the longest known cave in Alaska (Whispering Cave) and potentially the deepest known cave in Alaska (Leprechaun Cave). These caves are well known in the Alaskan caving group and are gaining in popularity as a destination as caves in the lower 48 are closed due to white-nosed syndrome (a disease in bats). Some caves in the park get very regular use, often from very large groups—the number one thing these groups are looking for is a "sense of discovery." To date, 53 caves in the park have been explored and documented to some extent. In this process, a unique cave formation, "cave leaves," was documented in one of the caves whose wall appears to be covered with hundreds of projections as thin as potato chips and a curious leaf-like shape. Most of the caves in the park are very difficult to access, requiring climbing ropes just to reach the entrances; however, some are easier to access and a few are well known to visitors and locals alike. Many more caves likely exist in the park than the park staff has documented. Most of the caves do not have any indication of human usage; they have emerged from under the glacier ice recently and it is unknown whether or not any animals utilize them other than to shelter occasionally in the entrances.

Geologic Features and Processes (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Mining	Number of active mining plan of operations		The park has several valid unpatented and patented mining claims both on private lands within park boundaries and on park lands. Mining is governed by the 1976 Mining in the Parks Act, which requires that miners submit a mining plan of operations to the park so that activities can be monitored for resource impacts. Currently, the park has 4 approved mining operations within park boundaries, one of which is a patented claim on private land, and is presently reviewing one other proposal. Four of these five operations occur at Gold Hill, in the Chisana Mining District.
	Abandoned mine lands with safety issues and resource impacts		Mining includes base and precious metals (mainly copper and gold). Mining districts include: Nabesna, Chisana, Kotsina-Kuskulana, McCarthy-Nizina, and Bremner Districts. The Kennecott mines have been placed on the National Register of Historic Places. Other resource extraction that occurred includes oil and gas extraction along the coast in an area known as Sudden Stream. Abandoned Mine Lands (AML) and abandoned oil/ gas lands may have serious associated safety issues and resource impacts. According to the NPS's AML inventory, there are 92 mine sites and 29 mine features in need of reclamation in the park (Burghardt 2014). The park is actively trying to reclaim and improve the safety of contaminated mining sites in the park.

Resource Brief: Active Mining in Wrangell-St. Elias

Mining on a valid claim in Wrangell-St. Elias

All federal lands within WRST are closed to new mineral entry, but ANILCA provided for the continuation of existing patented and valid unpatented mining claims. Within WRST, there is potential for extensive mineral development. There are currently 25 unpatented mining claims and potentially 850 patented claims and mill sites, covering an estimated 19,250 acres. The primary economic commodities include copper, gold, and silver. Owners of valid existing rights (inholdings) have the right to develop reasonable access across public lands. Currently, operators are working on approved mining plans of operation in the Gold Hill and Dan Creek areas. Medium scale placer mining and hard rock mineral exploration and development have occurred within the past decade. Future mining activities are highly probable. Regulations promulgated from the 1976 Mining in the Parks Act control mining related activities on federal claims within units of the National Park System.

An Environmental Impact Statement was prepared to evaluate a range of alternatives for managing mining activities, analyze cumulative impacts, and mitigate environmental impacts. The Record of Decision - Final Environmental Impact Statement - Cumulative Impacts of Mining - WRST preferred alternative is to acquire all mining claims (NPS 1990). This alternative is the most environmentally-preferred as it has the least potential to cause damage to the biological and physical environment. Until funding is available for acquisition, the NPS will process mining plans of operations under Title 36 CFR 9A regulations and prepare environmental assessments as required by the National Environmental Policy Act.

Geologic Features and Processes (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Soils and Permafrost	Permafrost extent, presence of thermokarst		Permafrost is composed of frozen soil and rock that have been at a temperature of 32 °F or colder for two or more years. Permafrost is of high ecological importance, as it is a major controlling factor for surface water flow to vegetation. Thermokarst is surface subsidence resulting from thawing permafrost (Karle and Jorgenson 2004). In Wrangell-St. Elias, approximately 72% of the park is underlain by permafrost (Panda et al. 2014). This is a slight decrease from the estimated 74% permafrost cover in the 1950s. The rate of thawing is increasing, in part because 22% of the park is presently underlain by "warm permafrost:" defined as within one degree C (1.8 °F) of freezing, and hence especially vulnerable to melting. Recent permafrost modeling (Panda et al. 2014) for Wrangell-St. Elias predicts that only 42% of the park will be covered by permafrost by the 2050s. Trails created by off-road vehicles (ORV) in boreal lowlands are known to cause local impacts in WRST. ORV trails have caused local resource damage in intermountain lowlands with permafrost soils and wetlands. Observations of trail evolution relative to stream and wetland crossings suggest that ORV trails may be altering watershed processes. Addressing local land-use disturbances in boreal and arctic parkland with permafrost soils, where responses to climate change may be causing concurrent shifts in watershed processes, represents an important challenge facing resource managers (Arp et al. 2012).
Geologic Inventory	Digital geology map, geologic resources inventory completed		A geologic map was compiled for the park and vicinity (GIS and GoogleEarth formats) as part of the NPS Geologic Resources Inventory Program. The geologic resource inventory is scheduled for completion in 2017. Published geologic maps for the region exist at the 1:250,000 scale or larger (Wilson et al. 1998, Labay and Wilson 2004) and have been integrated into the NPS digital map.

Geologic Features and Processes (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Volcanic Features	Volcanic activity monitoring		Wrangell Volcanic Field is an active volcanic terrain (Richter et al. 1995) that covers 4,000 square miles, includes at least 12 known volcanic centers, and still produces warm springs and fumaroles. Volcanism in the region began 26 million years ago, and Mt. Blackburn is the oldest and tallest volcano in the park. Mt. Wrangell is considered the only active volcano in the park, but its most recent lava-producing eruption was about 50,000 years ago. Steam still occasionally rises out of the vents situated in craters along the margin of the summit caldera. Three mud volcanoes exist in the park boundaries between Mount Drum and the Copper River. Two of the mud volcanoes occur on private property and have received some research attention because of potential future geothermal development. Hydrothermal features (Klawasi sites) may emit high CO_2 sufficient to kill vegetation, animals, and birds and can pose a small risk to visitors.
Geologic Hazards	Seismic hazards		There has long been interest and research in the Yakutat subduction zone that created the St. Elias range, the highest coastal range on earth. The St. Elias Erosion / Tectonics Project is focused on research in this area. Outside of the coastal area, the seismic risk at WRST was thought to be minimal until the 2002 Denali earthquake, which ruptured the Totschunda branch of the Denali fault creating a magnitude 7.9 earthquake that was felt as far south as Seattle and created damage all over the state of Alaska. The Totschunda fault, which lies entirely within WRST, is similar to the San Andreas fault in California, the best exposed strike-slip fault systems in the world. Seismic stations in the park are maintained and monitored jointly by the Alaska Volcanic Observatory and the Alaska Earthquake Center, both of the University of Alaska's Geophysical Institute and the United States Geological Survey (USGS). These are used to research the tectonic environment, which is appropriate given the occurrence of large earthquakes. Significant earthquakes have occurred in the area in the past 100+ years (1899, 1958, and 2002). Seismic research generates some of the highest numbers of research permit requests annually. Park staff relies on outside researchers to provide information about seismic activity.

Water Quantity and Quality

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Water Chemistry	Nutrient concentrations, turbidity, and heavy metal concentrations		Water chemistry data are scant. Based on the available data and expert opinion, nutrient concentrations, turbidity and heavy metal concentrations for streams and lakes are expected to be within the range of natural variability and to meet state water quality standards, with isolated exceptions due to the effects of historical mining activity or present day infrastructure.
Ecosystem Condition	Aquatic invertebrate community composition		Data on invertebrate community composition are scant. Based on the available data and expert opinion, ecosystem condition for streams and lakes is expected to be good, with isolated exceptions due to the effects of historical mining activity or present day infrastructure. *E. coli* has been detected in Kennecott Mines National Historic Landmark streams. Cabin Creek in the Nabesna area is listed on the Clean Water Act 303(d) as category 4b due to the presence of manganese, arsenic, iron, copper, and cadmium from mine tailings (Alaska DEC 2010)
Glacially and Non-Glacially-fed Streams & Rivers	Hydrologic regimes: mean annual flow and timing and magnitude of peak flows		Current hydrologic data for the park are almost nonexistent. There is currently only one active stream gage within the park boundaries, plus limited information on instantaneous discharge or hydrologic regime at a handful of locations. Based on the available data and expert opinion, hydrologic regimes are expected to be within the range of natural variability. Climate change and shrinking glaciers are expected to affect hydrologic regimes, and temporarily increase summertime flows in glacier-fed streams.

Resource Brief: Aquatic Invertebrates

Ecosystem condition and integrity is a key aspect of water quality as it is defined in the Clean Water Act. Partly for this reason, monitoring ecosystem condition in streams is a major focus for the NPS Central Alaska Network Stream Monitoring Program. Because accurately measuring all aspects of ecosystem condition is very difficult, the NPS Central Alaska Network uses the condition or health of selected biological indicators as way to estimate the health or condition of the ecosystem as a whole. The health of the aquatic insect community is an excellent indicator of ecosystem condition, because aquatic insects are abundant, diverse, and sensitive to a wide variety of stressors. Although it seems obvious, they are also constantly present in the stream, meaning that they can integrate the effects of multiple stressors over both time and space, something that is otherwise very difficult to measure.

One way to assess ecosystem condition using aquatic insects is called RIVPACS or O/E modeling. This approach uses natural environmental gradients to predict the species composition of the aquatic insect community that would occur in a stream if it was unaffected by human activity. By comparing the species actually present at a site (O) to the species expected (E), researchers obtain a site-specific and standardized measure of taxonomic completeness. For example, an O/E score of 0.70 means that only 70% of the expected species were actually observed, or in other words, 30% of the native taxa were missing. Large deviations away from expectations (low O/E scores) can be used to infer that a site is impaired in some way. The NPS Central Alaska Network recently developed an O/E model for the network, the first of its kind in Alaska. The standard deviation of the distribution of reference site scores (a measure of precision) of the model is 0.17, which is comparable to other O/E models used in the lower 48 to assess ecosystem condition. The distribution of site scores for streams that have been sampled in WRST is nearly identical to the overall distribution of reference site scores for the NPS Central Alaska Network, suggesting that overall streams in WRST are in the reference condition, or in other words they are unimpaired.

Air Quality

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Deposition	Mercury and other toxics contamination		Toxic contaminants can enter the ecosystem from waterborne sources and/or from airborne sources (Pacyna and Pacyna 2002, Landers et al. 2008, Moynahan et al. 2008). In 2008 in the Western Airborne Contaminants Assessment Project (WACAP) Landers et al. (2008) found that the air sampled at WRST had the lowest number of detected contaminants among the 20 parks in the study and the vegetation samples from the interior sites at the park were at or below the median levels, or contaminants were not detected. See the Resident Fish and Contaminants Resource Brief for more information.

Resource Brief: Resident Fish and Contaminants

WRST supports subsistence hunting and fishing activities for rural Alaskans. Mercury and pesticide levels in fish that exceed human health benchmarks warrant significant concern. High mercury concentrations in animals such as fish can result in reduced foraging efficiency, survival, and reproductive success. Elevated levels of mercury in humans can affect the brain, kidneys, and reproductive function. Many pesticides and polychlorinated biphenyls (PCBs, commonly electrical coolant) are known or suspected carcinogens, or have been implicated in chronic diseases, reduced IQ, altered behavior, etc. In wildlife, these contaminants may induce male feminization, impaired reproductive and immune functions, and more (Landers et al. 2008).

Pesticide and mercury concentrations in some fish from WRST exceed human and/or wildlife health thresholds (Eagles-Smith et al. 2014, Flanagan Pritz 2014, Kowalski et al. 2014). Eagles-Smith et al. (2014) reported relatively high mercury concentration in fish from two lakes in the park. Lake trout from Tanada Lake had the highest mean mercury concentration of all 86 sites from all parks in the study. Sampled fish that contained contaminant levels of concern were larger, longer-lived predators, which indicates bioaccumulation over a period of time.

Remote Tanada Lake in early June

Toxic contaminants may enter the ecosystem from geologic processes, waterborne sources or both regional and global airborne sources (Pacyna and Pacyna 2002, Landers et al. 2008, Moynahan et al. 2008). The total contaminant burden (PCBs and pesticides) in fish from Alaskan parks (including WRST) is especially high and the contaminant composition suggests atmospheric influence from global sources. Other contaminant sources may include marine-derived fish (sockeye salmon) that spawn and die in anadromous lakes, such as Tanada Lake in WRST (Flanagan Pritz et al. 2014).

Because of recent research, fish consumption guidelines now exist for larger lake trout from Copper and Tanada lakes, due to the elevated levels of mercury (NPS 2014). The variability in mercury concentrations at WRST implies that the risk to park fish, wildlife, and humans is variable across lakes and species (Eagles-Smith et al. 2014, Kowalski et al. 2014). For example, mercury concentrations in fishes from Grizzly and Summit Lakes did not exceed any of the guidelines used for comparisons, whereas bioaccumulated concentrations in some larger, longer-lived predatory fish from Copper and Tanada Lakes exceeded benchmarks for toxicological risk to fish, birds, and/or humans (Kowalski et al. 2014).

How much fish from Copper, Tanada and Summit Lakes should women of child-bearing age and children eat?

2014 fish consumption guidelines for Tanada, Copper, and Summit Lakes. A meal is one 6 oz. portion.

Methylmercury concentration in fish (mg/kg)	Meals per month	Copper Lake	Tanada Lake	Summit Lake
0 – 0.20	unrestricted	All Kokanee & Grayling	-	Rainbow Trout
>0.20 – 0.34	up to 16	Lake Trout 16" to 22"	-	-
>0.34 – 0.46	up to 12	-	Lake Trout 16" to 19"	-
>0.46 – 0.68	up to 8	-	Lake Trout 19" to 25"	-

The most recent (2014) guidelines, *Fish Consumption Advice for Alaskans: A Risk Management Strategy to Optimize Public Health*, is available at: http://www.epi.hss.state.ak.us/eh/fish/FishConsumptionAdvice2014.pdf

Birds

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Bald Eagles	Occupancy of nesting territories and reproductive success (nest success, and fledgling production)		NPS biologists have monitored bald eagle territory occupancy and reproductive success since 1989. Between 2008 and 2014, alternating years of lower—followed by higher—territory occupancy rate, nest success, and fledgling production have occurred. Years of higher occupancy and success rates are sufficient for population stability.
Kittlitz's Murrelet	Abundance		At-sea surveys for Kittlitz's murrelet were conducted in Icy Bay between 2002 and 2012 (Kissling et al. 2011; Kissling, unpublished data) and there was a population decrease of 10%. A population model that incorporates reproduction, survival, and abundance of Kittlitz's murrelets in Icy Bay substantiated these results predicting an 8% decline between 2002 and 2012, but the variance surrounding this estimate is large (Kissling et al. 2015).
Trumpeter Swans	Abundance and distribution		The abundance and distribution of Trumpeter Swans has been monitored cooperatively with the U.S. Fish and Wildlife Service every five years since 1975. The statewide population increased 38% from 2000 to 2005 (Conant et. al. 2007). Increases occurred in 3 of the 4 swan census units that overlap WRST. The 2010 statewide estimate utilized a random sample design and recorded a 14% increase in adult swans and 11% decrease in cygnets since 2005 (Groves and Hodges 2013).

Mammals

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Caribou	Mentasta Herd: population size, demography, and distribution		The Mentasta Caribou herd has steadily declined from a population estimate of 3,160 caribou in 1987 to 336 caribou in 2010 (NPS 2013). Once an important local subsistence resource, all human harvest from this herd in Game Management Unit 11 was closed in 1993. A portion of the herd migrates out of WRST during the winter and could be incidentally harvested during winter hunts from adjacent caribou herds. The herd appears to be stable at a low population level.
	Chisana Herd: population size, demography, and distribution		The Chisana Caribou Herd population estimate was 701 (639–763) in 2013 (Hegel et al. 2013). The number of calves and bulls per 100 cows was 16 and 49, respectively. The herd has remained stable since 2003 following a major decline during the 1990s and subsequent captive calf rearing effort from 2003–2007.

Resource Brief: Chisana Caribou Herd

Chisana caribou cows and calves resting in the predator-free captive rearing pen, Yukon, 2005.

The Chisana caribou herd is a small international herd that ranges across the Yukon-Alaska border north of the St. Elias Mountain Range. In Alaska, the herd ranges predominately within WRST. The Chisana herd is genetically distinct from other herds in Alaska and the Yukon (Zittlau 2004) and is classified as woodland caribou (*Rangifer tarandus* caribou) in Canada. Thus Chisana caribou may comprise the only woodland caribou herd in Alaska. The protection of caribou populations and habitat is specifically mentioned in WRST's enabling legislation, and caribou are a Vital Sign for the NPS Central Alaska Network. Biologists in the Yukon and Alaska began monitoring the Chisana herd in 1987 through the use of radio telemetry to determine seasonal movements and facilitate annual fall sex and age composition counts, as well as population, birth rate, and adult mortality estimates. These efforts revealed a long and steady population decline from about 1,800 animals in 1989 to approximately 400 animals in 2001. In response to the herd's decline, all licensed hunting of Chisana caribou was prohibited in 1994. In 2002, the herd was listed as a "Specially Protected" population under Yukon's Wildlife Act and is one of 36 herds comprising the Northern Mountain Caribou population designated a species of "Special Concern" under Yukon's federal Species at Risk Act. With the herd in continual decline, Yukon Government initiated a captive rearing program in 2003. Over four years, pregnant cows were captured in late-winter and transferred to a predator-free holding pen within their natural range in Yukon, allowing these animals to safely endure calving and neonatal periods before being released. Over the four-year recovery period, 136 calves were released from the pen and likely stabilized the herd.

