National Park Service
U.S. Department of the Interior

Arctic Alaska Network
Alaska

Climate Monitoring Program in the Arctic Alaska Network (ARCN) National Park Service Units

Environmental Assessment
June 2010

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ACRONYMS AND ABBREVIATIONS

ANILCA	Alaska National Interest Lands Conservation Act
ARCN	Arctic Alaska Inventory and Monitoring Network
ATLAS	Arctic Transitions in the Land-Atmosphere System
ATV	All Terrain Vehicle
BELA	Bering Land Bridge National Preserve
BLM	Bureau of Land Management
CAKR	Cape Krusenstern National Monument
CASTNET	Clean Air Status & Trends Network
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COOP	Cooperative Observer Program
CWOP	Citizen Weather Observer Program
dBA	A-weighted Decibel
DO	NPS Director's Order
EA	Environmental Assessment
FAA	Federal Aviation Administration
GAAR	Gates of the Arctic National Park and Preserve
GMP	General Management Plan
GOES	Geostationary Satellite Server
KOVA	Kobuk Valley National Park
NADP	National Atmospheric Deposition Program
NEPA	National Environmental Policy Act
NOAT	Noatak National Preserve
NPS	National Park Service
NHPA	National Historic Preservation Act
NRCS-SC	Natural Resource Conservation Service - Snowcourse Network
NSF	National Science Foundation
NWR	National Wildlife Refuge
NWS	National Weather Service
OHV	Off Highway Vehicle
PRISM	Parameter-elevation Regressions on Independent Slopes Model
RAWS	Remote Automated Weather Station
SAO	Surface Airways Observation network
SCAN	Soil Climate Analysis Network
SNOTEL	Snowfall Telemetry network
SOD	Summary of the Day
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United Stated Geologic Survey
VFR	Visual Flight Rules
WRCC	Western Regional Climate Center

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.1 PURPOSE OF ACTION

The National Park Service (NPS) is considering expansion of the remote automated weather station (RAWS) network in the Arctic Alaska Inventory and Monitoring Network (ARCN). The Arctic Network consists of Gates of the Arctic National Park and Preserve (GAAR), Noatak National Preserve (NOAT), Kobuk Valley National Park (KOVA), Cape Krusenstern National Monument (CAKR), and Bering Land Bridge National Preserve (BELA) (Figure 1-1). The proposed action would expand the RAWS program by establishing additional stations to collect basic climatological data including air and soil temperature, precipitation, relative humidity, wind speed and direction, solar radiation, and snow depth.

The ARCN units occupy over 20 million acres or roughly 25 percent of all NPS acreage in the United States. GAAR, KOVA, and NOAT are contiguous and encompass a large expanse of mostly mountainous arctic ecosystems at the northern limit of treeline. Immediately to the west of these units lie CAKR and BELA, which border Kotzebue Sound, the Bering Strait, and the Chukchi Sea. BELA and CAKR are similar with respect to their coastal resources and strong biogeographical affinities to the Beringian subcontinent, the former land bridge between North America and Asia. Much of the ARCN is designated or eligible wilderness (97%). The ARCN units are not connected to a road system.

Ecosystem processes in the ARCN are driven by climate characteristics. Climatic stressors may be the foremost issues that park management will deal within a few decades. Changes in the physical environment, caused either by climate change or normal physical processes, can have significant impacts on the entire ecosystem. Global climate models indicate that subtle climate changes will have the most dramatic effect in arctic regions. These changes will be observable in many arctic system characteristics, such as permafrost dynamics, snowpack persistence, variations in timing of wildlife migrations, plant phenology, albedo, and sea ice extent and duration.

In order to properly monitor an ecosystem, the changes in the physical environment must be properly monitored and documented (Sousanes, 2006). In general, Alaska has a sparse dispersion of climate monitoring sites (Simpson et al., 2002). There are a few permanent long-term climate monitoring sites in the ARCN region, though most of them are located at relatively low elevation, along major rivers, and in settlements surrounding the parks. There are large regions within ARCN units with no climate monitoring stations.

New permanent RAWS would be established at as many as four locations in GAAR, six locations in NOAT, one location in KOVA, two locations in CAKR, and four locations in BELA. These automated stations, consisting of a battery-powered weather instrumentation unit and separate snowfall measuring unit, would become part of the ARCN climate monitoring system providing baseline weather information and supporting climate trend analysis.