In 2009, a working group comprised of members from the Government of Yukon, Alaska Department of Fish and Game (ADF&G), White River First Nation, Kluane First Nation, WRST, and Tetlin National Wildlife Refuge was formed to develop a 5-year Chisana caribou herd management plan that was finalized in 2011. The Chisana caribou herd management plan identifies a number of objectives to be cooperatively pursued by the working group agencies, including monitoring herd size and population indicators such as sex ratio and calf recruitment, which are used to determine herd stability and whether to reinstate a harvest. New proposals to open a harvest were considered by the Federal Subsistence Board and resulted in a decision to open a small subsistence harvest on the herd beginning in the fall of 2012. Population monitoring continues to support a sustainable harvest opportunity for subsistence hunters.

Mammals (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Dall's Sheep	Population size, demography, and distribution		2010–2011 distance sampling surveys estimated Dall's sheep abundance was 12,428 (10,780–14,470) and composed of approximately 18% lambs, 55% ewes, 21% less than full-curl rams, and 6% full-curl rams (NPS 2013). The 2011 estimate represents a 29% decrease from an estimated 17,455 sheep derived in the early 1990s. Recent counts of selected sheep survey units indicate that sheep populations have stabilized with productivity estimates for 2005–2014 averaging 30 lambs per 100 ewe-like sheep.

Mammals (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Moose	Population size, demography, and distribution		The moose population within an 8,210 km² survey area was estimated in 2007, 2010, and 2013. In 2013, the abundance of moose for the survey area increased over previous years and was estimated to be 2,107 ± 307. Overall density was low at 0.7 moose/mi². The number of calves and bulls per 100 cows was 18 and 60, respectively. Although the overall population has increased, calf to cow ratios remain below those needed for sustained growth (Putera 2010).
Bats	Presence/absence of white-nosed syndrome		Currently, three species of bat are documented to use the interior portion of the park with two Myotis species having significant maternity colonies. Up to six species may occur in the coastal areas of the park. Currently populations are healthy and have no documented cases of rabies or white-nosed syndrome.

Resource Brief: Bat Research at Wrangell-St. Elias

WRST has been cooperating with the University of Tennessee and the University of Iowa to conduct basic bat research since 2012. The goals of this project are to increase knowledge of the presence, habits, and status of bats in WRST and to establish baseline information to address the concern for conservation of bats in the face of impending spread of white-nosed syndrome into bat populations in the region. Bats have clearly been in the region for some time, as the Ahtna Athabaskans (like their Alutiiq neighbors) have a word for bat: xełggaay [keth-guy] or in another dialect xełggaagga' [keth-guy-ga] which translates as "little bear."

A bat captured at the park

Fieldwork in 2012 and 2013 revealed several surprises:

- Researchers found that WRST does not just have a "few" bats, but rather very large maternity colonies composed of hundreds of bats.
- Researchers detected three species, including one that may be new to science.
- Researchers found that bats are still foraging during official twilight hours (1 hour before sunset to 1 hour after), even during the summer solstice.
- Researchers found that there seems to be a mating behavior where bats aggregate in the early fall and presumably mate.

Ongoing research includes genetics work to distinguish the new species and work on energetics and calories of available insects. Research continues as biologists try and answer the question of where the different species of bats go in the winter—do they hibernate in WRST's many caves or buildings, or do they migrate?

Mammals (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Bison	Abundance & distribution		The park has two herds of introduced plains bison, which are not considered native to Alaska. Immediately adjacent in Canada, is a significant population of woods bison that occasionally wander over. A significant trans-boundary fire could lead to a more permanent range expansion. Interbreeding between the two populations is not desired as the plains bison genetics would dominate.
Brown Bears	Abundance		No brown bear surveys have been conducted; therefore bear population information is not available. Yearly brown bear harvest data (ADF&G 2011) for Game Management Unit 12 is thought to be within the estimated sustainable yield of 5–8% of the population and included more than 55% males in the harvest. Harvest in Game Management Unit 11 is considered low and generally includes greater than 70% males.
Wolves	Abundance		Fall wolf population estimates in Game Management Unit 11 have been relatively stable. From 2008–2011, the fall estimate averaged 119 (7.9 wolves /1,000 km²), and the spring estimate averaged 102 (6.8 wolves/1,000 km²) (Schwanke 2012). Spring wolf density in the northern section of the park was estimated at 5.4 wolves/1,000 km² during 2013 aerial surveys. ADF&G estimated 6.1 wolves/1,000 km² within the Chisana caribou range in Game Management Unit 12. No wolf surveys have been conducted since 2001 in Unit 12; however, wolf harvest has been stable, averaging 30 wolves taken per year between 2006 and 2013 (Bentzen 2012).

Resource Brief: Bison

WRST provides habitat for two introduced plains bison herds. The Copper River herd and the Chitina River herd. In addition, individual bison have been observed within the Preserve in the White River drainage. While the origin of these individuals is unknown, they may be woods bison straying from herds in the Yukon Territory.

The Copper River bison herd originated from animals relocated from the National Bison Range in Moise, Montana to Delta Junction, Alaska in 1928. In 1950, 17 bison were moved from the Delta herd to the Nabesna Road in northern Game Management Unit 11. These bison moved away from the release site, and by 1961 they had moved into the Dadina and Chetaslina River area where they remained. The Copper River herd inhabits the area between the Dadina River and the Kotsina River in northern Game Management Unit 11. Over the years, the herd size has ranged from a low of 51 bison in 1967 to a high of 143 bison in 2009. The first hunt for this herd was in 1964. Deep snow (resulting in winter mortality), as well as hunter harvest, controls the herd size. Harvest is under a drawing permit. Hunting was closed between 1989 and 1999 due to low numbers. Management objectives are to maintain a herd size of 60 overwintering animals. Harvest has been about eight animals/year (five year average, 2002–2007). About 24 permits are issued, out of about 1,100 applications.

The Chitina River herd inhabits the area around the Chitina River from the confluence of the Tana River and the Chitina Glacier in Game Management Unit 11. In 1962, 35 bison were translocated from the Delta herd. The herd grew to about 50 in 2003. A large die-off occurred in 2004 because of winter mortality; only 25 bison were observed the summer of 2005. The hunt was closed in 2004 and 2005 because of low numbers. Two bison were harvested in 2006, and hunting has been closed since then because of low numbers. The management objective is a minimum of 50 overwintering adult animals. The last count, in 2009, was 41 animals and the herd is slowly increasing.

Fish

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Resident Fish	Abundance and distribution		Few data are available for most species and most water bodies. A freshwater fish inventory (Markis et al. 2004) and burbot fish assessment projects in 2007 and 2008 (Schwanke 2010) and in 2011 (Dave Sarafin, WRST fisheries biologist, unpublished data) provide some baseline abundance, distribution, and species richness information; these studies indicate that resident fish are within the natural range of variability. Anecdotal observations and small isolated research projects indicate little to no change.
	Mercury and other toxics contamination		Pesticide and mercury concentrations in some fish in WRST exceed human and/or wildlife health thresholds. Eagles-Smith et al. (2014) reported relatively high mercury concentration in fish from two lakes in WRST. Since WRST supports subsistence hunting and fishing activities, mercury and pesticide levels in fish that exceed human health benchmarks warrant concern. Three studies (Eagles-Smith et al. 2014, Flanagan Pritz et al. 2014, and Kowalski et al. 2014) reported relatively high mercury and semi-volatile organic compound (SVOC) concentrations in fish from two lakes in the park. Four lakes used by subsistence and sport fishermen were studied (Tanada, Copper, Grizzly, and Summit). Sampled fish were collected in 2008, 2012 and 2013. Some of the SVOCs found in these fish were from historic-use pesticides no longer in use in the U.S. or Canada but are used in other countries. Fish with the highest concentrations of contaminants came from Tanada and Copper Lakes. The variability in mercury concentrations across site and fish species at WRST implies that the risk to park fish, wildlife, and humans is variable across lakes and species. No determination about the source of these contaminants has been made yet; however, the total contaminant burden (mercury, PCBs and pesticides) in fish from Alaskan parks (including WRST) is especially high and the contaminant composition suggests atmospheric influence from global sources. Other contaminant sources may include marine-derived fish (sockeye salmon) that spawn and die in anadromous lakes, such as Tanada Lake in WRST (Flanagan Pritz et al. 2014). Fish consumption guidelines exist for lake trout from Copper and Tanada lakes, due to the elevated levels of mercury (NPS 2014). Research suggests that piscivorous fish (those that eat other fish) and older fish are more likely to have higher levels of contaminants, a biological process called bioaccumulation. See the Resident Fish and Contaminants Resource Brief for more information.

Fish (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Anadromous Fish	Chinook salmon escapement numbers		There has been a decrease in Chinook salmon escapement (the number of fish that does not get caught by fishermen and return to their spawning habitat) between the past five years and the previous five years. This assessment is based on figures provided from the ADF&G (based on Chinook mark recapture project done by the Native Village of Eyak), which shows that Chinook escapement in the upper Copper River is down 34% (Mark Somerville, ADF&G area biologist, personal communication).
	Sockeye salmon escapement numbers		There has been a large increase in sockeye salmon escapement between the past five years and the previous five years, based on escapement figures from two park weirs and the ADF&G upriver escapement: Long Lake weir up 169% (McCormick and Sarafin 2013), Tanada Creek weir up 28% (Sarafin 2012), upper Copper River estimate up 38% (Mark Somerville, ADF&G area biologist, personal communication).

Resource Brief: Salmon Weirs in the Park

WRST operates two salmon weirs: the Tanada Creek weir in the upper reaches of the Copper River and the Long Lake weir in the Chitina River drainage of the Copper River basin. These weirs provide an accurate assessment of yearly run strength and migratory timing for two sockeye salmon populations in upper Copper River tributaries and provide information that helps in the development of a management strategy that meets the mandates of the Alaska National Interest Lands Conservation Act (ANILCA), the legislation that created the park in 1980.

The Tanada Creek weir is a floating picket weir that is in operation between early June and late September. This weir was run by WRST in 1997 and 1998 and from 2001 to present. Sockeye salmon migrate through the weir on their way to spawn in Tanada Lake, and there is a very small population of Chinook salmon that spawns in the creek. The sockeye count at the weir (in years that the weir was not compromised by flooding) has varied between 4,515 (2006) and 52,162 (2013). A crew of 2–3 local residents operates this weir. A 24-hour video recording system was installed at the weir in 2007 and replaced a visual counting routine that closed the weir during hours when the crew was not working. Tanada Creek is a dynamic system that can range from no flow to numerous floods per summer, so a floating weir works well.

Long Lake weir from the upstream side. This photo shows the back of the weir, camera box, and fish chute.

The Long Lake weir is a standing picket weir that has been in operation since 1974: first by the ADF&G (1974–1975): then the local land owner, Cliff Collins and his family (1976–2002); and currently WRST (2003–present). This is the longest existing data set of sockeye escapement on record in the upper Copper River. This weir operates from August until the middle of October and counts both sockeye and coho salmon. The sockeye escapement has varied between 631 (2008) and 49,747 (2002). A crew of 1–3 local residents operates this weir. An underwater video recording system similar to Tanada Creek's was installed at this weir in 2010. Both systems are run by solar energy. The Long Lake weir is on private property within the boundaries of WRST. The landowner requested help from WRST in running the weir when, at age 93, he was no longer able to operate it on his own.

Vegetation

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Terrestrial Invasive Species	Presence/absence, abundance, distribution, & invasiveness ranking		Invasive species in Alaska are a growing threat, with new species detected and expansion of existing infestations. Forty-five species of terrestrial invasive plants have been documented in WRST. Most of them currently exist along roads, trailheads, and the occasional airstrip. Keeping these plants out of the backcountry where they have a large potential to change the native ecosystem is a priority. The park actively controls known populations through manual, mechanical, or chemical means and regularly surveys likely portals for new infestations. Education of visitors and residents is a key component as invasive plants can easily hitchhike into the park, with its numerous access points, without anyone knowing.
Aquatic Invasive Species	Presence/absence of Elodea		Currently no invasive aquatic plants have been documented in the park; however aquatic Elodea is of concern. Elodea grows in freshwater lakes, and can damage fish habitat and impede boat and floatplane traffic. Until recently, Alaska was considered free of invasive submerged aquatic plants, until the discovery of Elodea in a Fairbanks lake in 2010 (Wurtz and Lisuzzo 2010). Elodea had been documented in Cordova, a coastal town just outside park boundaries with heavy float plane traffic into WRST, before the scope of the potential threat was recognized (1982). WRST manages the famous Copper River salmon fishery (Demientieff 2002). Elodea has been documented to directly compete with Chinook salmon for breeding habitat (Mertz et al. 2008). It is estimated that Elodea, if left unmonitored and allowed to spread, could cost the state of Alaska $230,000 a year in future commercial salmon harvest revenues and over a million dollars a year in future sport fishing revenues (Wurtz and Lisuzzo 2010). Because of the importance of the Copper River salmon fishery, one of the more important fisheries in the state, the park is concerned about the introduction of this invasive and the effect it could pose on the health of the fishery in the Copper River watershed. For this reason the NPS is monitoring lakes with high float plane traffic for the occurrence of Elodea.

Resource Brief: Exotic Plant Work at Wrangell-St. Elias

Invasive plants are those that have been introduced here from elsewhere, either deliberately or accidentally. Many are popular as ornamentals and backyard plantings, but when they escape into the wild, they quickly overrun native plants. Alaskan wildlife and insects may or may not consume or use these exotic plants. Some invasive plants change entire ecosystems by utilizing large amounts of water and nutrients, altering soil and water resources, and increasing fire frequency. When this occurs, diverse Alaskan habitats supporting many species may give way to monocultures of exotic weeds.

In the past, harsh climate and isolation protected Alaska from exotic plant species. Recently, however, some of the most harmful weeds of the lower 48 states have begun to appear, grow, and spread. A recent study identified over 50 species of exotic plants in Alaska National Parks. Many have been identified in Wrangell-St. Elias. Luckily, so far they've only established a foothold in disturbed areas along roads and near structures, not in the expansive backcountry.

As Alaska continues to warm, visitation increases, and development progresses, exotic plants will increase in number and extent. Although the invasion is just beginning, it may not be too late to literally "nip it in the bud." During the summer of 2014, more than 80 acres were surveyed for invasive plants. A total of 4.6 infested acres and 34 species were found, while 170 bags weighing total of 5,073 pounds were manually pulled and destroyed and 3 gallons of herbicide were applied. For re-vegetation purposes, 5.8 pounds of native seed were collected (Weidman and Frank 2015). Hopefully this "rapid detection, rapid response" strategy will help keep exotic species in check and preserve the park's dynamic, productive, and native landscapes.

The 2014 Copper Basin Weed Smackdown. The park organizes this volunteer event in partnership with others in the Cooperative Weed Management Area.

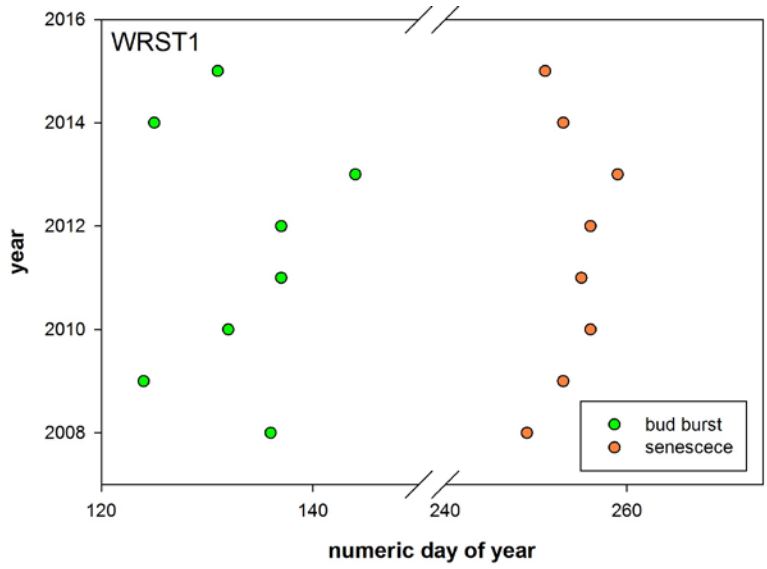
Vegetation (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Alpine Communities	Composition, structure, and proportion of landcover		Plant species in the tundra (both alpine and others) may be the most vulnerable to ecosystem changes brought about by a warming climate, because they may be displaced by trees and shrubs invading tundra landscapes from lower elevations. Evidence from repeat photography and studies elsewhere strongly suggest that the encroachment of larger-statured woody taxa would negatively impact tundra communities by outcompeting these plants in a warmer climate.
Forest Communities	Composition, structure, and proportion of landcover		WRST has large swaths of healthy boreal forest. The projected impacts of climate change, including drying permafrost, increasing fires, and disease/insect outbreaks may mean that forest communities give way to grasslands.