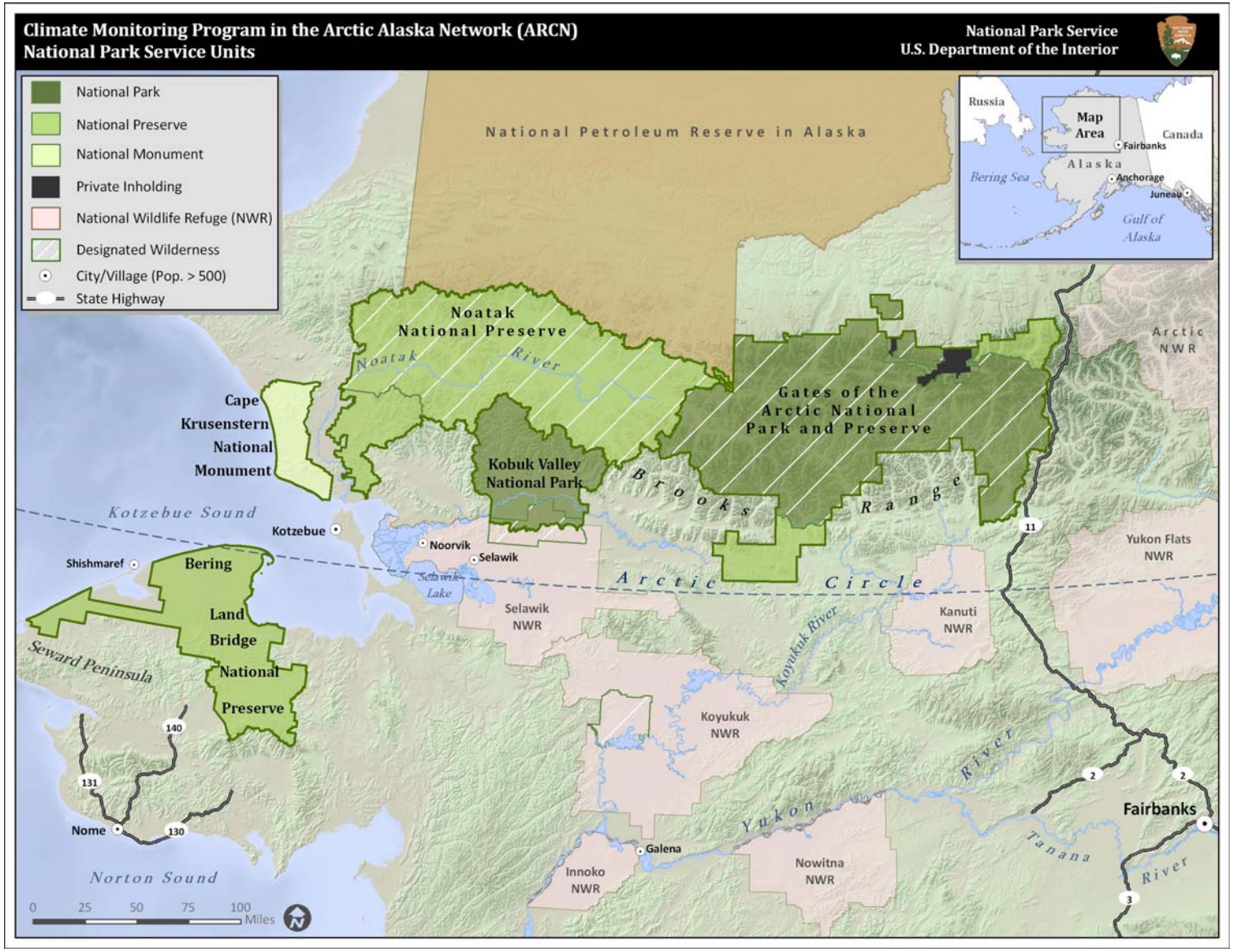


Figure 1-1. Vicinity map of the Arctic Alaska Network units.

1.2 NEED FOR ACTION

The National Parks Omnibus Management Act, passed by Congress in 1998, directs the NPS "to establish baseline [resource] information and to provide information on the long-term trends in the condition of National Park System resources." The NPS established the Inventory and Monitoring Program to determine the status and trends in the condition of resources in 270 park units nation-wide. Thirty-two Inventory and Monitoring Networks were established to identify and monitor a set of Vital Signs to represent the overall health or condition of park resources specific to each network. Climate is a fundamental driver of ecological condition and the patterns of plant and animal communities found in NPS park units. Changes in climate will impact these ecosystems. Climate Monitoring has been identified as a Vital Sign for the ARCN.

Deployment of permanent weather stations within the ARCN units would allow the NPS to achieve the goal of the Climate Monitoring vital sign and track climate change and how these changes affect park resources. This information would contribute resource data for park management decisions and would also contribute to future efforts in broader-scale climate monitoring and modeling efforts.

The monitoring program has the opportunity to advance understanding of the ecosystems that encompass the network of parks. This understanding would come in the form of the monitoring data that would be collected, analyzed, interpreted, and reported. Further, the NPS recognizes that while scientific work has been conducted in each of the network parks, this information needs to be incorporated with NPS monitoring efforts to improve its understanding of the holistic functioning of ecosystems within the network. An understanding of ecosystem function is important because it will allow NPS to fulfill the legislative mandate to manage parks in a manner that leaves them unimpaired for the enjoyment of future generations. At the most basic level, the NPS cannot evaluate appropriate ecosystem function when bounds of natural variability are not known because it is not possible to identify when conditions are outside an expected range of variation. Similarly, in this situation, reliable identification of resource trends is also difficult (MacCluskie and Oakley, 2002).

One objective of the ARCN program is to monitor and record weather conditions at representative locations in order to identify long and short-term trends, provide reliable climate data to other researchers, and to participate in larger scale climate monitoring and modeling efforts. To better understand climate variation as well as possible long-term changes in ecosystems of the ARCN, new long-term weather stations are proposed for installation throughout the five units in the coming years. Currently, no remote automated weather stations (RAWS) exist in GAAR or CAKR. There are two in NOAT, one in KOVA, and one in BELA.

This environmental assessment (EA) analyzes the potential environmental impacts which could result from the proposed action and the No Action alternative. This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, regulations of the Council of Environmental Quality (CEQ) (40 Code of Federal Regulations 1508.9), and the NPS NEPA compliance guidance handbook (Director's Order (DO)-12, *Conservation Planning, Environmental Impact Analysis, and Decision-making*).

1.3 PURPOSE AND SIGNIFICANCE OF THE PARKS

1.3.1 Gates of the Arctic National Park and Preserve

Gates of the Arctic National Park and Preserve was designated as a National Park and Preserve on December 2, 1980 when Congress passed the ANILCA, Public Law 96-487. The purpose of Gates of the Arctic National Park and Preserve is to preserve the vast, wild, undeveloped character and environmental integrity of Alaska's central Brooks Range and to provide opportunities for wilderness recreation and traditional subsistence uses.

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

- To maintain the wild and undeveloped character of the area, including opportunities for visitors to experience solitude, and the natural environmental integrity and scenic beauty of the mountains, forelands, rivers, lakes, and other natural features;
- To provide continued opportunities, including reasonable access, for mountain climbing, mountaineering, and other wilderness recreational activities; and
- To protect habitat for and of populations of, fish and wildlife, including, but not limited to, caribou, grizzly bears, Dall sheep, moose, wolves, and raptorial birds.

Subsistence uses by local residents shall be permitted in the park, where such uses are traditional, in accordance with the provisions of title VIII of ANILCA.

Significance Statements (NPS, 2009a):

GAAR is acknowledged as the premier Wilderness park in the national park system, protecting 8.4 million acres of diverse arctic ecosystems.

GAAR serves as the headwaters for six Wild Rivers that support natural systems and human activities across northern Alaska.

GAAR protects a highly functioning arctic, mountain ecosystem in its entirety and provides habitat of world importance for naturally occurring plant and animal populations.

GAAR manages the solitude and remoteness of a spacious arctic landscape, largely free from the mechanized world, with opportunities for challenging wilderness adventures that allow for self-discovery, renewal, and freedom.

GAAR protects habitats and resources in consultation with local rural residents to provide subsistence opportunities on lands that have supported traditional cultures and local residents for 12,000 years.

GAAR preserves and protects a 12,000-year record of human cultural adaptations to high latitude mountain environments and an unbroken tradition of living on the land.

1.3.2 Noatak National Preserve

Noatak National Preserve was designated as a National Preserve on December 2, 1980 when Congress passed the ANILCA, Public Law 96-487. The purpose of NOAK is to protect an intact 6.7-million-acre, mountain-ringed river basin ecosystem for outstanding scientific research and wilderness opportunities within an arctic-subarctic environment.

Specifically, section 201 of the Alaska National Interest Lands Conservation (ANILCA) states that the preserve shall be managed for the following purposes, among others:

- To maintain the environmental integrity of the Noatak River and adjacent uplands within the preserve in such a manner as to assure the continuation of geological and biological processes unimpaired by adverse human activity;
- To protect habitat for and populations of fish and wildlife, including but not limited to caribou, grizzly bears, Dall sheep, moose, wolves, waterfowl, raptors, and other species of birds;
- To protect archeological resources;
- To provide opportunities for scientific research.

Significance Statements (NPS, 2009b):

NOAT, largely unaffected by adverse human activity, protects a nationally significant, intact, and biologically diverse arctic-subarctic river basin ecosystem.

NOAT fosters exceptional opportunities for scientific research of unaltered arctic-subarctic ecosystems.

NOAT protects natural resources and native habitats that provide the opportunity for local rural Alaska residents to engage in customary and traditional subsistence uses.

The Noatak Wilderness constitutes the western half of a 13-million-acre designated arctic wilderness that limits development and protects the nation's largest unaltered river basin and free-flowing wild river.

1.3.3 Kobuk Valley National Park

Kobuk Valley National Park was designated as a National Park on December 2, 1980 when Congress passed the ANILCA, Public Law 96-487. The purpose of Kobuk Valley National Park is to maintain the environmental integrity of boreal forest, montane, and riverine ecosystems. The park protects and interprets diverse resources including arctic sand dunes, archeological sites, and subsistence resources.

Specifically, 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 the environmental integrity of the natural features of the Kobuk River Valley including the Kobuk, Salmon, and other rivers, the boreal forest, and the Great Kobuk Sand Dunes, in an undeveloped state;
- To protect and interpret, in corporation with Native Alaskans, archeological sites associated with native cultures;
- To protect migration routes for the Arctic caribou herd;
- To protect habitat for, and populations for fish and wildlife but not limited to caribou, moose, black and grizzly bears, wolves, and waterfowl; and
- To protect the viability of subsistence resources.

Significance Statements (NPS, 2010a):

KOVA preserves the environmental integrity and interprets the ecosystems of the Kobuk River watershed.

KOVA preserves, studies and interprets, in cooperation with Alaska Natives, evidence reflecting thousands of years of cultural use and adaptation within arctic-interior Alaska.

KOVA includes 1. 7 million acres of public land, all of which is eligible or designated Wilderness.

KOVA protects habitat for and populations of birds, fish, and other wildlife typical to both arctic and boreal forest ecosystems in northwest Alaska.

The unfettered migratory movement of the Western Arctic Caribou Herd through Kobuk Valley depends on the undeveloped character, vastness and natural resources of KOVA.

KOVA protects natural resources that provide the opportunity for local rural Alaska residents to engage in customary and traditional subsistence uses.

1.3.4 Cape Krusenstern National Monument

Cape Krusenstern National Monument was designated as a National Monument on December 2, 1980 when Congress passed the ANILCA, Public Law 96-487. The purpose of Cape Krusenstern National Monument is to preserve, study, and interpret a sequential archeological record of human migration and adaptation, and to protect arctic ecosystems and subsistence resources.