Resource Brief: Phenology

Phenology is the timing of biologic events such as when animals rut, put on or shed antlers, when lakes freeze or the date of the first snow. Specifically, when related to plants, it refers to when plants green up in the spring, when they flower, when they set fruit, and when their leaves turn colors in the fall (or die). Currently, the park monitors the phenology of aspen trees in Copper Center to determine whether or not the phenology is changing over time. Aspen trees are used because they occur throughout the United States, and observers can compare patterns observed in WRST to large scale changes elsewhere.



Results of aspen phenology monitoring at park headquarters, in Copper Center, from 2008 to 2016.

Globally, research of northern latitudes indicate that phenology of plants may be becoming mismatched with the timing of other events that allow them to reproduce and survive. For example, berry plants may be flowering earlier before the first pollinators arrive or they may set flowers during a wet spell both of which cause their berry crop to fail. Likewise, if it is extremely dry post flowering during the berry setting stage, berry crops will fail. The indication is that due to warming, the timing of these events is increasingly less predictable; the park is already getting anecdotal reports of this. These mismatches do not necessarily mean that a plant type will die, but it does have an impact on the quality of food and habitat that it provides for fish and wildlife. For example, if berries are not made because they bloomed before the cold spells were over, bears might not have enough food before hibernation. Unfortunately, the only real data the park has so far is the aspen phenology, which does not necessarily represent what is happening to other plants.

Vegetation (continued)

web ▸

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Wetland and Riparian Communities	Composition, structure, and proportion of landcover		Much of WRST is covered in wetlands, bogs, and fens many of which are fed directly or indirectly through permafrost and precipitation throughout the year.
Shrub Communities	Composition, structure, and proportion of landcover		Recent measurements suggest changing successional pathways leading to the establishment of stands of trees in areas that formerly were occupied by shrub communities (unpublished data, Viereck 1966). Climate warming likely will affect the distribution of shrub species at a landscape scale, and a network of plots has been established for long-term monitoring of vegetation changes. Anecdotal evidence from repeat photography suggests shrub encroachment has occurred in some areas.
Coastal Communities	Composition, structure, and proportion of landcover		The park has minimal coastal vegetation as much of the coastline is or was recently ice covered. However, with the ice receding and isostatic rebound (the rising of the land due to the weight of ice being removed) occurring in this area, it may become more and more vegetated.

Landscape and Ecosystem Processes

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Fire	Extent of natural fires		Extent of natural fires in the park is low but the more recent Chakina (2009) and Chisana River (2013) fires burned a very large extent.
Migratory Networks and Connectivity	Undisturbed connectivity in migration corridors		The park contains several large migratory networks that are of great importance to many animals. One of the most documented is the migration of salmon up the Copper River to its tributaries. Other important migration routes in the park include: the routes of the Chisana caribou between Canada and the U.S., the Mentasta caribou migration route, the huge fly-way route over the Chisana-Nabesna area for migrating birds (particularly golden eagles), the uphill winter migration of moose, and many others. In general, there are no large disturbances to these patterns: no dams, no wind turbines, no fences, etc.

Resource Brief: Fire Extent

Take a walk in the boreal forest of Wrangell-St. Elias and see that there is evidence of fire—old charred logs or buried ends of uprooted trees that fell from a fire long ago. Fire is a natural part of the boreal forest (Viereck 1973). Understanding the fire history of parks is necessary to manage wildfires as a natural process and to prepare for wildfires in the future. The fire records since 1945 indicate that fires occur in Wrangell-St. Elias almost every year, with an average of 1.5 fires per year. Over the past 70 years, nearly 62% of the fires were reported to be human caused. In the past decade the number of natural or lightning caused fires has increased. This could be due to increased lightning, better reporting (many old fires were reported as human caused), drier conditions, or vegetation and succession.

Although fires occur annually, the total area burned from wildfires in Wrangell-St. Elias is variable and episodic. Some years many acres burn, but a majority of the time fires remain small or are extinguished. Over the past decade the area burned due to natural fires has increased. Variation in area burned annually is not unusual for Alaska interior boreal forests (Kasischke et al. 2002); however, the time period between large fire years appears longer when compared to other parks in the interior of Alaska. There is ample evidence of large fire events within the park that pre-date agency fire records. Lutz (1956) described two fires from 1915 in the Chitina Valley that burned over 380,000 acres. Fred Moffit, an early surveyor in the area, wrote about the weather in 1915, which provides some insight as to why such large fires may have occurred: “If the summer of 1915 was normal the summers of the upper Chitina Valley are dry and hot, for practically no rain fell from early in June until late in August, and for a week or more in midsummer the thermometer stood near 85 (degrees) each day” (Moffit 1918).

Fire is a natural process in the forests and shrublands of Wrangell-St. Elias, many plants and animals depend on the regeneration that occurs after a fire. Understanding what factors led to several decades of infrequent, small fires in the region followed by years of large fires is important for managing natural fire regimes and future fire regimes in the park.

Resource Brief: Climate Projections for Wrangell-St. Elias

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 spinning off of the Pacific Ocean to the south. The warm, moist air masses deposit precipitation on the windward sides of the mountains—rain at low elevations and snow at higher elevations. Large scale atmospheric and oceanic circulation patterns influence seasonal and annual weather patterns in the park, like the repositioning of the polar jet stream and the Aleutian low pressure system or the frequency of La Niña and El Niño (Papineau 2001).

Wrangell-St. Elias has two very distinct climate regimes divided by the Chugach Mountain Range. The Northeast Gulf climate regime to the south is moderated by the North Pacific Ocean with a relatively small annual temperature range and some of the highest precipitation values in the state. Most of the park area is north of the Chugach Range within the Southeast Interior climate division and is more characteristic of a continental climate with large temperature variability between summer and winter and less precipitation overall. The high mountains and icefields in the Chugach act as barriers to the moderating influence of the ocean. The transition from a maritime climate to an interior climate occurs over a very short distance within the park. These climate gradients are intrinsic to the ecosystem patterns, and vegetative and faunal communities found in the park.

There are two long-term climate stations that anchor the park's two major climate zones, Yakutat along the Gulf Coast and Gulkana in the Southeast Interior. These sites provide insight on long-term climate trends that affect the park. Average seasonal and annual temperatures and total annual precipitation trends from the Gulkana and Yakutat stations are shown in the graphs that follow. Temperature and precipitation projections over the next century have been calculated on a monthly time scale for both locations. 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).

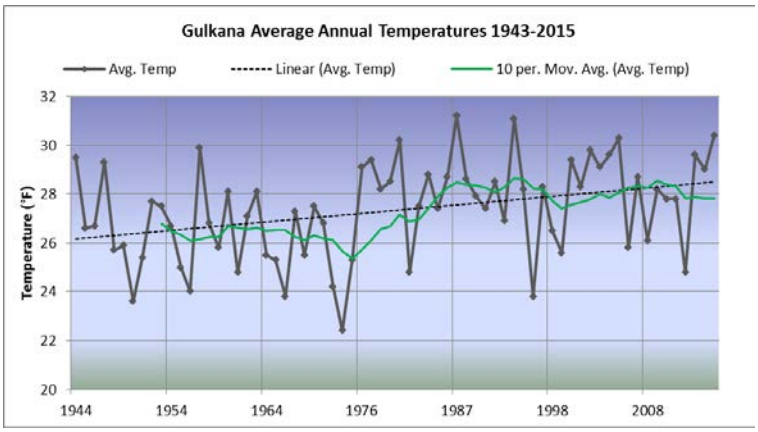
Historical trends and future projection for temperature

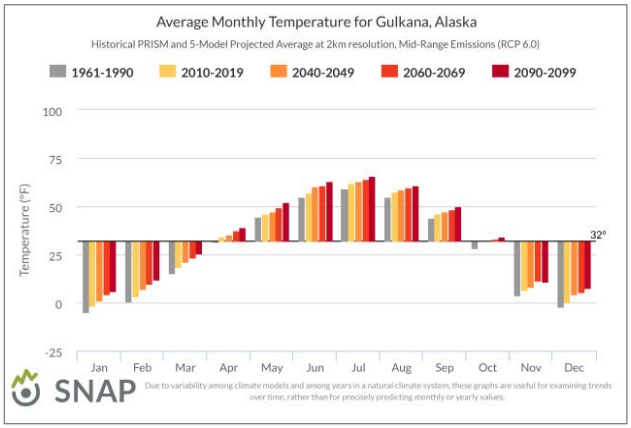
The observed historical temperature trend is non-linear, with multi-decadal variations (graph below left). The increase in the mean annual temperatures is significant with temperatures warming >2.0 °F when a simple linear regression is applied to the >50 year records at both locations. Considering just a linear trend masks important variability in the time series; this record spans the phase shift of the Pacific Decadal Oscillation (PDO) in 1976 where annual temperatures at this location, and at most locations around the state, abruptly shifted up by ≈1.8 °F in a single year and then persisted in this warmer phase for the next several decades. The ecological consequences of an abrupt shift in temperatures versus a steady increase in temperatures need further investigation.

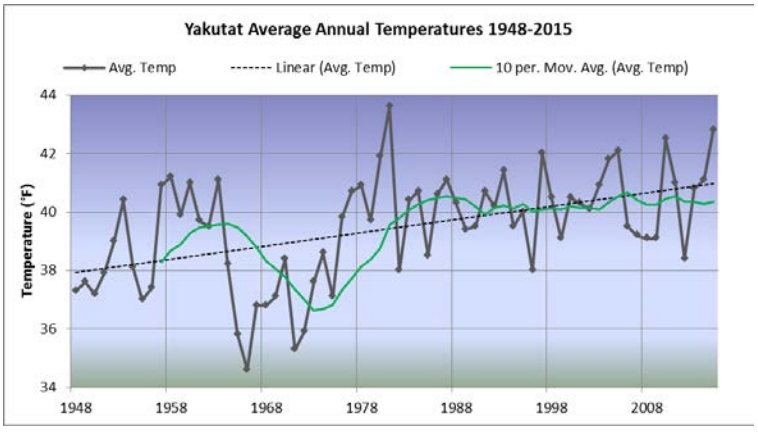
The trend in annual temperatures since 1977 has been relatively stable. However, over the past several years the PDO index has had the highest, most persistent positive values since the 1980s, coinciding with a strong El Niño pattern, resulting in two of the warmest years on record for the state of Alaska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

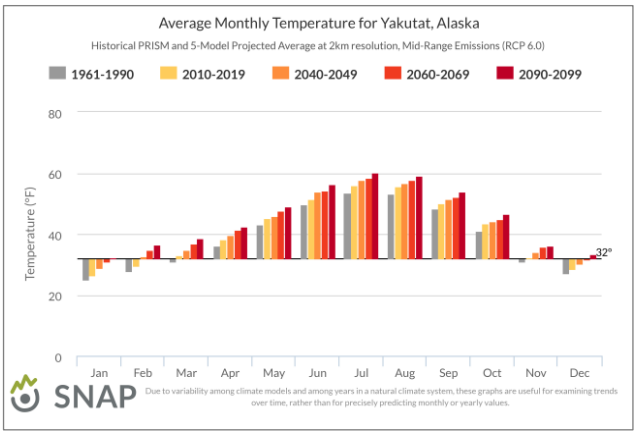
Seasonally winter temperatures show the most significant increase at both locations. In Yakutat, spring and summer temperatures have also increased significantly over the period of record. Temperatures are projected to increase for all seasons by mid-century, with the greatest increases likely in winter (graphs below right). There is general agreement among individual climate models in the direction and magnitude of warming over the coming decades. Warming temperatures pose serious threats to park resources when the average annual temperatures are near freezing.

Resource Brief: Climate Projections for Wrangell-St. Elias (continued)









Average annual temperatures at Gulkana (top left) and Yakutat (bottom left). The green lines show the 10-year moving averages. The dotted lines show a simple linear regression trend. The Scenarios Network for Alaska and Arctic Planning (SNAP) monthly temperature projections for the next century are shown for Gulkana (top right) and Yakutat (bottom right)(SNAP 2016).

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

Historical trends and future projection for precipitation

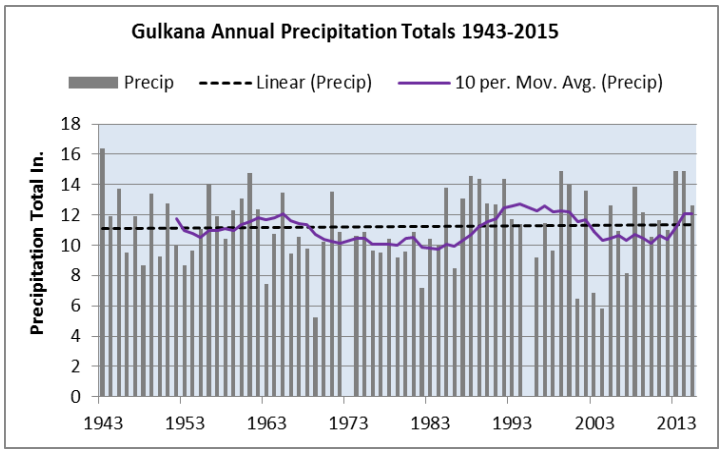
Observed annual precipitation at Yakutat and Gulkana shows inter-annual variability and no significant linear trend across the entire record (graph below left). Snowfall records are available for Yakutat only and these show a significant decreasing trend for annual and winter snowfall totals; indicating that more precipitation is falling as rain in the winter months in Yakutat. 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 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).

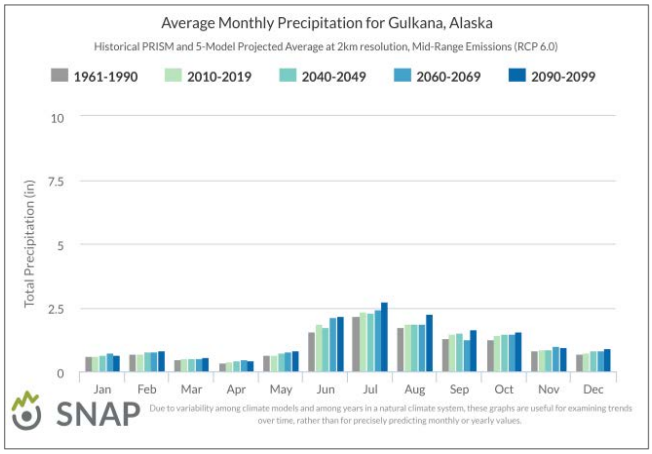
Increasing winter temperatures can lead to an increase in the number or intensity of rain-on-snow events that could potentially disrupt the path to the food supply for wildlife. The precipitation projections indicate that late spring may see an increase in precipitation amounts. Late spring snowfall 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 Gulkana and in the fall for Yakutat; more rain and more intense rain events can lead to flooding, landslides, and soil instability.

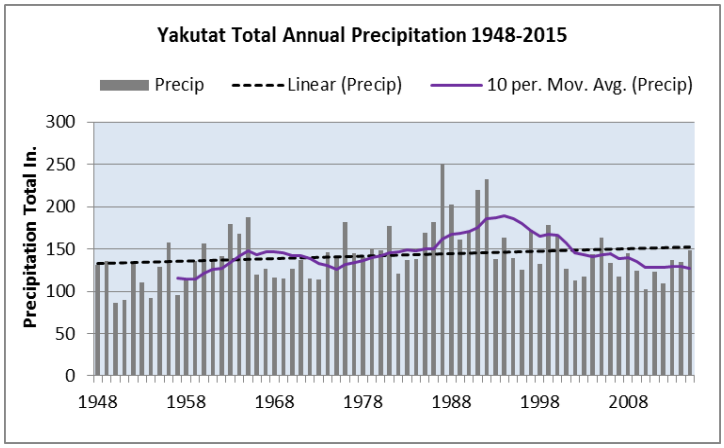
Resource Brief: Climate Projections for Wrangell-St. Elias (continued)

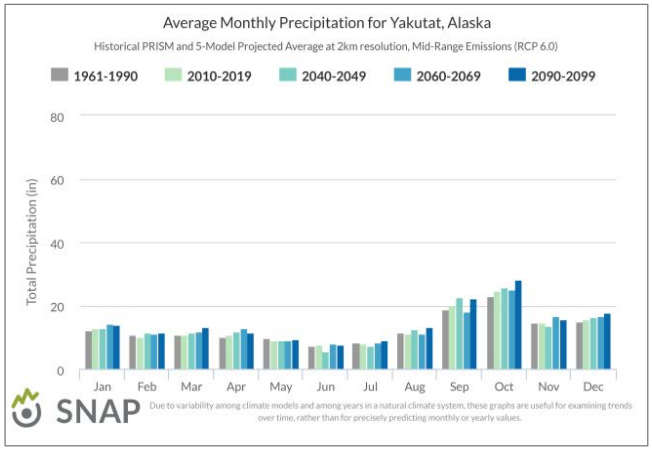
Other projections

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 northern regions of the park, is projected to decrease in thickness and extent across large portions of Interior Alaska by 2100 under both low and high emissions scenarios, altering local hydrology and potentially impacting roads, buildings, and other infrastructure (Panda et al. 2014; 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 more frequent droughts and more severe flooding and erosion.









Total annual precipitation at Gulkana (upper left) and Yakutat (lower left). The purple lines show the 10-year moving average. The dotted lines show a simple linear regression trend. The Scenarios Network for Alaska and Arctic Planning (SNAP) monthly precipitation projections for the next century are shown for Gulkana (top left) and Yakutat (bottom right) (SNAP 2016).