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

- To protect and interpret a horizontally stratified series of archaeological sites;
- To provide for scientific study of the process f human population of the area from the Asian Continent, in corporation with Native Alaskans;
- To preserve and interpret evidence of prehistoric and historic Native Cultures;
- To protect habitat for seals and other marine mammals;

- To protect habitat for and populations of, birds and other wildlife, and fish resources, and
- To protect the viability of subsistence resources.

Subsistence uses by local residents are permitted in the monument in accordance with the provisions of title VIII of ANILCA.

Significance Statements (NPS, 2010b):

CAKR preserves, studies and interprets, in cooperation with the Inupiaq people, evidence of thousands of years of human migration from Asia and cultural adaptation in arctic Alaska.

CAKR preserves a landscape supporting a dynamic process of coastal erosion and accretion in an arctic environment as exemplified by the formation of over 100 beach ridges containing a 5,000 year record of sequential human use.

CAKR protects habitat for and populations of birds, fish, and other wildlife in an ecologically diverse coastal and upland ecosystem.

CAKR protects natural resources that provide the opportunity for local rural Alaska residents to engage in customary and traditional subsistence uses.

1.3.5 Bering Land Bridge National Preserve

Bering Land Bridge National Preserve was designated as a National Preserve on December 2, 1980 when Congress passed the ANILCA, Public Law 96-487. The purpose of BELA is to protect and provide the opportunity to study and interpret the landscape which contains an invaluable record of floral, faunal, and human migration between Asia and North America and which supports an ongoing traditional subsistence culture.

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

- To protect and interpret examples of arctic plant communities, volcanic lava flows, ash explosions, coastal formations, and other geologic processes;
- To protect habitat for internationally significant populations of migratory birds;
- To provide for archeological and paleontological study, in cooperation with Native Alaskans, of the process of plant and animal migration, including man, between North America and the Asian Continent;
- To protect habitat for, and populations of, fish and wildlife including, but not limited to, marine mammals, brown/grizzly bears, moose, and wolves;
- To continue reindeer grazing use, including necessary facilities and equipment;
- To protect the viability of subsistence resources;
- To provide outdoor recreation and environmental education activities including public access for recreational purposes to the Serpentine Hot Springs area.

Significance Statements (NPS, 2009c):

BELA protects and provides opportunities for the study of paleontological, archeological, and biological resources that reveal a record of migration across the land bridge between Asia and North America.

BELA protects and interprets, in collaboration with Alaska Natives, thousands of years of use and occupation by the Inupiaq people and their continuing subsistence way of life.

BELA protects natural resources and native habitats that provide the opportunity for local rural Alaska residents to engage in customary and traditional subsistence uses.

BELA protects the integrity of the Serpentine Hot Springs, its natural setting, and its cultural and spiritual significance.

BELA protects and provides opportunities to study and interpret a variety of high latitude volcanic features unique to North America.

BELA protects reindeer herding habitat to ensure the continued opportunity for reindeer herding by Alaska Natives

1.4 LAWS, REGULATIONS, AND POLICIES

The following laws and associated regulations provided guidance for the development of this EA, design of the Preferred Alternative, analysis of impacts, and creation of mitigation measures to be implemented as part of the preferred alternative.

NPS Organic Act

The NPS Organic Act (1916) and the General Authorities Act (1970) prohibit impairment of park resources and values. The NPS 2006 Management Policies and Director's Order #55 use the terms "resources and values" to mean the full spectrum of tangible and intangible attributes for which the park was established and is managed, including the Organic Act's fundamental purpose and any additional purposes as stated in the park's establishing legislation. The impairment of park resources and values may not be allowed unless directly and specifically provided by statute. The primary responsibility of the NPS is to ensure that park resources and values will continue to exist in a condition that will allow the American people to have present and future opportunities to enjoy them.

The evaluation of whether impacts of a preferred alternative would lead to an impairment of park resources and values is included in this EA. Impairment is more likely when there are potential impacts to a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;

- essential to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified as a goal in the park's General Management Plan (GMP) or other relevant NPS planning documents.

NPS Omnibus Management Act

The NPS Omnibus Management Act of 1998 (P.L. 105-391, 112 Statute 3497) addresses resources inventory and management in Title II. Section 201 defines the purposes of this title to enhance and encourage scientific study in National Park system units. Section 202 authorizes and directs the Secretary of the Interior to assure management of NPS units is enhanced by a broad program of high quality science and information. Section 205 states the Secretary may solicit, receive, and consider requests from Federal and non-Federal public or private entities for the use of NPS units for scientific study. Such proposals must be: 1) consistent with applicable laws and the NPS Management Policies, and 2) the study would be conducted in a manner as to pose no threat to park resources or public enjoyment of those resources.

NPS Management Policies

NPS Management Policies 2006 (NPS, 2006a) addresses the importance of and need for weather and climate monitoring efforts in a number of sections:

Section 4.7.2 *Weather and Climate* "parks containing significant natural resources will gather and maintain baseline climatological data for perpetual reference".

Section 4.2 *Studies and collections* "The Service will encourage appropriately reviewed natural resource studies whenever such studies are consistent with applicable laws and policies. These studies support the NPS mission by providing the Service, the scientific community, and the public with an understanding of park resources, processes, values, and uses that will be cumulative and constantly refined… Studies include projects conducted by researchers and scholars in universities, foundations and other institutions, tribal colleges and organizations, other federal and state agencies, and Service staff".

Section 2.3.1.5 *Science and Scholarship* "The collection and analysis of information about park resources will be a continuous process that will help ensure that decisions are consistent with park purposes."

Section 6.3.1 *Wilderness Resource Management, General Policy*: Section 6.3.1 establishes that eligible and proposed wilderness on NPS lands should be managed under wilderness policy as follows:

> For the purposes of applying these policies, the term "wilderness" will include the categories of eligible, study, proposed, recommended, and designated wilderness. Potential wilderness may be a subset of any of these five categories. The policies apply regardless of category except as otherwise provided herein.

> In addition to managing these areas for the preservation of the physical wilderness resources, planning for these areas must ensure that the wilderness character is likewise preserved. This policy will be applied to all planning documents affecting wilderness.
>
> The National Park Service will take no action that would diminish the wilderness eligibility of an area possessing wilderness characteristics until the legislative process of wilderness designation has been completed. Until that time, management decisions will be made in expectation of eventual wilderness designation.

Section 6.3.6 *Scientific Activities in Wilderness* "The statutory purposes of wilderness include scientific activities, and these activities are encouraged and permitted when consistent with the Service's responsibilities to preserve and manage wilderness".

Section 6.3.6.1 *General Policy* "The National Park Service has a responsibility to support the appropriate scientific activities in wilderness and to use science to improve wilderness management. The Service recognizes that wilderness can and should serve as an important resource for long-term research into, and study, and observation of, ecological processes and the impacts of humans on these ecosystems. The National Park Service further recognizes that appropriate scientific activities may be critical to the long- term preservation of wilderness".

"Scientific activities are to be encouraged in wilderness. Even those scientific activities (including inventory, monitoring, and research) that involve a potential impact to wilderness resources or values (including access, ground disturbance, use of equipment, and animal welfare) should be allowed when the benefits of what can be learned outweigh the impacts on wilderness resources or values. However, all such activities must also be evaluated using the minimum requirement concept and include documented compliance that assesses impacts against benefits to wilderness. This process should ensure that the activity is appropriate and utilizes the minimum tool required to accomplish project objectives".

<u>Wilderness Act of 1964</u>

The Wilderness Act of 1964 (Public Law 88-577, 16 USC §§ 1131-1136, 78 Stat. 890) established the National Wilderness Preservation System and identified the National Park Service as one of the four federal agencies responsible for protecting and preserving the nation's wilderness resource. The Wilderness Act defines wilderness as follows:

> A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this chapter an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation

> and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

Section 4(c) of the Wilderness Act defines prohibited uses as:

> Except as specifically provided for in this Act, and subject to existing private rights, there shall be no commercial enterprise and no permanent road within any wilderness area designated by this Act and, except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area.

The minimum requirement concept is used when making all decisions concerning management of wilderness, including administrative practices, proposed special uses, scientific activities, and equipment use (including weather stations) in wilderness. When the minimum requirement is determined, the potential disruption of wilderness character and the physical resource is considered and given more weight than economic efficiency and convenience. If a compromise of wilderness resource or character is unavoidable, only those actions that preserve wilderness character and/or have localized, short-term adverse impacts will be acceptable. The minimum requirement/minimum tool analysis for this project is included in Appendix B.

Therefore, a two-step process is used:

1) Determine whether the proposed management action is needed, necessary for the purpose of wilderness, and does not pose a threat to wilderness resources and character.
2) Determine the techniques and type of equipment needed to ensure that impact to wilderness resources and values is minimized.

National Historic Preservation Act

The National Historic Preservation Act (NHPA) sets forth Government policy and procedures regarding historic properties including districts, sites, buildings, structures and objects included in or eligible for the National Register of Historic Places. Section 106 of NHPA requires that Federal agencies consider the effects of their actions on such properties, following regulations issued by the Advisory Council on Historic Preservation (36 CFR 800).

Alaska National Interests Lands Conservation Act

Pursuant to ANILCA the Department of the Interior issued special access regulations at 43 CFR Part 36. Helicopter use is addressed in 43 CFR 36.11(f)(4):

> The use of a helicopter in any area, other than at designated landing areas or pursuant to the terms and conditions of a permit issued by the appropriate Federal agency, or

pursuant to a memorandum of understanding between the appropriate Federal agency and another party, or involved in emergency or search and rescue operations is prohibited.

1.5 PREVIOUS PLANNING FOR THE CLIMATE MONITORING PROGRAM

Existing Climate and Weather Networks

A sparse network of climate monitoring sites currently exists in and around the ARCN units (Figure 1-2). Most existing sites are located at relatively low elevations, along major rivers, and in settlements surrounding the parks. Records for many of these sites are commonly short-term or sporadic. This network consists of:

- National Weather Service (NWS) Cooperative Observer Program (COOP): The COOP network has been a foundation of the U.S. climate program for decades and continues to play an important role. Manual measurements are made by volunteers and consist of daily maximum and minimum temperatures, observation-time temperature, daily precipitation, daily snowfall, and snow depth.

- Remote Automated Weather Station (RAWS) Network: The RAWS network is administered through many land management agencies, particularly the BLM. Hourly meteorology elements are measured and include temperature, wind, humidity, solar radiation, barometric pressure, fuel temperature, snow depth, and precipitation (when temperatures are above freezing). The few Remote Automated Weather Station (RAWS) sites were added in the 1990s as part of the fire monitoring network. Records for these stations were initially gathered during the summer fire months only, although attempts are now being made to keep them operating year-round

- NWS Surface Airways Observation Network (SAO): These stations are located at major airports and military bases. Almost all SAO sites are automated. The hourly data measured at these sites include temperature, precipitation, humidity, wind, barometric pressure, sky cover, ceiling, visibility, and current weather. Most data records begin during or after the 1940s, and these data are generally of high quality.