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		No ground based or modeled night sky quality data are available for WRST. However 2012 visible infrared imaging radiometer (VIIRS) satellite imagery shows very little evidence of light pollution in and around the park. Night sky quality is assumed to be good. Low population growth in the region indicates a stable trend.

Resource Brief: Night Sky Resources at Wrangell-St. Elias

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.

Night sky quality at Wrangell-St. Elias 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. Additionally, very little anthropogenic light is detected in an area within 200km radius around the park. Given these very low levels of anthropogenic light, the photic environment of WRST is subject to the natural regime of dark/light patterns allowing visitors to the park to experience pristine night sky resources. Learn more at the NPS Natural Sounds & Night Skies Division website.

Acoustic Environment

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Acoustic Impact Level	Modeled mean acoustic impact level (L50 dBA) – a measure of the noise contributed to the acoustic environment by man-made sources		All physical sound resources, whether they are heard or not, are referred to as the acoustic environment of a park. The quality of the acoustic environment affects park resources and values including wilderness quality, wildlife, and cultural resources and landscapes. The condition of the acoustic environment is assessed by determining how much noise man-made sources contribute to the existing acoustic environment. This measure is referred to as the mean acoustic impact level, measured in A-weighted decibels (dBA). The mean acoustic impact level is 1.0 dBA in WRST, meaning that the acoustic resources are in good condition. Acoustic conditions in national parks are largely driven by transportation activity, and overall, nationwide increases in ground-based (Federal Highway Administration 2013) and aircraft traffic in recent decades (Federal Aviation Administration 2010) indicate a downward trend in acoustic conditions. State-wide increases in development and steady tourism pressure throughout the state of Alaska (McDowell 2014) also indicate a downward trend in acoustic conditions.

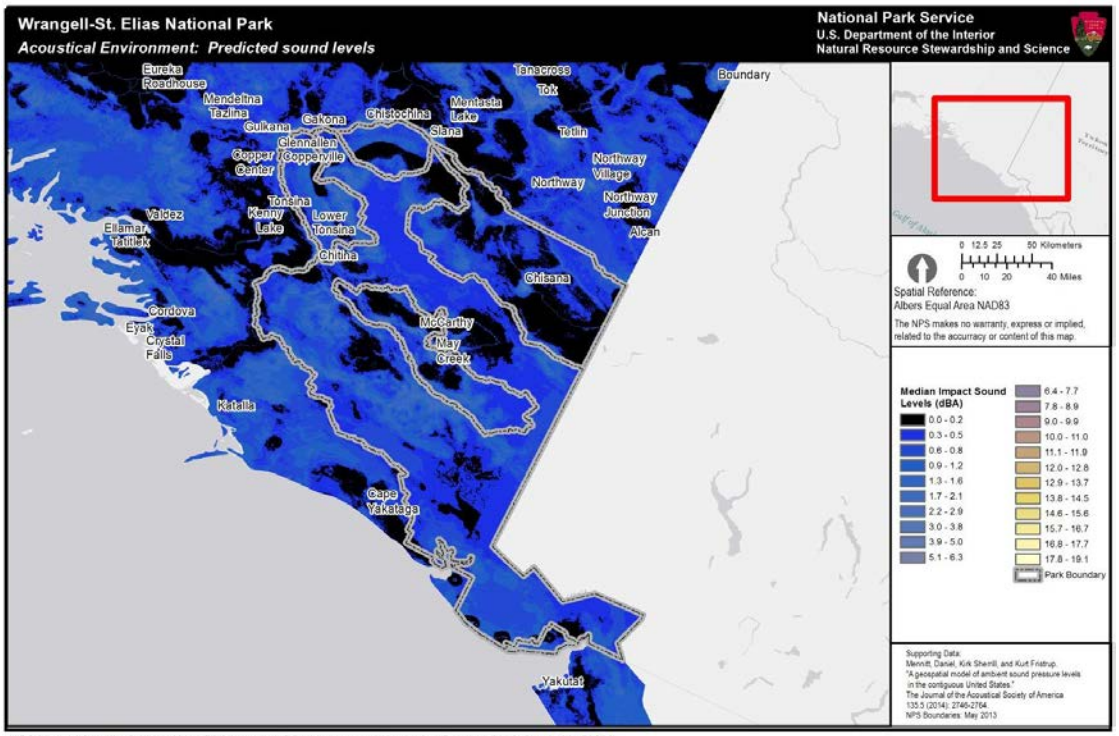
Resource Brief: Acoustic Environment

Every unit in the national park system has a unique acoustic environment, and every unit should understand what its desired acoustic environment would be. The acoustic resources at Wrangell-St. Elias are in good condition. To characterize the acoustic environment (a complex and multifaceted resource) in all parks, the NPS has developed a national geospatial model of noise pollution (Mennitt et al. 2014). This model predicts the increase in median sound level that can be attributed to human activity on an average summer day. The model is based on measured sound levels from hundreds of national park sites and about one hundred explanatory variables such as location, climate, landcover, hydrology, wind speed, and proximity to noise sources such as roads, railroads, and airports. The resulting model predicts sound levels anywhere in the U. S., and also estimates how much lower these sound levels would be in the absence of human activities. It is this predicted difference between the existing and natural sound level (acoustic impact level) that is used to evaluate the condition of the acoustic environment. Because acoustical conditions within a park may vary widely along a gradient, mean acoustic impact level is used because it is a close approximation of expected impact levels at any given point in a park.

Condition thresholds for the acoustic environment

Indicator	Threshold (dBA)
Mean L_{50} impact (dBA) Calculated as difference between existing ambient and natural ambient models	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%*

For State of the Park Reports, NPS has established acoustic standards (green, amber, red) and two sets of impact criteria for urban parks and non-urban parks. A park's status (urban or non-urban) is based on data from the U.S. Census Bureau (U.S. Census 2010). Parks outside designated urban areas typically possess lower sound levels, and exhibit less divergence between existing sound levels and predicted natural sound levels. These quiet areas are highly susceptible to subtle noise intrusions. Based on these assumptions, all Alaska parks will be assessed using the non-urban criteria. To learn more about acoustic resources, condition criteria, and the model used in State of the Park Reports, refer to Recommended Indicators for Acoustic Resource Quality and the NPS Natural Sounds and Night Skies Division website.



Park-specific acoustic impact (mean L_{50} dBA) map, as predicted by ver. 3.1 of NPS's national model of noise pollution. The color scale indicates how much man-made noise raises sound levels in a given location (measured in A-weighted decibels, or dBA), with 270 meter resolution. Black or dark blue colors indicate areas of low impact while yellow or white colors indicate greater impacts. Note that due to the national scale of the model inputs, this graphic may not reflect recent localized changes (such as new access roads or development).

2.2. Cultural Resources

Archeological Resources

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research is conducted to understand the relationship of the park's archeological resources to the historic contexts for the park.		There are 744 archeological sites recorded in WRST in the Archeological Site Management Information System (ASMIS). Including prehistoric and historic sites, they represent direct evidence of over 4,000 years of sustained occupation. Because so little of the park has been systematically surveyed, most recorded sites are within high-probability areas (hilltops, prime hunting areas, close to water) or are associated with highly visible resources (such as historic structures).
	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.		An Overview and Assessment of the Archaeological Resources has been completed (NPS 1998), but has become outdated as new research is conducted and new sites and site complexes are identified and evaluated. A draft National Register Nomination has been prepared for an Archeological District, and other important sites have been found through independent research (e.g., Dixon et.al. 2005, and Dixon et. al. 2007).
Inventory	Percentage of park intensively surveyed.		Only about 1% of the park has been systematically surveyed. Most new sites are found during monitoring of other activities or in compliance surveys prior to park actions (primarily maintenance and construction).
	Percentage of archeological resources with complete, accurate, and reliable State site forms.		Within the last 5 years, all new sites have been recorded with the Alaska Heritage Resources Survey annually. The backlog of incomplete records decreases each year as well, when new site visits update and complete the required information. About 75% are now complete.
Documentation	Research results are disseminated to park managers, planners, interpreters, and other NPS specialists and incorporated into appropriate park planning documents.		Research results and information are available to all park staff, and the Cultural Resources team is always involved with project planning and implementation.
	Percentage of archeological materials cleaned, conserved, studied, cataloged, and properly stored.		Almost all archeological materials recovered each year are cleaned, cataloged, and stored, and are conserved as necessary. Two small collections from 2013 and 2014 still need to be cataloged.

Archeological Resources (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Certified Condition	Percentage of archeological resources certified as complete, accurate, and reliable in the Archeological Sites Management Information System (ASMIS) in good condition.		Only about 20% of the sites in ASMIS are noted to be in good condition. However, this is largely due to a general lack of information when the original records were created, as another 20% have no condition data or are listed as "unknown." Records are updated as site visits allow, and over 100 records have been updated within the past three years.

Cultural Anthropology

web

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.		An Ethnographic Overview and Assessment (EOA) for the Upper Tanana communities was completed in 2007 (Hayes and Simeone 2007) and work is in progress on EOAs for the Yakutat Tlingit and for several occupational groups traditionally associated with WRST (miners, hunting guides, trappers, homesteaders). Additionally, numerous oral history interviews with residents of park-affiliated communities have been conducted and can be viewed online as part of the University of Alaska Fairbanks Project Jukebox.
Inventory	Appropriate studies and consultations document resources and uses, traditionally associated people, and other affected groups, and cultural affiliations.		WRST has been actively seeking to collect up-to-date information about the harvest and use of wild renewable resources by residents of local communities, as authorized by the park's enabling legislation. Recent household surveys conducted in eight Copper Basin communities (Kukkonen and Zimpelman 2012, La Vine et al. 2013, La Vine and Zimpelman 2014) have updated information last collected in the mid-1980s, and a similar survey was conducted in the Upper Tanana community of Northway. The park also recently collaborated with the Cheesh'na Tribal Council and Mount Sanford Tribal Consortium to produce a report about former village sites in the northern part of the park (Simeone 2014). The park also actively consults with local tribes on proposed federal actions with the potential to impact them and holds regular meetings with three park-affiliated tribes to share information.

Cultural Anthropology (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Documentation	Research results are disseminated to park managers, planners, interpreters, and other NPS specialists and incorporated into appropriate park planning documents.		Research results and information are available to all park staff, and the cultural anthropologist is involved with project planning and implementation as appropriate.

Resource Brief: Kendesnii Campground Dedication

Under sunny skies, Wrangell-St. Elias dedicated Kendesnii Campground on July 27, 2012, with a naming ceremony and picnic at the Nabesna Road site. Park Superintendent Rick Obernesser opened the event, saying "I am excited that so many of us are here today as we dedicate the park's first official campground."

Kendesnii is the Ahtna name of Daisy Nicolai. She and her children had a spring camp in the campground area for many years. In addition to acknowledging the family's connection to this site, using an Ahtna name for the campground recognizes the important association between Alaska Natives and Wrangell-St. Elias. Park staff worked with local tribes in identifying the campground name, and the Cheesh'na Tribal Council, on behalf of Daisy's family, partnered with the park in organizing the dedication.

At the 2012 dedication of Kendesnii Campground, Daisy Nicolai's family members gather for the unveiling of a sign remembering their mother and grandmother and their family's connection to the site.

Many of the more than 100 guests at the event were members of Daisy's family. Also among the guests were Nabesna Road residents and park visitors camping at the site. Daisy's closest surviving relatives—a sister and three daughters—shared memories of Daisy, as did several grandchildren. Speaking on behalf of the Cheesh'na Tribal Council, Tribal Administrator Wilson Justin, who is also one of Daisy's grandchildren, said "The honor of keeping a promise made a generation ago is privilege not always understood but vital to those who stand in shadows of our traditions. Thank you to the Wrangell-St. Elias for the support in keeping that promise. Cheesh'na extends a welcome to all visitors to the Kendesnii Campground."

The campground is located at Mile 28.2 on the Nabesna Road. It has vault toilets, picnic tables, and ten sites that will accommodate tents and medium-sized recreational vehicles. Currently there is no charge for use of the site. A canoe launch and water well are also planned. Funding for campground construction came from the American Recovery and Reinvestment Act of 2009 and the Recreational Fee Demo Program.

Cultural Landscapes

web

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.		There is a vast array of cultural landscapes in Wrangell-St. Elias, including historic transportation corridors, mining districts, and airstrips. 31 cultural landscapes have been identified in WRST and are documented in the Cultural Landscape Inventory database. As of February 2015, 13 Cultural Landscape Inventories (CLI) have been completed.
Inventory	Percentage of landscapes eligible for the National Register in the Cultural Landscapes Inventory (CLI) with certified complete, accurate, and reliable data.		13 cultural landscapes have complete, accurate, and reliable CLI documentation. An additional 18 cultural landscapes in WRST have been identified. The potential for additional cultural landscapes is great and 7 CLIs, 1 CLI Revision, and 1 DOE are underway for FY15.
Documentation	Percentage of cultural landscapes with Determination of Eligibility (DOE) documentation.		Of the 31 cultural landscape records in the CLI database only 13 (41.9%) have been evaluated—and determined eligible—for nomination to the National Register of Historic Places.
Certified Condition	Percentage of cultural landscapes certified as complete, accurate, and reliable in the Cultural Landscapes Inventory (CLI) in good condition.		There are 13 cultural landscapes with certified conditions. Of the cultural landscapes with certified conditions, 3 are in good condition (23%), 6 are in fair condition (46.2%), and 4 are in poor condition (30.8%). Without serious maintenance, many of the "fair" landscapes will continue to deteriorate.

Historic Structures

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Historic Structures are identified and evaluated using historical contexts.		A comprehensive Historic Structure Inventory has been completed for the park, and the structures within three historic mining districts have been extensively researched.
Inventory	Percentage of historic structures eligible for the National Register in the List of Classified Structures (LCS) with accurate, complete, and reliable data.		93.18% (246 of 264) of resources listed on the LCS are eligible for listing in the National Register with accurate, complete, and reliable data.

Historic Structures (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Documentation	Research results are disseminated to park managers, planners, interpreters, and other NPS specialists and incorporated into appropriate park planning documents.		Research results and information are available to all park staff, and the Cultural Resources team is always involved with project planning and implementation.
Certified Condition	Percentage of historic structures certified as complete, accurate, and reliable in the List of Classified Structures (LCS) in good condition.		Roughly 20% (54 of 264) of the structures listed in the LCS with complete, accurate, and reliable data are certified in good condition. 100 structures are listed in poor condition, and the remainders are listed in fair condition. Most of those listed as good will continue to be maintained, and although some in the fair category will be repaired or rehabilitated, the majority of them will continue to deteriorate to poor condition.

Resource Brief: Kennecott Mines National Historic Landmark Stabilization Program

The Kennecott Mines National Historic Landmark (NHL) contains over thirty-five historic structures, numerous small-scale features, and countless archeological resources that epitomize an early 20th-century industrial mining town set in the midst of a vast wilderness setting. Since acquisition by the park in 1998, active stabilization of these historic structures has been an ongoing activity. The goal of the NPS Kennecott Mines NHL preservation program is to apply measures necessary to sustain the existing form, integrity, and materials of key historic buildings within the Kennecott Mines NHL by repairing and replacing deteriorated roofs, walls and foundations and, in some cases, by replacing and maintaining windows, siding and paint to ensure preservation of historic structures for generations to come.

A view of the iconic Concentration Mill in the Kennecott Mines NHL. While the lower seven levels have been stabilized, work is being planned to stabilize the upper five levels.

Since 2010, stabilization projects have included replacement of the crib wall, installation of an ADA-compliant ramp at the New School, and stabilization of the Leaching Plant, Transformer House, Dairy Barn, East Bunkhouse, National Creek Bunkhouse, Hospital, West Bunkhouse, and the lower seven levels of the Concentration Mill.

Planning is underway to restore the upper levels of the Concentration Mill to its original form within the next three years. While most major stabilization work has already been completed, and most of the structures are now secure and able to be maintained, cyclic maintenance will be an ongoing challenge to ensure adequate preservation.

History

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Sufficient research is conducted to establish the reasons for park establishment and a history of the NPS management of the site.		An administrative history of the park is an excellent resource (Bleakley 2002). Since the administrative history was written, no updates have been made and it is unlikely to be updated in the near future. A history of how the park acquired the Kennecott Mines National Historic Landmark was documented in cooperation with community members in 1997. Allan's (2010) thesis gives a good background on the politics surrounding the establishment of the Alaska ANILCA parks.
Inventory	Cultural resources are inventoried and evaluated in consultation with State Historic Preservation Officers (SHPOs).		The park consults with the SHPO on all projects that could potentially affect cultural resources, during either an annual meeting, or on an as needed basis.
Documentation	Research results are disseminated to park managers, planners, interpreters, and other NPS specialists and incorporated into appropriate park planning documents.		Research results and information are available to all park staff, and the Cultural Resources team is always involved with project planning and implementation.

Museum Collections

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Museum curator is included in permit review and informed about park resource projects that may affect collections.		Although there is currently no museum curator at the park, the Cultural Resources staff and Alaska Regional Office Senior Curator review permits that may involve collections.

Museum Collections (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Inventory	Scope of Collection is consistently implemented; items or objects are researched to determine their appropriateness for inclusion in the museum/archive collection.		The Scope of Collections was signed in October 2010, and will be reviewed in late 2016.
	Percentage of existing collection that is accessioned and cataloged.		Nearly 100% of the collections are accessioned (formally added to collections), but only 21% were cataloged to date. By the end of 2015, 95% will be cataloged as the archive project wraps up.
Documentation	Accession and deaccession files are complete with all appropriate signatures.		These files were 100% complete until the Park Curator retired a year ago. With current staffing, it is a struggle to keep them completed.
Certified Condition	Percentage of museum collection storage facilities in the Facility Management Software System (FMSS) with a Facility Condition Index (FCI) indicating good condition.		100% of the park's collections storage facilities (the Headquarters Administration Building and the Kennecott Store) are in good condition.

Resource Brief: Artifacts Return Home for Display at the Ahtna Cultural Center

After over ten years of research at ice and snow patches in WRST, in 2014, dozens of archeological artifacts returned to the region from which they came. At a ceremonial homecoming hosted by the Ahtna Heritage Foundation, many of the artifacts were placed on temporary display, along with the unveiling of interpretive panels illustrating the history of the research and what it revealed about the prehistory of the park. One of many findings, the 550-year old (± 20 years, radiocarbon dated) composite arrow pictured below was recovered from a melting ice patch at an elevation of 6,600' above sea level. Ice and snow patches are attractive to sheep and caribou in the summer to help them cool off and avoid mosquitos and flies. Hunters exploited this trait by targeting them at these locations. This arrow demonstrates the technological complexity of the traditional Ahtna people of the area. The Ahtna were renowned for their copper technology and trading. The copper end blade and antler arrow point are currently on display at the C'ek'aedi Hwnax, the Ahtna Cultural Center located at WRST headquarters campus in Copper Center.

A copper endblade, antler arrowhead, and portions of a wooden arrowshaft recovered from a melting snow patch in WRST.

2.3. Visitor Experience

Visitor Numbers and Visitor Satisfaction

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Number of Visitors	Number of visitors per year		The total of 74,722 visitors to the park in 2014 is higher than that of 2013 (69,984) but much lower than that of 2012 (87,158). The 10-year average of visitors for 2003–2012 was 61,939. WRST has road, trail, water route, and aviation access. Since access is so variable, estimating visitor use is challenging.
Visitor Satisfaction	Percent of visitors who were satisfied with their visit		Based on the standard visitor satisfaction survey conducted each year, the percentage of visitors satisfied in FY14 was 98.0%, which is higher than the average for the previous five years (95.6%) and ten years (95.2%). Source: 2014 Visitor Survey Card Data Report.

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		The park collaborates with the Copper River School District to implement Spring and Fall education programs for grades 2–6. These curriculum-based studies include in-class activities and field trips to Copper Center. Programs for a junior high school, grades 7–8, also provide an immersive experience. The park partners with local organizations to host many summer youth programs incorporating resource education and stewardship. Future growth is needed to transport students from urban communities to the park for immersive experiences, offer distance learning programs, and develop website curriculum. Source: Servicewide Interpretive Report.
Ranger Programs	Number and quality of programs and attendance		Ranger programs are dependent on seasonal rangers, and the number of seasonal rangers hired is subject to fluctuations in budget. Thus, the number of programs offered each year fluctuates. The quality of training and mentoring for seasonal rangers has improved, but it is an investment in a resource that is always slipping away as seasonal workers move on to other jobs. There were 3,072 formal interpretation programs in 2014 resulting in 11,593 visitor contacts. This figure is up from the 1,241 formal interpretation programs in 2013, which resulted in 8,491 visitor contacts.

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

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Junior Ranger Programs	Number of programs and attendance		The park provides Junior Ranger booklets and badges at numerous visitor centers and contact stations in the park. These programs remain popular. The park issued 533 badges in FY14 as compared to 397 in FY13.
Special Events	Variety and longevity of events, community involvement		Community outreach for Wrangell-St. Elias has grown during the past five years. The park biannual "Wings Over the Wrangells" Day recently took place, with more than 250 people in attendance. Additionally, the park hosts a Guest Lecture Series, which invites experts in both cultural and natural history. Annually, these programs are attended by 100+ local participants and continue to grow.

Resource Brief: Chosen Frozen Winter Campout

Snowshoeing was one of many activities the "Chosen Frozen" were able to accomplish while camping out

In the spring of 2014, the park education specialist developed a new program for middle schoolers (7th and 8th grade). The park education program reaches most of the grade levels from 2nd grade through 6th grade and 9th through 12th grade with various in-park programs or in-classroom programs. The "Chosen Frozen" was developed in response to lack of programming for 7th and 8th graders.

The park had experienced success in the past with summer camps and day camps, but had not tried a winter camp program. The park met with partners—Wrangell Institute for Science and the Environment, Bureau of Land Management, and the Copper River School District—to collaborate on a winter camp program. The program took the Glennallen School 7th and 8th grade classes to Meier's Lake, an area outside of the park but within an hour's drive of the school. The students set up camp for an overnight stay on the lake.

During the day, the students participated in several winter activities. The students donned snowshoes and learned how to travel across deep snow, learned how to ice fish, and learned how to survive in the cold. All of these activities exposed the students to a new learning environment and enabled them to develop a new set of skills.

The program was so successful that the 7th grade teacher wanted to know when her class could come back and do it again next year. The park plans to continue this program by expanding it to the Kenny Lake School as well as local homeschool students. New partners are being added to the program in 2015, including Prince William Sound College and the Chugach School District. The program will be expanded in 2015 from just a few days to a 10-day experience for four different classes. This program is not possible without the generous support of WRST's education partners.

The "Chosen Frozen" students

Interpretive Media – Brochures, Exhibits, Signs, and Website

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Exhibits	Kennecott Visitor Center		A main exhibit was installed in 2009 in the Kennecott Visitor Center. Other exhibits are hand-crafted or touchable items. The Kennecott Mines National Historic Landmark is in the process of a comprehensive exhibit design and fabrication. New exhibits will be installed in 2017 or 2018.
	Slana Ranger Station		There are very few exhibits in this facility besides some photos that were recently upgraded (2014). Developing new exhibits or panels for the walls would enhance the visitor experience.
	Exhibit Hall – Copper Center		Most displays at the Copper Center Visitor Center are in acceptable condition. They are mostly static exhibits that are easily maintained, though exhibits need to be updated and more closely connected to the park's purpose.
Wayside Signs	Condition and currency of signs		Content of signs would benefit from refreshing. Future waysides would benefit from quick response (QR) codes. Information (including maps) is current and valid. Extreme cold temperatures, sun, and vandalism result in a deteriorating condition and shortened life expectancy for signs.
Park Directional Signs (off-site)	Usefulness, quantity, and placement		Park directional signs are current and in acceptable physical condition, though they do not meet current Department of Transportation standards for proper color. A new directional sign in the Headquarters area was installed in late 2014 to help visitors discover a cultural center located on the visitor center campus.
Print Media	Accuracy and availability of primary park publications		The park brochure is in need of updating. A request has been submitted to start work on redesigning and upgrading the park map. The Keltaeni visitor guide and other brochures are revised each season.
Audio-visual Media	Orientation Films		Orientation films shown at the park include a general park film and a film about the history of the Kennecott Mill. These films were developed in the past decade and are in good condition. The main park film features open captions and audio description.
	Other AV material		Other short videos about park resources are shown infrequently but are in good working order. There has been a significant increase in the number of high resolution photos and film shot in several regions of the park, which is already being used on the park website. Additionally, hours of interviews and natural sound were recorded in summer 2015.

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		A motivated web team continues to develop the breadth and depth of the WRST website. Challenges to the website include lack of a full-time dedicated web coordinator to keep information current, sometime slow internet connectivity, and keeping informed of NPS web technical changes content guidance.
	Social media: Facebook updates and "likes," overall activity		The number of WRST Facebook followers continues to grow steadily. Members of the social media team post regularly, actively monitor posts to respond to questions and comments, and continue to explore innovative new ways to engage followers, such as using quizzes. The team also posts regularly to Twitter, YouTube, and Flickr.

Accessibility

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Mobility	ADA compliance		The park lacks accessible facilities in the historic Kennecott area of the park. There is a partially accessible trail at the Copper Center Visitor Center. Publicly accessible buildings in Copper Center have automatic opening doors recently installed.
Visual Accommodation	ADA compliance		The park needs more interpretive tools and content that are accessible to visually impaired visitors. The park recognizes these challenges and is working to improve accommodation.
Auditory Accommodation	ADA compliance		Park film is captioned; however, no auditory assistance or amplification equipment is available. Content of ranger presentations is not transcribed. The park recognizes these challenges and is working to improve accommodation.
Public Transportation	Access to park via public transportation		Most of WRST is remote and has no roads. There is limited availability for public transportation into the park. There is a daily shuttle (summer only) to the Kennecott area of the park. There is no public transportation to the Nabesna area of the park. In the Copper Center area there is public transportation available year-round.
Multi-lingual Resources	Audio and print materials in multiple languages		The park has visitors that represent a range of countries and languages. The park brochure and other print materials are in English only. Translation assistance may be an excellent opportunity for volunteer assistance.

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. • Park Rangers have designed a P-SAR (Preventative Search and Rescue) program in order to educate visitors on safety and best practices. • Park Rangers maintain a high level of training and readiness to respond to emergency medical services (EMS) and search and rescue (SAR) situations as they arise. • Park Rangers maintain a robust schedule of both back country and front country patrols in order to provide law enforcement and emergency services to the visiting public.
Staff Safety and Training	Number of staff trained		Operational Leadership Training has been completed by park staff, and CPR, First Aid, and AED training are offered to staff on a space-available basis. Job hazard analysis is conducted before jobs throughout the park. Regular safety messages are given and distributed to staff members. Park rangers maintain a high degree of training in both emergency medical services (EMS) and search and rescue (SAR) situations as they arise. The park maintains and has access to 24-hour dispatch during the summer months to monitor the safety of staff in remote backcountry settings.

Partnerships

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Volunteers	Number and hours contributed		The number of volunteers in WRST has declined in the last three years, from 62 in 2012 to 47 in 2014. During the same timeframe, the number of hours worked by volunteers also has declined from 9,889 to 5,556. Part of this decline in volunteers and hours worked is due to lack of capacity for park staff to manage volunteers.

Partnerships (continued)

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Partnerships	Number of partnerships		Wrangell-St. Elias has numerous official partners, including Alaska Geographic, Princess Cruises, Kennicott Glacier Lodge, Ahtna Heritage Foundation, Wrangell Institute for Science and the Environment, Wrangell Mountains Center, and Copper River Watershed Project. Other park partners include Alaska Department of Fish & Game, Alaska Department of Environmental Conservation, USGS, U.S. Fish & Wildlife Service, Bureau of Land Management, Federal Highway Commission, Copper River School District, Student Conservation Association, and researchers from many universities.
Commercial Services	Visitors are satisfied with the services provided		The park has 16 commercial service hunting guides, 1 interpretive program service, and 54 commercial service providers who offer opportunities for visitors to access and experience the park. The overall satisfaction of these services is good and there seems to be an appropriate amount of services available.

Resource Brief: Programming at the Princess Lodge

The park has a great partnership with Princess Cruises. Princess Lodge is just a few miles down the road from the Copper Center Visitor Center. Each year, Princess funds a couple of WRST's seasonal rangers to provide specific programming at their facility. Each night, a ranger delivers a guided walk on the Princess Lodge grounds, followed by a short PowerPoint presentation inside the lodge.

The park also delivers a special guided walk on the summer solstice. Since this is the longest day of the year, the walk is performed at midnight. This has been a popular activity for lodge guests who are spending the night at the lodge. The park also holds special presentations at the lodge when there are special events occurring at the Copper Center Visitor Center. One popular event, "Wings over the Wrangells," is a live bird event. The park partners with a rescue bird and rehabilitation center from Anchorage, and brings live birds to the park for talks and demonstrations.

Without Princess Cruises support, the park would have difficulty in hiring two additional seasonal rangers. With the lodge nearby, many of the Princess guests often come over to the visitor center to learn about the park and its resources. This partnership has been a great asset to the park and an opportunity for Princess' guests to learn about Wrangell-St. Elias.

Summer Solstice walk at the Princess Lodge.

2.4. Park Infrastructure

Overall Facility Condition Index

web

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

Asset Category	Number of Assets 2009 / 2014	FCI 2009 / 2014	Condition Status/Trend	Rationale
Buildings	185 / 200	0.158 / 0.082		Maintenance completed on park facilities has improved their condition. Maintenance activities include stabilizing a number of buildings and foundations in Kennecott Mines National Historic Landmark; restoring historic Kennecott buildings; painting several buildings throughout the park; re-roofing, replacing/repairing doors and windows as needed; and replacing boilers.
Campgrounds	1 / 2	0.572 / 0.031		There was recently a major renovation and upgrade of Kendesnii Campground, the park's largest campground. This improved the overall condition of the campground. The hiring of a permanent maintenance worker in campground area has kept routine and cyclic maintenance up to date.
Trails	26 / 28	0.027 / 0.204		Many of the park's trails have degraded substantially over a number of years. Recent work on several trails has significantly improved condition, and the hiring of permanent trail crew positions should result in improved trail conditions in the coming years. This is not reflected in the 2014 FCI.
Wastewater Systems	14 / 15	0.047 / 0.061		Two of the park's wastewater systems were previously in poor condition, but in the past two years the park has undertaken two projects to expand or replace the degraded systems. This will result in improved wastewater system conditions once the projects are finalized and work completed. This work is not yet reflected in the FCI.

Overall Facility Condition Index (continued)

web

Asset Category	Number of Assets 2009 / 2014	FCI 2009 / 2014	Condition Status/Trend	Rationale
Water Systems	12 / 11	0.123 / 0.002		The Glennallen water treatment system has been upgraded over the past years, greatly improving the treatment system. Preventive and recurring maintenance have kept the park's water systems in good condition.
Unpaved Roads	0 / 2	------- / 0.033		There are only two items listed in unpaved roads: the Kennecott National Creek Trestle and the Crystalline Hills parking area. The current FCI numbers indicate they are in good condition.
Paved Roads, Parking Areas, Bridges, Tunnels	8 / 5	0.276 / 0.172		The poor rating on paved roads is due to the high cost of the deferred maintenance to seal and repaint the roads and parking lots at the headquarters facility. There are plans in place to seal and repaint.
All Others	79 / 110	0.133 / 0.070		The few items in this category that scored poorly are interpretive media (signage).

2.5. Wilderness Character and Stewardship

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." Nearly 10 million acres, or 15,000 square miles, of Wrangell-St. Elias National Park and Preserve are designated and managed as a wilderness area—the largest in the U.S. National Park system. With the passage of the Alaska National Interest Lands Conservation Act (ANILCA) in 1980, a new vision of wildness was established, where humans are viewed not as separate from nature but rather a part of it. The vision also prescribes that park and preserve protection are not meant exclusively for natural and cultural resources—it also extends to people, their lifestyles and intangible associations with the land. For more information, see the park's 2014 Wilderness Character Narrative.

Overall Wilderness Character

web

Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Wilderness Character Qualities	Natural		Activities or processes that diminish the natural quality of wilderness do occur, though not in a manner that is noticeable to the average visitor. Some of the threats to the natural quality of wilderness include: • Predator control programs outside and adjacent to park boundaries reduce predator populations, in turn causing changes that ripple through the entire ecosystem. • Resident fish populations show the evidence of sport fishing. Commercial, sport and subsistence harvest of salmon, while managed on a sustainable basis, affect salmon returns in wilderness headwater streams and rivers. Sport and subsistence hunting have a direct effect on wildlife populations. These effects may be compatible with sustaining a healthy population, but they also have an impact on the natural quality. • The presence of global pollutants is now being documented in fish samples taken from park lakes. • Invasive plant species have been documented along roads, airstrips, and trails.

Overall Wilderness Character (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Wilderness Character Qualities (continued)	Undeveloped		The WRST wilderness retains its primeval character and influence, and is essentially without permanent improvements or modern human occupation. Besides fixed-wing aircraft, other motorized use does occur in portions of the wilderness. • Off-road vehicles are used on informal and managed trails to access traditional Dall's sheep hunting sites in a small portion of wilderness in the Black Mountain area. This use supports subsistence hunting. Off-road vehicle use has resulted in permanent scars on the landscape. To a subsistence hunter, these trails and associated impacts might represent a means of access to be able to continue to provide meat on the table. To some visitors, these trails and associated scars represent strong evidence of the presence of machines, and these impacts detract from the undeveloped character of the wilderness. • Snowmachine use occurs in the wilderness, in support of traditional activities such as trapping, but also for recreational purposes. While this use does not leave permanent evidence on the landscape, snowmachine tracks and noise detract from the undeveloped character of the wilderness. • The few human "improvements" within Wrangell-St. Elias wilderness are primarily airstrips, cabins, and automated equipment used for scientific study. At the top of several mountains, largely unknown and unseen, are NPS radio repeaters used to facilitate administrative activity. The airstrips and cabins are primitive. Some of these are no longer usable and harken back to an earlier time when the initial exploration of the land was ongoing and the park did not yet exist.
	Inhabited		While very few people have lived or continue to live within the wilderness boundary itself, Wrangell-St. Elias wilderness has always been a "homeland" for Native people (Dixon 2013) and a "working wilderness" for Euro-Americans who came to carve out a living in a wild land (Bleakley 2002, Hunt 1991). A subsistence way of life continues to thrive and evolve in WRST (Justin 2014, Simeone 2014). Traditional ways of living combine with modern forms of technology and evolve to meet the needs of people who depend upon the park's wild resources for sustenance, cultural identity, and spiritual well-being. As described above, access for traditional activities has had some impact on the undeveloped and natural qualities of wilderness, but in limited areas. Cultural artifacts of both ancient and historical times are preserved or allowed to decay, but all of them are cherished for the contribution they make to Wrangell-St. Elias' inhabited wilderness.