- USDA/NRCS Snowfall Telemetry (SNOTEL) Network: The USDA/NRCS maintains a network of automated snow-monitoring stations known as SNOTEL. The network was implemented originally to measure daily precipitation and snow water content. Many modern SNOTEL sites now record hourly data, with some sites now recording temperature and snow depth. Most data records began during or after the mid-1970s.

The weather and climate networks in the ARCN have at most several stations at or near each park unit (Figure 1-2). Most of these are operated by the NWS, NRCS, and the FAA. A station does not have to be within the boundaries of a park to provide useful data and information regarding the park unit in question. Some may be physically *within* the administrative or political boundaries, whereas others may be just outside, or even some distance away, but would be *nearby* in terms of behavior and representativeness.

Criteria for Selection of Potential Weather Station Sites in the ARCN Network

Initially, a climate monitoring scoping meeting was held in 2006 in an effort to identify potential weather station deployment areas across the ARCN units which would help to fill in climate monitoring gaps existing in the current network of operating weather stations across the ARCN region. Climatologists, park staff, and other weather experts were asked to make recommendations on locations of new weather stations (Nolan, 2007). The Western Regional Climate Center (WRCC) also completed a weather and climate inventory for ARCN in 2006 that reviewed the existing network of operating weather stations in northwest Arctic Alaska and identified potential areas within the ARCN units which would fill in gaps in the ability of the currently operating network of weather stations to monitor climate and climate change in the ARCN parks. Both of these documents were used in the site evaluation process. The WRCC report stated that, "Weather/climate station coverage is currently very sparse within the parks units of the ARCN. Large portions of all ARCN units have no station coverage. These areas include western GAAR, northern KOVA, far eastern and west-central portions of NOAT, all of CAKR, and northwestern (coastal) areas of BELA. (Davey et al, 2006).

Potential weather station deployments sites were identified in 2008 across the ARCN units (Figure 1-2). This effort to identify potential climate monitoring sites was multifaceted utilizing multiple datasets including: landscapes, ecoregions, vegetation patterns, temperature and precipitation models (PRISM), land management units (wilderness), access, visitor use, and topography were some of the factors considered. Numerous professionals from various organizations in the state participated in the effort to identify potential sites, including: park personnel, National Weather Service, Natural Resource Conservation Service, the WRCC (Davey et al., 2006; Redmond and Simeral, 2010), and the University of Alaska.

Several criteria were used in identifying potential sites, including these 3 main criteria: 1) to provide the best possible coverage across each park, 2) to sample different ecoregions within each park, and 3) to get a good elevational gradient between sites. Additionally, we considered the issue of access, although the remote nature of these parks makes access an undeniable additional logistic expense. In many instances an effort was made to co-locate new stations with existing infrastructure or other disturbances such as airstrips, repeater sites, and buildings.

Most previous systematic attempts to measure climate over long durations have taken place where people typically live and work, namely along rivers and streams or in lowlands, and upper elevations have consequently been greatly undersampled. Most of the suggested sites are intended to help address this unintentional bias of the observed historical records (Redmond and Simeral, 2010).

Based on siting criteria, the advice of climate experts, and spatial density considerations, as well as logistical constraints, budget considerations, and other factors, 17 stations were selected as an appropriate number of adequately acquire knowledge of the climate of the five ARCN parks. On-the-ground site surveys and over-flights were conducted in GAAR, NOAT, KOVA, CAKR, and BELA in 2008 and 2009 by appropriate NPS staff.

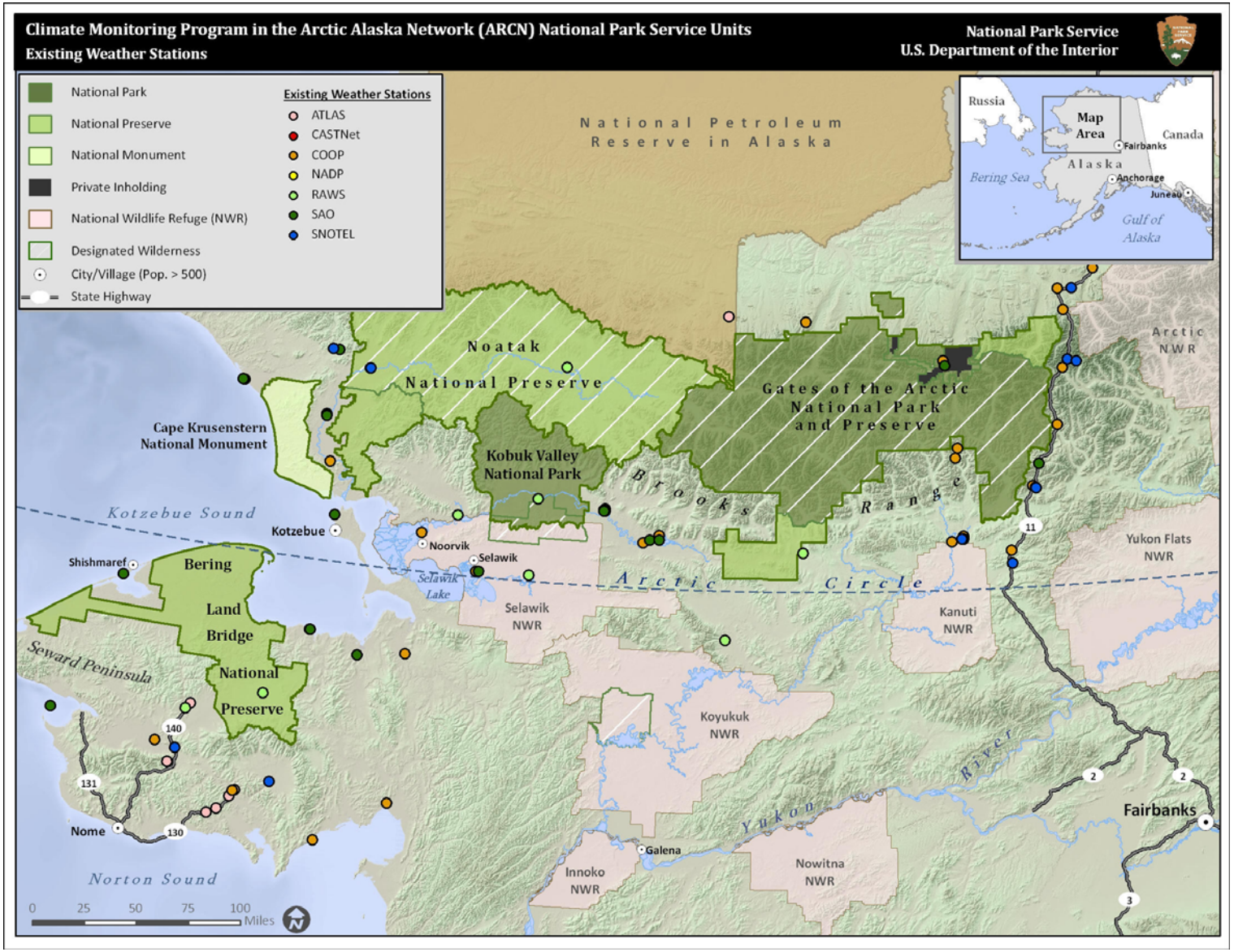


Figure 1-2. Location of existing weather stations, Arctic Alaska Inventory and Monitoring Network.

Climate Monitoring Site Review and Priority Ranking Process

The NPS-ARCN invited Alaskan weather and climate professionals to review and prioritize the potential weather station deployment sites in support of the ARCN climate monitoring effort. This review was conducted in a couple of phases. Initially, in preparation for face-to-face meetings, information characterizing each potential site was disseminated to the panel of experts to give these folks the opportunity to become familiar with the sites. The potential climate monitoring sites were priority ranked by the experts with the ARCN climate monitoring objectives used for guidance. Based on this review, additional site evaluation was completed in 2009 to look at additional sites and to attempt to co-locate the sites with vegetation and permafrost monitoring efforts.

In addition to descriptions, maps and photographs of each site, data used in the site ranking process included ecoregion maps, temperature and precipitation models, topography, land status, and maps showing existing weather stations in the ARCN region. Table 2-1 and Figure 1-3 identify the top ranked sites in GAAR, NOAT, KOVA, CAKR, and BELA.

Sites that didn't rank high in the ranking process were in areas that did not have good regional exposure as compared to other sites, thus weather observations would likely be influenced by local topographic conditions. Other sites may have proved too challenging to maintain due to available access or extreme conditions.

Gates of the Arctic National Park and Preserve

Initially, 15 potential weather station sites were identified within the park and preserve: 9 sites in western GAAR, five in the central area of the park, and one along the eastern side of the park (Nolan, 2007). All but two of these sites were at mid elevations in open river valleys in the Brooks Range, the other two were located in the southern areas of the park at low elevations. The mid elevation sites would characterize moderate elevation conditions in the continental-interior climate zone, while the low elevation sites in the southern portion of the park would characterize low elevation conditions at the northern extent of the boreal forest in the continental-interior climate zone. The upper elevations of the Brooks Range ecoregion is lacking in climate data. There are sites along the Dalton highway to the east of the park, sites in the lowlands to the south, no existing sites in the adjacent Noatak Preserve to the west, and few sites to the north. An east west transect going through the heart of the Brooks Range targeting elevations above 1,000 feet would provide the much needed data from the mountainous areas within the park. Four high priority sites were identified in GAAR (Chimney Mountain, Pamichtuk Lake, Ram Creek, and Killik Pass).

Noatak National Preserve

In NOAT the strategy was to locate sites in upland areas on both the north and south side of the Noatak River corridor in the far eastern and central areas of the park. There were 21 sites identified within NOAT during the original scoping meeting. The high mountain regions were not considered because of the remote nature of these sites and harsh windy conditions above