Overall Wilderness Character (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Wilderness Character Qualities (continued)	Untrammeled		Wrangell-St. Elias wilderness provides an outstanding example of untrammeled land virtually untouched by human use. Large scale natural processes such as undisturbed fire regimes carry out their role in the ecosystem without human interference. Fires burn unimpeded across thousands of acres of land with limited suppression efforts. Rivers flow freely with no dams, levies, or flood channels to affect their routes and no bridges to span them. The glaciers feeding these rivers grind against mountain walls and wildlife travels across the landscape without human interruption. Though primarily free of human manipulation, there are several human actions that affect the untrammeled quality of the wilderness. • While hunting, trapping, and fishing are a part of the cultural and historic fabric of the park, they require management of harvest and the need for the monitoring of fish and wildlife populations. • While capturing and collaring moose and caribou add to knowledge and increase capability to manage for healthy populations, these management activities also detract from the untrammeled character of wilderness. • While very little subsistence firewood gathering occurs in the wilderness, firewood cutting in association with permitted outfitter/guide activities does occur. This activity negatively impacts the untrammeled character.

Resource Brief: Wilderness Visitor Impact Inventory

During summer 2014, three seasonal wilderness field technicians inventoried visitor impacts in designated wilderness, including motorized and non-motorized trails, social trails, dispersed campsites, litter, and group encounter rates. The WRST wilderness is vast (9.6 million acres), with very few trails or other developments. Most visitor access is via small fixed-wing aircraft into remote landing strips or landing spots. As some landing strips receive more commercial use, nearby areas are starting to show impacts such as dispersed campsites and social trails. Point-to-point drop off/pick up trips are becoming more popular. These routes were chosen to be surveyed to provide the park with baseline information for developing its Wilderness Stewardship Plan.

Wilderness technician collecting wilderness baseline data

The remote and difficult-to-access nature of WRST made data collection a challenge, but the crew persevered through rain, wind, snow, biting bugs, rugged terrain, and impenetrable alder thickets. Logistics and expense of the project required innovative thinking and field techniques and packs weighing as much as 70 lbs. In the end, the beauty, incomparable solitude, challenge, and character of the WRST wilderness won out over the hardships, and all crew members plan to return for more of the same!

Overall Wilderness Character (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Wilderness Character Qualities (continued)	Solitude or Primitive and Unconfined Recreation Opportunity		Solitude and primitive and unconfined recreation is certainly to be found in WRST—as wilderness enthusiasts paddle the rivers and coasts in rafts and kayaks; as backpackers employ their navigation skills (and not a little common sense), to explore where few have been; as skiers traverse glaciers; and as mountaineers climb, much as they always have, with muscle power, steel crampons and ice axes. Wrangell-St Elias wilderness is a world class mountain-climbing area containing numerous peaks that have never been climbed. Few mountaineers make the trip because the area is so remote, the storms are so powerful, and the chances of rescue are so slim. These same qualities make it a haven for a select few, those seeking the purest experience unencumbered by crowds, self-reliant on their own skills and judgment to return them safely. The distance from major cities creates a buffer of remoteness that works to enforce the solitude. Because it takes expedition-like planning and logistics to get to WRST, the few who come are rewarded with ample opportunities to find solitude. To some visitors, the solitude can be intimidating; to others, these conditions create a deep sense of humility. The fear and excitement of being able to “disappear” both literally and figuratively can provide opportunities for self-discovery unavailable in most other places. In WRST, one can feel both humbled and exhilarated at one’s small place in an infinite universe. Some popular access portals and wilderness routes are showing signs of use that detract from a sense of solitude—campfire rings, trampled vegetation, compacted soils, social trails, litter, and human waste. In certain areas, seasonal hunting activities can result in an influx of users and an increase in the potential for encountering sights and sounds of other parties. Sights and sounds of motorized access have potential to detract from solitude, and a primitive and unconfined experience.

Wilderness Stewardship

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Stewardship to Preserve Wilderness Character	Key Information		Research efforts have been underway for the past two years to better understand impacts to wilderness character as well as visitor use patterns and the perceptions of visitors, concessionaires, and a variety of backcountry users. Identification of indicators and measures for wilderness character require data summary. Through the park's ongoing Wilderness Stewardship Planning effort, data related to visitor use continues to be compiled.
	Management Operations		WRST continues to increase awareness of wilderness law, regulation, and policy both with staff and with the general public. The park interdisciplinary team currently uses the Science in Wilderness Framework and a Minimum Requirements Analysis for administrative actions in wilderness. Commercial filming and other special uses are permitted only after considering impacts to wilderness character.
	Status of Plans		A Wilderness Stewardship Plan (WSP) was initiated in 2015, to be followed by a Commercial Services Plan. These plans will address all activities that have the potential to impact wilderness character. The WSP is scheduled for completion in 2018.
	Completed Training		The Park Superintendent has not completed the Carhart National Wilderness Leadership Training Course. WRST has not had a Unit Wilderness Workshop since 2005. The park has conducted informal training during the Wilderness Character Narrative workshop and staff-led training that preceded internal scoping for the Wilderness Stewardship Plan.

2.6. Subsistence

Subsistence

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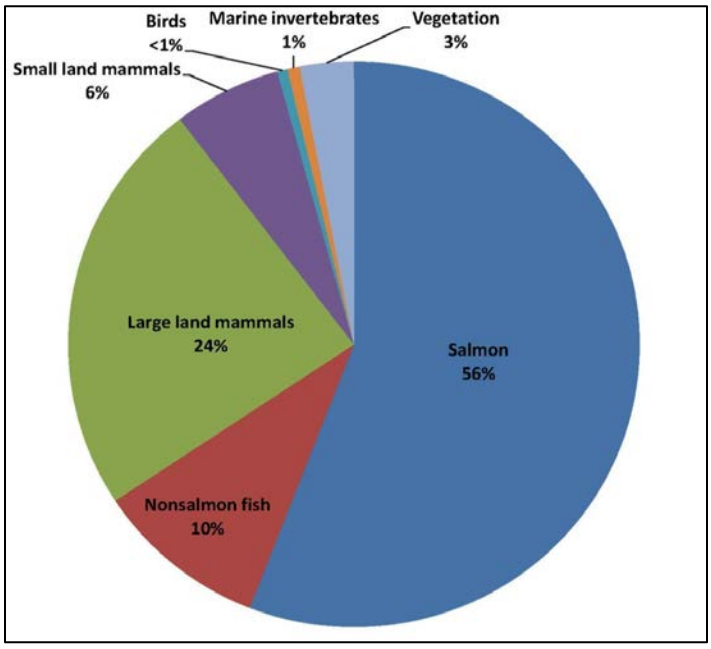
Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Knowledge	Up-to-date documentation is available about subsistence resources and their uses in communities eligible to harvest resources in the park/preserve		Working in cooperation with the Alaska Department of Fish and Game (ADF&G) Division of Subsistence, Wrangell-St. Elias has completed community harvest surveys in eight Copper Basin communities with subsistence rights in the park in the last 5 years (Kukkonen and Zimpelman 2012, La Vine et al. 2013, La Vine and Zimpelman 2014). Additional recent surveys were conducted by ADF&G in park-affiliated communities with funding from other sources.

Resource Brief: Community Harvest Surveys

In cooperation with the Alaska Department of Fish and Game, Division of Subsistence, Wrangell-St. Elias recently surveyed eight communities in the Southcentral Alaska's Copper Basin about subsistence harvests of fish, wildlife, firewood, and plants (Kukkonen and Zimpelman 2012, La Vine et al. 2013, La Vine and Zimpelman 2014). Information was also collected on harvest locations, sharing of subsistence resources, and the involvement of individual household members in subsistence activities.



Composition of wild resource harvests by pounds usable weight, Gakona, 2012 (La Vine and Zimpelman 2014).

This survey updated information most recently collected more than 20 years ago. The communities surveyed are eligible to harvest subsistence resources within Wrangell-St. Elias: Chistochina, Chitina, Copper Center, Gakona, Kenny Lake/Willow Creek, McCarthy, Mentasta Lake, Mentasta Pass, and Slana/Nabesna Road.

Taken together, the survey results document the continued importance of wild foods and other subsistence resources to residents of the rural communities in and around Wrangell-St. Elias. In all of the communities surveyed, more than 90 percent of the households reported using subsistence resources, and at least 85 percent of the households in each community reported participating in harvest of subsistence resources. Per capita harvests of wild foods during the most recent study year ranged from a low of 87 pounds in McCarthy to a high of 246 pounds in Chitina. Four of the communities had estimated per capita harvests in excess of 200 pounds per capita. In most of the surveyed communities, these harvest amounts equaled or exceeded per capita harvests documented during the previous round of surveys in the 1980s. Although the list of top resources used varied from community to community, sockeye salmon, firewood, moose and blueberries often appeared on the list of the five most frequently used resources.

Subsistence (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Opportunity and Continuity for Subsistence Activities	Proportion of users who are able to engage in all the subsistence uses they would like to pursue		Opportunities for subsistence activities continue to be available. For most species and areas, harvest opportunities are not limited by drawing permits, area closures, or other restrictions on harvest. Game Management Unit 11 is closed to the harvest of caribou due to conservation concerns for the Mentasta caribou herd. Harvest quotas exist for a few other hunts; however, those quotas are generally not met.
	Subsistence users are engaged in subsistence management		The Wrangell-St. Elias Subsistence Resource Commission meets regularly in communities around the park to take comments from the public and make recommendations to the park and the Federal Subsistence Board about the management of local subsistence resources.
	Continuity of subsistence uses		The harvest and use of wild foods and other subsistence activities continues to be important for residents of communities in and around the park. Recent household surveys in the Copper Basin suggest that per capita harvest levels are similar to or in some cases higher than those documented during the 1980s. More than 90 percent of the surveyed households reported using subsistence resources during the study year (Kukkonen and Zimpelman 2012, La Vine et al. 2013, La Vine and Zimpelman 2014). There is some concern about the continuity of subsistence, because many youth in rural communities move to urban communities to find employment.

Resource Brief: Wrangell-St. Elias National Park Subsistence Resource Commission

The Wrangell-St. Elias National Park Subsistence Resource Commission provides a venue for local subsistence users to have input in the management of subsistence resources in Wrangell-St. Elias National Park and Preserve. It was established under the provisions of the Alaska National Interest Lands Conservation Act and charged with recommending a program for subsistence hunting in the park. The commission's recommendations may address major topics related to management of subsistence such as access, customary and traditional use determinations, eligibility, season and harvest limits, harvest methods and means, traditional uses areas, trapping, customary trade, cabin use, plant materials, and research. Since the establishment of the Federal Subsistence Program in 1990, the commission has also been making recommendations on proposals affecting Wrangell-St. Elias directly to Regional Advisory Councils and the Federal Subsistence Board.

The commission consists of nine local residents who are, or have been, active subsistence users of the park. Commission members represent the geographic, cultural, and user diversity from within the region. They are appointed by the Governor, the Secretary of the Interior, and Regional Advisory Councils. The commission meets twice a year at various locations surrounding the park.

The Wrangell-St. Elias National Park Subsistence Resource Commission meets in Gakona, Alaska on February 26, 2015.

Subsistence (continued)

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Indicators of Condition	Specific Measures	Condition Status/Trend	Rationale
Harvest of Fish, Wildlife, and Vegetation	Fish Resource Availability		There has been a large increase in sockeye salmon escapement in the past 5 years from the previous 5 years. Based on escapement figures from 2 park weirs and the ADF&G upriver escapement estimates (Miles Lake total salmon escapement minus the Native Village of Eyak's mark-recapture Chinook salmon figures). Long Lake weir up 169% (McCormick 2014), Tanada Creek weir escapement is up 28% (Sarafin 2012), upper Copper River estimate up 38% (Mark Somerville, ADF&G area biologist, personal communication).
	Wildlife Resource Availability		Sheep, moose, and caribou populations appear stable. However, one caribou herd is closed to harvest and the second is open to hunting until a small quota (7 animals) is reached. Opportunity for moose harvest was recently expanded by opening a portion of the unit to winter moose harvest in addition to the long-standing fall season. There is substantial concern among hunters regarding the opportunity to harvest sheep; however, neither subsistence nor sport harvest has been restricted during the general season in the recent past. The Game Management Units that cover WRST are some of the few road-accessible areas where sport hunters can still hunt sheep in Alaska without having to compete in a limited drawing to obtain a harvest tag. Monitoring wildlife resource availability and cautious management are appropriate strategies.
	Vegetation Resource Availability		Berries, firewood, mushrooms, and birch bark are all valued vegetation subsistence resources. Other parts of plants are also harvested for a variety of medicinal, edible, and handicraft uses. Unfortunately, the park lacks reliable data on the status of most of these resources. Firewood seems to be a fairly stable vegetation resource, as a large spruce bark beetle infestation in the 1980s left large amounts of standing dead timber available for harvest. Berry harvests, however, may be threatened due to an increase in mismatched timing of pollinators, rain versus dry events, and freeze events that lead plants to have failed crops. The park has received an increase in calls from users concerned about various berry crops in some traditional locales. Research indicates that this problem will increase with climate change and that this is an increasing problem at high latitudes. Berry crops may become out of synch with traditional harvest times, which would also impact subsistence harvesters.

Resource Brief: Fishwheels

For subsistence users in the Copper River basin, fishwheels are one type of gear allowable for salmon harvest during the summer months. Fishwheels were brought to the Copper River around 1911. Before that, the Ahtna people used dipnets or fish traps to harvest salmon (Simeone and Kari 2002). A fishwheel is a simple and very effective way to harvest fish in a river. Traditionally, they were made from roots and small trees. Now, they are usually constructed from wood, metal, Styrofoam, metal barrels, and/or wire fencing.

Traditional fishwheel made by Johnny Goodlataw. This wheel sits in front of the Ahtna Cultural Center at WRST.

A fishwheel consists of a floating platform that holds a rotating axle. Four arms protrude from the axle, with two baskets and two paddles on opposing spokes (Reckord 1983). The fishwheels are set out into the river channel but anchored in some way (usually cables or ropes) to the bank, with the open part of the baskets pointed downstream. The river current rotates the wheel by pushing on the paddle arms. The baskets scoop up the fish as they swim up the river against the current. An opening in the side of the basket allows the fish to slide out of the basket when it is at the top of its rotation into a box on the platform beside the wheel.

Fishwheels are used as an allowable subsistence gear type in Alaska in the upper Copper, Kuskokwim, Kasilof, and Yukon Rivers. They are also used to fish commercially in parts of the Yukon and Tanana Rivers. In the upper Copper River federal fisheries, they are one of three allowable methods for salmon fishing; the others are dip net and rod and reel.

In 2014, the harvest by fishwheel in the upper Copper River District was 20,359 sockeye salmon, 360 Chinook salmon, and 23 coho salmon (McCormick 2014). This federal fishery is open only to rural Alaskan residents who live in communities that have a customary and traditional use pattern of fishing in this area. There is also a concurrent state subsistence fishery that allows fishwheel harvest and is open to all Alaska residents. Each wheel is generally owned by one person, but many other people can use it with the owner's permission. Subsistence users are allowed to share their catch with friends and relatives. Up to 500 fish per household can be harvested. Federal subsistence permits are issued annually by the park for salmon harvest in the Upper Copper River Basin; 427 permits were issued in 2014.

***Left*: Close-up view of a fishwheel, used by subsistence users in the Copper River basin; *Right*: Fishwheels belonging to subsistence users lining the bank of the Copper River at Chitina.**

Resource Brief: Batzulnetas, Katie John, and the Fish Weir at Tanada Creek

Tanada Creek flows into the headwaters of the Copper River just upstream of a fishwheel near a site known to the upper Ahtna people as “the roasted salmon place” (Simeone 2014). Every year anadromous sockeye salmon swim by the fishwheel, and into Tanada Creek. They migrate up the creek to Tanada Lake where they spawn and die. Their offspring hatch and then swim down the creek into the Copper River to begin the cycle all over again. These sockeye are one of the furthest upstream populations of sockeye salmon in the Copper River drainage and have been caught for generations by the upper Ahtna people in this area, known as Batzulnetas (Simeone and Kari 2002). It is a good place to fish, but in 1964 the newly designated state of Alaska restricted the upstream boundary for the salmon fishery in the upper Copper River to the confluence with the Slana River, approximately six miles from Batzulnetas (Norris 2002). It became illegal to fish for salmon at this traditional fishing site.

The Tanada Creek weir, operated by WRST is located just downstream of Katie John’s traditional fish camp at Batzulnetas. Katie John was the lead plaintiff in a series of lawsuits aimed at reclaiming Alaska Native fishing rights. It started in 1984 when she and Doris Charles petitioned the state to allow them to fish at their fish camp, a petition that was denied. This was the start of seventeen years of litigation, congressional moratoriums, political arguments, and grassroots struggle. A later lawsuit was the key factor in bringing the federal government into fisheries resource management of navigable waterways in the state. The federal government recognized a rural subsistence preference for all rural residents who had a customary and traditional use of fish and wildlife, the state of Alaska did not. Finally, in 2001, when trying to decide whether or not the state should appeal the latest court ruling to the U.S. Supreme Court, then governor Tony Knowles visited Katie at Batzulnetas and spent an afternoon at her fish camp and later at her home in Mentasta (Hess 2013). A few days later Governor Knowles made the decision not to take an appeal to the U.S. Supreme Court. Katie John had won her case. As a result of Katie John’s determination and vision, her name is synonymous in Alaska with rural subsistence rights (Norris 2002).

The Tanada Creek weir is located on private land belonging to Doris Charles’ descendants. With their permission, the weir is reconstructed each season and WRST’s fish crew counts the returning sockeye that swim past Batzulnetas on their way to spawn in Tanada Lake. Although Katie John passed away in 2013, her descendants continue to fish at Batzulnetas.

***Left*: Katie John at Batzulnetas in 2003; *Right*: Batzulnetas Culture Camp.**

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

- WRST continued to operate two weirs within the park in order to monitor daily salmon migration into Tanada Lake and Long Lake, which provides information about yearly run strength and migratory timing in tributaries in the park.
- Continued an ongoing joint project with the ADF&G to transfer unwanted rainbow trout from Summit Lake into nearby Silver Lake (a lake that is stocked by the state and is not on park land).
- Completed natural resource inventories, including: mammal inventory (Cook and MacDonald 2003), coastal fish inventory (Arimitsu et al. 2003), freshwater fish inventory (Markis et al. 2004), vascular plants inventory (Cook et al. 2007), and surficial geological features inventory (Wilson 2005, Labay and Wilson 2004), and glacier status and trends (Loso et al. 2014).
- Finalized a national wetlands inventory standard mapping of the wetlands of Gold Hill, Chisana Mining District where active mining occurs (NPS Wetlands Inventory 2015).
- Initiated important aquatic invasive plant inventories to detect the invasive Elodea or Canadian waterweed in WRST waters.
- Conducted bat research, which revealed that the park has both more species and a higher abundance of bats than previously thought.
- National and local fish contaminant research in lakes within the park found high concentrations of mercury and some organic pollutants in some fish species from some lakes. This data will be useful in future planning efforts.
- Developed an international management plan for the Chisana caribou herd in cooperation with the Government of Yukon, White River First Nation, Kluane First Nation, Alaska Department of Fish and Game, and the U.S. Fish and Wildlife Service.
- Completed a park-wide Dall's sheep population estimate based on newly developed aerial distance sampling methodology that includes estimates of precision and correction for imperfect detection.
- Participated in research to determine reproduction, survival, and abundance of the Kittlitz's murrelet, a candidate species considered for listing under the Endangered Species Act.
- Managed the Chakina Fire, the Gilahina Fire, and the Chisana River Fire for resource benefits and allowed these fires to burn extensive areas naturally.
- Informed park management using science-based natural resource inventory and monitoring activities including ongoing climate monitoring, wildlife surveys, vegetation green-up monitoring, glacial volume change inventories, and monitoring of flowing waters.
- Attracted external researchers by developing a research-friendly and supportive environment.
- Initiated a permanent glacier monitoring program on Kennicott Glacier.
- Installed a new year-round discharge monitoring gage on the Kennicott River, in collaboration with the NPS Dam Safety Program and USGS.
- Restored and protected resource values, including but not limited to wetlands, through improvements of ORV trails along the Nabesna Road.
- Completed high-resolution permafrost modeling (Panda et al. 2014).
- Collaborated with ADF&G to manage salmon fisheries in the Copper River.

Cultural Resources

- Surveyed residents of eight Copper Basin communities about the harvest and use of wild renewable resources.
- Updated the web interface for Wrangell-St. Elias National Park and Preserve Project Jukebox and added new interviews from the Upper Tanana communities.
- Completed a report on Upper Ahtna ties to the northern portion of WRST in cooperation with Mount Sanford Tribal Consortium and the Cheesh'na Tribal Council.
- Worked with the Cheesh'na Tribal Council and the Mentasta Traditional Council to identify a name for the park's new campground on the Nabesna Road that recognizes Upper Ahtna ties to the area.
- Conducted 115 condition assessments of known archeological and historic sites within the park over the past 3 years.
- Completed a loan agreement with the Ahtna Heritage Foundation for them to display ice-patch artifacts at the Ahtna Cultural Center.

- Continued excellent consultation relationship with the Alaska State Historic Preservation Office, including the renewal of the Kennecott Mines National Historic Landmark Stabilization, Rehabilitation, Reconstruction, and Maintenance Programmatic Agreement, and development of a programmatic agreement for implementation of the Nabesna Off-road Vehicle trails program.
- Cultural Anthropologist and Subsistence Specialist Barbara Cellarius won the 2014 DOI Multi-Cultural Day Photography Contest in the Food Category for her photograph titled "Smoking Salmon at Johnny Goodlataw's Copper River Fish Camp."

Visitor Experience

- Steadily increased the amount of interpretive programs and attendance of programs at the park.
- Completed a schematic design for interpretive exhibits for the Kennecott Mines National Historic Landmark in 2015.
- Developed a new winter camp program and expanded programming for middle school grades in 2014.
- Continued increase in the number of Facebook and other social media site followers, due to posting by park staff.
- Organized and updated the park website to allow better access for the visitor in 2014.
- Increased attendance at ranger programs as more bus tours are staying longer at the Copper Center Visitor Center and attending programs.
- Created a free audio tour of the Nabesna Road, which is available on CD at the ranger station or for download from the park website.
- District ranger law enforcement officers continue to maintain a wide geographic area of responsibility for visitor safety and work in conjunction with the chief ranger to formulate a program of visitor education that promotes safety and compliance with park regulations.
- Each district ranger continues to maintain a staff of law enforcement rangers trained in both emergency medical services (EMS) and search and rescue (SAR), in order to provide basic visitor safety to the public.
- The Visitor and Resource Protection Division continues to maintain a high degree of readiness for backcountry response for search and rescue of visitors, should the need arise.
- The Ranger Division continues to actively promote a P-SAR (preventative search and rescue) program for backcountry visitors in order to get safety and best-practices information out to the public. Visitor safety remains a primary task for the rangers who maintain a robust visitor protection patrol schedule for both backcountry and frontcountry visitors.

Park Infrastructure

- Continued stabilization, repair, and rehabilitation of the historic buildings at the Kennecott Mines National Historic Landmark, including lead and asbestos mitigation.
- Conducted cyclic painting and maintenance to preserve the historic integrity of these building, while keeping them safe for the public.
- Upgraded the electrical and water systems in Kennecott Mines National Historic Landmark, and installed a COGEN (heat and power generation) system at McCarthy airport.
- WRST employee Jim Baker received the Appleman-Judd-Lewis Award for Cultural Resource Stewardship through Maintenance, for his work at the Kennecott Mines National Historic Landmark.
- Repaired and upgraded the Kendesnii Campground.
- Rerouted the Soda Lake Trail.
- Conducted major renovations and improvements on the Copper Lake Trail, including building a bridge over Tanada Creek.
- Repaired and upgraded deficiencies of the Nugget Creek trail.
- Continued cyclic upkeep of backcountry airstrips and trails.
- Conducted multiple renovations to various public cabins.
- Made major improvements to McCarthy airport and other backcountry fueling facilities.
- Installed two leach fields, one at the Copper Center Seasonal housing complex and the other at the Slana Ranger Station.
- Installed a new above ground septic system at the Slana Freed property.
- Renovated and upgraded the Slana Freed property main house.
- Renovated and relocated of the Root Glacier outhouse.
- Replaced the old heavy garage doors at the Glennallen Maintenance Facility with new safer door.
- Upgraded and improved the Glennallen Housing Water system.
- Built the new Headquarters Bluff trail and overlook.
- Built the Headquarters amphitheater.
- Installed programmable thermostats, motion sensor lighting, parking lot controllers (for vehicle block heater control), and LED lighting (as fixtures are replaced), to be more efficient and bring down the overall carbon footprint at the Park Headquarters Facilities.

Wilderness Character and Stewardship

- Began using the Science in Wilderness Framework for external research permits in designated wilderness in 2011.
- Began using the Minimum Requirements Decision Guide for administrative activities in designated wilderness in 2011.
- The WRST designated wilderness boundary was refined in the regional GIS database in 2013.
- Conducted a Wilderness Character Narrative Workshop coordinated by Dr. Peter Landres of the Aldo Leopold Wilderness Research Institute. This two-day, park-wide effort took place in 2013 and resulted in the development of a Wilderness Character Narrative, required for all parks that manage designated wilderness and associated wilderness resources.
- Collected baseline data regarding visitor impacts in the wilderness backcountry in 2014.
- Initiated a three-year Wilderness Stewardship Planning effort in 2015, including internal and external scoping and wilderness baseline data collection.
- Received the Regional Wilderness Stewardship Award.

Subsistence

- WRST continues to manage salmon in the Copper River in collaboration with the state of Alaska to ensure opportunities for subsistence harvest for local rural residents.
- Provided additional subsistence harvest opportunities for local rural residents by establishing two new federal subsistence hunts: a winter moose hunt in a portion of Game Management Unit 11 and a hunt for the Chisana Caribou herd in a portion of Game Management Unit 12.
- Surveyed residents of eight Copper Basin communities about the harvest and use of wild renewable resources, updating information that was more than 20 years old.
- The Wrangell-St. Elias National Park Subsistence Resource Commission remains active in advising the park about the management of subsistence resources and commenting on proposals being considered by the Federal Subsistence Board.
- Resolved concern about authorization to use portable motors such as chainsaws in support of the subsistence way of life through the issuance of a community-wide permit.

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

Wrangell-St. Elias National Park and Preserve is truly a land that is so spectacular it defies description. A long list of superlatives still does not adequately describe this vast land. Management of this spectacular landscape presents many challenges. The Alaska National Interest Lands Conservation Act (ANILCA) was carefully crafted to maintain subsistence opportunity, private lands, and traditional means of access in the newly established park unit. WRST staff is excited that visitation by the global community continues to grow, but park visitors need adequate infrastructure to support them during their visit. The complex challenges described below are a snapshot of the issues the park faces in 2015.

Issue/Challenge #1
Balance within the Kennecott Mines National Historic Landmark

What is the issue?
Since acquisition in 1998, WRST has had to deal with the balancing act of active stabilization of the historic structures of Kennecott Mines National Historic Landmark (NHL) to maintain their integrity and run an interpretive program in the midst of a thriving, living community made up of diverse local and tourist populations. Increasing tourism and the desire to explore the historic structures at the site generated new concerns regarding both access and safety in buildings that were designed and built 100 years ago.

What has the park done about the issue?
The park updated the 2001 Interim Operations Plan recognizing WRST partnerships with the local communities of Kennecott and McCarthy, and continues emphasizing open communications between the NPS, local residents, non-profit organizations, and businesses.

The resulting Kennecott Mines National Historic Landmark Operations Plan identified the general goal of historic preservation and interpretation of the structures and features that define the historic, cultural, and natural character of the NHL. It outlines how the NPS will deal with cultural and natural resources, interpretation, access and transportation, and administration and operations. It was finalized by the signing of a Finding of No Significant Impact by the Alaska Regional Director in November 2013.

What's next?
The Kennecott Mines National Historic Landmark Operations plan will remain in place for the next 5–10 years and will guide NPS historic preservation and stabilization goals, while balancing the needs and desires of the local communities. It will allow for focused interpretation on the historical and natural aspects of the NHL, and provide direction for both park managers and partners.

Issue/Challenge #2:
Park and Preserve Access

What is the issue?
Access to, and through WRST creates management and resource challenges that can be divided into two major areas:

- Access to WRST
  - WRST has road, trail, water route, and aviation access. This allows visitors and users to access the park in a variety of ways, whether from the approximately 90 miles of AK Department of Transportation managed road or via one of the approximately 250 landing strips. Since access is so varied with no controls, gates, or mandatory registration for this park; it makes estimations of use and impact analysis challenging. Additionally, access across the roughly 683 thousand acres of private native lands is provided via the approximately 320 miles of 17b easements (Alaska Native Claims Settlement Act, 43 U.S.C. 1616(b)).
- Access through WRST
  - WRST has about 238 private in-holders within the administrative boundary. Many need, and are provided, access to their private property. Some are located on the road system but others may be 100 air miles away from the nearest road or population center. The largest private in-holders are the native and village corporations of Ahtna Incorporated, Chugach Alaska Corporation, and Chitina Native Corporation. These native corporations reflect the bulk of the private land within the park boundary, making up about 5% or 680,186 acres. There is also access and use of 56,573 acres of State of Alaska and University of Alaska land within the WRST administrative boundary. Lastly, there may be a possibility for future park access via Alaska Revised Statue 2477 (RS 2477), which would develop new Alaska highways. At Statehood, the State of Alaska identified potential highway routes and many of these routes traverse the Park.

What has the park done about the issue?
WRST recognizes that neighbors within and adjacent to park boundaries make up and contribute to the unique character of the park. WRST has a relationship with land managers at the Native Corporations and regularly updates affected members of park operations. WRST is involved in the McCarthy Area Council (MAC), which represents many of the private land owners in the area. Significantly, the park has a viable approach to recognizing access rights via the "Established and Maintainable Access to Inholdings Programmatic Plan and Environmental Assessment" document. This is the mechanism that the park uses to issue right-of-way certificates of access (RWCA) to individuals with private land in the park.

What's next?
A recognized challenge for the park is the 17(b) easements crossing private native lands. Many of these easements are identified only on maps and have no visible footprint on the ground. WRST has management authority over the 17(b) easements within the park boundary and needs to have respectful and fruitful negotiations with Native Corporation neighbors to resolve these access issues.

Issue Challenge #3:
Wilderness Stewardship

What is the issue?
With 9.6 million acres of designated wilderness within 13 million acres of national park and preserve, WRST is the largest wilderness unit in the United States and comprises over 10 percent of the entire National Wilderness Preservation System. Section 707 of ANILCA says that "except as otherwise expressly provided for in this Act, wilderness…shall be administered in accordance with…the Wilderness Act…" The Wilderness Act mandates that wilderness be managed to preserve wilderness character. The challenge to the park is balancing the preservation of wilderness character with provisions of ANILCA that recognize the unique nature of Alaska parks, subsistence use, and wilderness character.

Specifically, the park attempts to balance the following activities (most are provided for in ANILCA) with the preservation of wilderness character:

- Motorized access to subsistence activities
- Snowmachine use to access traditional activities
- Airstrip management and maintenance
- Cabin management and maintenance
- Commercial use in wilderness, including guided sport hunting concessions and commercial use authorizations
- Maintenance and management of navigational aids, communication sites, and research proposals and activities
- Management of visitor use and associated impacts such as campsites and social trails
- Administrative activities in wilderness

The 1986 WRST General Management Plan (GMP) provides general guidance on activities in wilderness allowed under ANILCA. This consists more of a description of the regulatory framework rather than management guidance. NPS management policies and on-the-ground realities have changed notably since the GMP was prepared in 1986. For example, new requirements for park planning and wilderness management require a clarification of desired future conditions for the park that align with the park purpose and significance statements identified in the 2010 Foundation Statement. In addition, the 1986 GMP does not adequately establish wilderness resource protection and visitor experience goals. Nor does it specifically describe desired conditions and standards for measuring success.

What has the park done about the issue?
WRST continues to increase awareness of wilderness law, regulation, and policy both on staff and with the general public. The park interdisciplinary team currently uses the Science in Wilderness Framework and a Minimum Requirements Analysis for administrative actions in wilderness. Commercial filming and other special uses are permitted only after considering impacts to wilderness character. The majority of the off-road vehicle (ORV) use by subsistence users in wilderness was addressed in the 2011 Record of Decision (ROD) for the Nabesna Off-Road Vehicle Management Plan/ Environmental Impact Statement. The ROD designated trails in wilderness that subsistence ORV users must stay on.

What's next?
The park has received funding to initiate a Wilderness Stewardship/Backcountry Management Plan. The plan will provide management direction and guidance to help the park deal with the issues identified above. Specifically, the plan will identify desired future conditions, goals, and objectives for wilderness in WRST. It will identify indicators and standards, based on the wilderness character narrative, to be used for monitoring the condition of WRST wilderness character. The plan will identify appropriate management actions to preserve and improve wilderness character while allowing for exceptions provided under ANILCA. The park will rely on an extensive public involvement effort throughout the planning process to identify issues, management alternatives, and potential management actions.

Issue Challenge #4:
Climate Change Response

What is the issue?
Retreating glaciers, thawing permafrost, and longer growing seasons present clear evidence of the park's changing climate. Scientists who observe the Earth's climate have documented a warming trend caused in large part by human activity (IPCC 2013). Modeling results predict the park's climate will warm over the coming century. Five recent global climate models, assuming a moderate emissions scenario, recently predicted that, by the 2060s, summertime average temperature in the park will increase by 2 °C and the wintertime precipitation average will increase by up to 25 cm in most areas, and up to 50 cm in the coastal mountains (Loso et al. 2014). Not only does climate change transform the natural and cultural landscapes of national parks, but it also is very likely to impact the visitor's park experience by changing wildlife and glacier viewing opportunities. Increased wild-land fire frequency, severity, and area burned will increase the number of smoky days. These changes and impacts already are being experienced at Wrangell-St. Elias. As the scope and intensity of climate change increase, the historical or "natural" conditions in parks will be difficult or impossible to maintain. What will it mean to protect park resources "unimpaired for future generations" in the face of climate change?

What has the park done about the issue?
In 2012, the NPS released a Climate Change Action Plan, which provides context, sets short-term priorities, and considers future planning for the Climate Change Response Program's four emphasis areas: (1) Science: using science to help manage parks, (2) Adaptation: planning for an uncertain future, (3) Mitigation: reducing the NPS carbon footprint, and (4) Communication: educating about climate change.

Wrangell-St. Elias is responding to climate change in all four areas. Accomplishments within each area include the following:

(1) Science:
- Monitoring climate at eight weather stations that contribute year-round real-time data to national climate databases
- Monitoring Kennicott Glacier for cumulative mass balance, terminus location, and rates of reduction in area and thickness
- Determining topographic change due to glacier change or other processes using digital elevation models and GIS
- Developing a protocol to detect the effects of climate change on the extent and thermal properties of permafrost
- Analyzing data from vegetation plots to establish a baseline for future changes (Central Alaska Network)
- Documenting the phenology of aspen leaf-out and fall color change in relation to climate data
- Conducting social science interviews with rural community members and park staff to collect knowledge about how climate change has affected resources in Wrangell-St. Elias

(2) Adaptation:
- Developing plant diversity maps for use in scenario planning and visualization, e.g., encroachment of woody vegetation upslope into tundra would pose a major threat to vulnerable tundra plant species that are already rare
- Planning and funding a study of the Kennicott Glacier's ongoing changes to plan for infrastructure hazards that must be accommodated by future developments
- Discussing potential use of prescribed fire to decrease the probability for large severe fires and allow ecosystems to adjust to new climatic conditions

(3) Mitigation:
- Using solar power at many remote sites, and investigating use of photovoltaic power to supplement propane generators at the Kennecott Mines NHL
- Hiking to wilderness work sites when feasible instead of using a helicopter
- Reusing and recycling paper, cans, and metal. WRST is presently awaiting results from an environmental audit that will guide future efforts in this area

(4) Communication:
- Offering training sessions on climate change for park rangers (interpreters)
- Including climate change messages in many interpretive programs
- Planning web page updates to www.nps.gov/wrst/learn/nature/climate-change.htm

What's next?
Wrangell-St. Elias will continue efforts in all four areas to address climate change: science, adaptation, mitigation, and communication. In particular, long-term (25–30 years) wildlife, plant community, glacier, stream, and permafrost monitoring programs, run by the Central Alaska Network, in conjunction with the park's climate monitoring data, are now well-positioned to detect climate change responses in key park resources.

Issue Challenge #5:
Off Road Vehicle Management

What is the issue?
Off-road vehicle (ORV) use has been occurring since before the establishment of the park. The park's 1986 General Management Plan (GMP) recognized that ANILCA authorized ORV use for subsistence uses and access to inholdings in WRST under certain circumstances. For recreational ORV use, the GMP cited the need for designation of specific areas for ORV use and a determination that ORV use in these areas would not adversely affect the natural, aesthetic, or scenic values, consistent with Executive Order 11644.

Since 1986 the park has conducted two major studies (Happe et al. 1998, Connery 1987) of ORV impacts and mitigation and a detailed survey and inventory of physical conditions along the major existing trails (Meyer and Anderson 2007). These studies demonstrated that ORV use over wet areas leads to trail braiding and widening. Vegetation does not recover quickly, soils erode, permafrost depth changes, and impacts to surface hydrology occur. Where degraded trail conditions occur, trails can become impassable, resulting in the formation of multiple alignments or braiding.

On June 29, 2006, the National Parks Conservation Association, Alaska Center for the Environment, and the Wilderness Society filed a lawsuit against the NPS regarding recreational ORV use on nine trails within WRST. In a settlement agreement, the NPS agreed to suspend issuing recreational ORV permits for three specific trails until an environmental impact statement (EIS) was completed and a decision made regarding authorized uses on park ORV trails.

What has the park done about the issue?
The Nabesna ORV Management Plan EIS was completed and a Record of Decision signed in 2011 (see online documents). The Record of Decision included several components to address ORV use in the Nabesna area of the park:

- Recreational ORV use would not be permitted on trails in the national park
- Recreational ORV use is permitted on improved and designated trails in the national preserve
- Highly degraded trails are being improved through a variety of trail improvement techniques, including re-routes and trail hardening. Where re-routes are utilized, old degraded trail segments are closed and allowed to recover
- Weight and size limits were established for ORVs in the park/preserve
- Subsistence users utilizing ORVs in wilderness must stay on designated trails, with the exception of game retrieval. In non-wilderness, off-trail use may occur as long as resource impacts are not occurring (as defined by developed standards)

These decisions have resulted in trail improvements that allow ORV users to stay on one trail alignment without having to leave the trail and create off-trail impacts.

What's next?
The Nabesna ORV Management Plan provided a framework for ORV management park-wide. The park still permits recreational ORV use on the Nugget Creek trail. This use will need to be addressed through a planning process, either a frontcountry management plan or a site-specific plan addressing trail use in that area. ORV use in wilderness outside the Black Mountain area will be addressed in the upcoming Wilderness Stewardship/Backcountry Management Plan, which may designate trails for subsistence use and require users to stay on those trails.

Issue/Challenge #6:
Management of Mining within Wrangell-St. Elias

What is the issue?
Valid patented and unpatented mining claims exist within WRST. Owners of these claims may operate in accordance with an authorization to mine issued by the NPS Alaska Regional Director. WRST has many valid mining claims. Typically mine operators need to transport equipment and supplies across the park unit to their claims, which may involve a wide range of impacts. Mining operations are conducted in accordance with an NPS mining plan of operations; however, environmental impacts still occur from these operations.

What has the park done about the issue?
WRST has acquired a number of mining claims. WRST is working closely with some operators to complete mining plans to allow operations. WRST has cooperated with the BLM to complete validity exams for some claim groups. Validity exams are required to complete a mining plan of operations. The park has completed several environmental assessments in support of mining plans of operations.

What's next?
WRST is pursuing acquisition of additional claim groups. The park is performing further NEPA analysis of proposed mining operations and their associated access. WRST will continue to reach out to claim owners to resolve specific issues.

Issue Challenge #7:
Invasive Plant Management

What is the issue?
Unlike many places in the lower 48 states, Wrangell-St. Elias can proudly say that it has large, intact ecosystems, many of which are untouched by invasive species. However, 45 species of invasive plants have been detected within the park and new arrivals and expansion of existing populations are documented annually. To date, most infestations are contained along roadsides, trailheads, and the occasional airstrip, but with invasive plants hitching rides on every mode of human conveyance and with some wildlife, the threats are numerous. Elodea, an aquatic invasive plant that poses some threat to salmon fisheries, has been rapidly spreading through the state via floatplanes, and floatplanes are known to be flying from infested lakes to pristine lakes in the park.

Two roads, eleven distinct ORV trails, and 19 maintained backcountry landing strips provide access to WRST, although the majority of park lands remain inaccessible to all but foot and river traffic. These primary vectors for invasive plants are spread out over the 13.2 million acres of park and preserve lands. As the access points to the park are diffuse it is very difficult to monitor all possible entry points regularly; there may be places that plants come in that the park is unaware of until someone stumbles across an infestation and alerts park staff. Increasing visitation and increasing number of invasive species in Alaska can only mean that there is an increasing threat of these plants being introduced and altering the pristine ecosystem.

What has the park done about the issue?
To combat the threat of invasive plants, the park tries to: a) monitor known infestations of invasive weeds; b) contain, control and where possible eradicate these infestations; and c) to inventory areas with known human disturbance where invasive plants are likely to appear. Control work, i.e., weeding, is prioritized using the invasiveness rank from the Invasiveness Ranking System for Non-Native Plants of Alaska (Carlson et al. 2008). Species with a higher rank are considered more aggressive than weeds with a lower rank and are usually considered a higher priority for treatment. Small infestations of weeds that can easily be pulled are also a high priority regardless of the species rank. Large infestations of low ranked weeds are considered the lowest priority for control but are still mapped and monitored. Areas with high human activity or high vector areas (areas likely to transfer invasive plants or seeds to other areas of the park) are also a priority. The park actively controls known populations through manual, mechanical, or chemical means and regularly surveys likely portals for new infestations. The park sees education of visitors and residents as a key component as invasive plants can easily hitchhike into the park, without anyone knowing.

Issue Challenge #8:
Park Infrastructure General Challenges

What is the issue?
There are several different challenges associated with park infrastructure:

- WRST is a uniquely large park, with vast travel distances, and challenging and dangerous weather. Stabilizing, repairing, and rehabbing historic structures in Kennecott Mines National Historic Landmark is a large undertaking. Maintenance of trails and back country facilities is more challenging in WRST than in most parks. Even Park Headquarters is in a remote location by most standards. Finding skilled, trained workers available to complete maintenance tasks in these remote and sparsely populated areas remains a challenge. Budget limitations further restrict that search. Shipping supplies and tools to remote locations compounds the cost of all work efforts.

- Historical structures do not meet ADA requirements; they do not meet modern codes for fire detection, sprinkler, or other safety infrastructure. Upgrading these and other public spaces is a major challenge.

- Trails and building maintenance personnel, as well as utility supervisors at WRST, are subject to furlough (mandatory unpaid time off, often used when budgets fall short). Key employees are often sent on furlough during the winter season, when new projects should be being developed, and summer seasonal staff should be located and hired. All planning, paperwork, and management activities must be completed by the Chief of Maintenance and sparse winter staff. This large workload is more than that staff can keep up with, and all schedules and projects fall behind.

- With years of stabilization, restoration, and repair of the buildings in Kennecott Mines National Historic Landmark complete, a long range plan needs to be established for the continual maintenance and upkeep of the buildings that have been restored. Without this continual maintenance, restoration efforts completed so far may have to be re-done in the future.

Issue/Challenge #9:
Nabesna Mine Cleanup

What is the issue?
Nabesna Mine Site
The presence of mill tailings at the historic Nabesna Mine site (located within the boundaries of WRST) prompted a site inspection by the United States Environmental Protection Agency and implementation of subsequent environmental and geochemical studies by the NPS and the USGS. The site has been appropriately reported and is listed on the U.S. Environmental Protection Agency's Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database and the Alaska Department of Environmental Conservation's Contaminated Sites Database.

Proposed Actions
The Nabesna Mine is currently managed under NPS Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) authority. Currently, the NPS is revising an engineering evaluation/cost analysis (EE/CA) to evaluate alternatives for mitigation of potential risks to human health and environmental resources in the area.

The EE/CA analysis must determine the nature of the tailings to fully evaluate all the mitigation alternatives, including onsite burial/disposal, to appropriately handle this waste stream under the Resource Conservation and Recovery Act (RCRA) and be in compliance with all laws. The NPS staff familiar with the site interprets the Bevill Amendment definitions found at 40 CFR 261.4(b)(7), specifically: "Beneficiation operations include crushing, grinding, washing, dissolution, crystallization, filtration, sorting, sizing, drying, sintering, pelletizing, briquetting, calcining, roasting in preparation for leaching (to produce a final or intermediate product that does not undergo further beneficiation or processing), gravity concentration, magnetic separation, electrostatic separation, flotation, ion exchange, solvent extraction, electrowinning, precipitation, amalgamation, and heap, dump, vat, tank, and in situ leaching," to exempt these tailings from regulation as a hazardous waste under RCRA, allowing the NPS to handle them as solid waste. This interpretation is based upon the definitions above, and the known history of mining and processing operations at the site, which are described below,

Nabesna Mining History
"The mining process at Nabesna consisted of underhand stoping with the broken ore being hand trammed to the portals where it was carried by an aerial tramway to the mill at the base of the mountain. The milling process initially consisted of a small ball mill and gravity separation. On-site amalgamation of the concentrates from the sand tables was attempted but was not successful. Eventually, concentrates were shipped to Tacoma, Washington, for processing. In 1933, a six-cell floatation unit was added with moderate success. In 1934, a larger ball mill was installed and the use of slime tables discontinued. In 1935, a cyanide leaching plant was added but, due poor performance, its use was discontinued in 1938. In 1937 and 1938, a considerable volume of old tailings was reprocessed by the mill.

The mine, mill, and some of the associated mill tailings, are located on the Sunshine Lode mining claim, patented to the Nabesna Mining Corporation. The remaining tailings are situated down slope of the mill building on federal land managed by the NPS, along the north and south sides of Nabesna Road. The mill tailings cover approximately 9 acres, with an average thickness of approximately 1.5 feet. The estimated volume of the tailings is 17,300 cubic yards. Currently, the mill and camp are in disrepair and the tram system used to transport ore from the mine adits is partially collapsed. The iron-rich surface of the tailings has oxidized and appears as a bright orange and grey packed crust. In general, the tailings do not support vegetation, are acidic, and contain heavy metals such as lead, cadmium, nickel, and arsenic (a metalloid)." (Excerpted from Wayland, USGS Bulletin 933-B 1943).

What's next?
The NPS intends to proceed with the cleanup of the Nabesna Mine tailings in Wrangell-St. Elias National Park and Preserve in a manner that is best for the resources, park visitors and the agency. To this end, the NPS seeks concurrence by the EPA Region 10—that the tailings at Nabesna meet the Bevill amendment definitions of extraction and beneficiation and may be managed as solid waste for mitigation purposes.

Issue/Challenge #10:
Coastal and Yakutat District Operations

What is the issue?
Situated on the south side of the Chugach Mountain Range, along the North Pacific coastline and separated from the rest of the park both geographically and from daily park operations, the Yakutat District faces unique challenges with regard to effective park management. Based in the community of Yakutat, the district encompasses an incredible array of marine, tidal, and inland resources and is host to sport, subsistence, and commercial take of fish and wildlife.

Yakutat's exposed location on the Gulf of Alaska ensures that it will be at the forefront of challenges, many of which are outside of management control, including but not limited to climate induced sea-level rise, commercial fishing, and impacts from tsunami debris and other marine debris. Its remoteness and difficulty of access both protects the Yakutat District and makes it expensive and extremely difficult to manage. Although some portions of the district are accessible by boat, most of it can only be reached by aircraft. Once on the ground, the movement of field crews is generally non-motorized and limited by lack of infrastructure.

Park staff in Yakutat is asked to live and work in substandard housing and office conditions in a community that is accessible only by aircraft or ferry. The District Ranger is a shared position with Glacier Bay National Park and Preserve that works with one or more seasonal employees to manage not only areas such as Icy Bay and the Malaspina Forelands, but also Dry Bay and the outer coast. Aerial patrol and occasional on-the-ground field trips are the standard methods of visitor management and resource protection. Its size and lack of access makes regular and efficient monitoring of park resources nearly impossible.

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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 Wilderness-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:

ADF&G	Alaska Department of Fish and Game
The Alaska National Interest Lands Conservation Act (ANILCA)	United States federal law passed on November 12, 1980 and signed into law by President Jimmy Carter on December 2, 1980, providing varying degrees of special protection to over 157,000,000 acres of land, including national parks, national wildlife refuges, national monuments, wild and scenic rivers, recreational areas, national forests, and conservation areas.
Americans with Disabilities Act (ADA) and American Barriers Act (ABA)	Laws enacted by the federal government that include provisions to remove barriers that limit a disabled person's ability to engage in normal daily activity in the physical, public environment.
Archeological Sites Management Information System (ASMIS)	The National Park Service's standardized database for the basic registration and management of park prehistoric and historical archeological resources. ASMIS site records contain data on condition, threats and disturbances, site location, date of site discovery and documentation, description, proposed treatments, and management actions for known park archeological sites. It serves as a tool to support improved archeological resources preservation, protection, planning, and decision-making by parks, centers, regional offices, and the national program offices.
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.
Carbon Footprint	Carbon footprint is generally defined as the total set of greenhouse gas emissions caused by an organization, event, product, or person.
Central Alaska Network (CAKN)	One of 32 Inventory & Monitoring Networks established as part of the NPS Inventory and Monitoring Program. The Central Alaska Network provides scientific data and expertise for natural resources in 3 parks located in Alaska.
Cultural Landscapes Inventory (CLI)	A Cultural Landscapes Inventory describes historically significant landscapes within a park. The inventory identifies and documents each landscape's location, size, physical development, condition, characteristics, and features, as well as other information useful to park management.
Cultural Landscape Report (CLR)	A Cultural Landscape Report is the principal treatment document for cultural landscapes and the primary tool for long-term management of those landscapes. It guides management and treatment decisions about a landscape's physical attributes, biotic systems, and use when that use contributes to historical significance.
Curation	National parks are the stewards of numerous types of objects, field notes, publications, maps, artifacts, photographs, and more. The assemblage of these materials comprises a museum collection. Curation is the process of managing, preserving, and safeguarding a collection according to professional museum and archival practices.
Exotic Plant Management Team (EPMT)	One of the ways the NPS is combating invasive plants is through the Exotic Plant Management Team Program. The program supports 16 Exotic Plant Management Teams working in more than 225 park units. EPMTs are led by individuals with specialized knowledge and experience in invasive plant management and control. Each field-based team operates over a wide geographic area and serves multiple parks.

Facility Condition Index (FCI)	FCI is the cost of repairing an asset (e.g., a building, road, bridge, or trail) divided by the cost of replacing it. The lower the FCI number, the better the condition of the resource.
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.
Green Parks Plan (GPP)	The Green Parks Plan defines a collective vision and a long-term strategic plan for sustainable management of NPS operations. A critical component of the implementation of the GPP will be informing and engaging park staff, visitors, and community partners about climate change and sustainability to broaden opportunities to foster change.
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.
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.