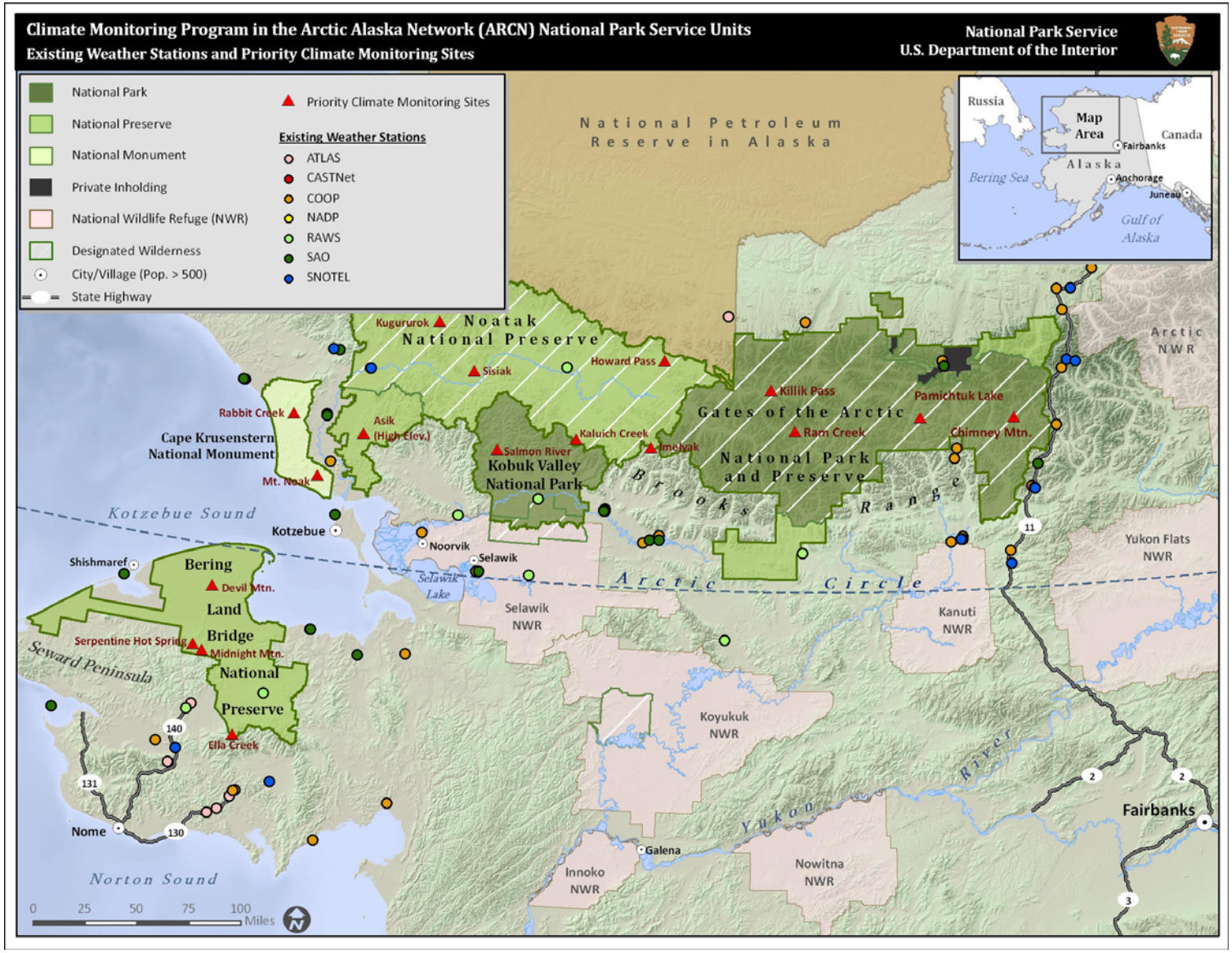


Figure 1-3. Location of priority weather station/climate monitoring sites, Arctic Alaska Inventory and Monitoring Network.

4,000 feet. Mid level elevations between 2,000 and 3,500 feet were targeted. Currently the two existing sites are down along the Noatak River corridor, so an effort was made to consider new sites in higher elevations within the mountains and foothills of NOAT within the continental-interior climate regime. Six high priority sites were identified in NOAT: Kaluich Creek, Imelyak, Howard Pass, Sisiak, Kugururok and Asik (high elevation).

Kobuk Valley National Park

There were 5 sites identified as potential climate locations during the scoping meeting. There is good coverage of the lowland areas between Ambler, Kavet Creek RAWS, and Kiana. The goal in Kobuk Valley the goal was to look for locations up in the northern mountainous areas of the upper watersheds. These sites characterize the mid and upper elevation areas of KOVA within the continental interior climate region. One high priority site was identified in KOVA: Salmon River.

Cape Krusenstern National Monument

Initially 5 sites were identified in the national monument. The strategy in Cape Krusenstern was to locate sites at higher elevations and inland from the coast. Red Dog Mine operates a weather station at the port site and there are other network sites at Kivalina and Kotzebue. The rolling hills east of the coastal area would characterize the eastern edge of the Bering Strait coastal climate region and the western edge of the continental interior climate. Two high priority sites were identified in CAKR: Mt. Noak and Rabbit Creek.

Bering Land Bridge National Preserve

Twelve sites were identified during the scoping meeting as potential locations in Bering Land Bridge. The objective was to fill in some of the data gaps between the coastal stations at Nome and Shismaref with some northern interior peninsula sites. The strategy involved a north to south transect through the park starting with the Devil Mountain Lakes area in the north and ending with a site in the mountains along the southern boundary of the preserve. The middle of the transect would include a paired high and low elevation site near Serpentine Hot Springs. Four high priority sites were identified for BELA: Midnight Mountain, Serpentine Hot Springs, Devil Mountain, and Ella Creek.

1.6 ISSUES AND IMPACT TOPICS

Issues and concerns with this project are grouped into distinct impact topics to aid in analyzing environmental consequences, which allows for a standardized comparison of alternatives based on the most relevant information. The impact topics were identified on the basis of federal laws, regulations and orders, NPS Management Policies 2006, and NPS knowledge of potentially affected resources. A brief rationale for selecting or dismissing each topic is provided below.

1.6.1 Issues Selected for Detailed Analysis

Vegetation
Vegetation could be trampled during installation and maintenance of the weather stations. Small areas of vegetation may require clearing beneath and around new weather stations. The footprint could have an impact on vegetation.

The potential exists for invasive species to become transported to weather station sites on equipment, clothing and footwear.

Wildlife
Installation and maintenance of the weather stations could temporarily displace wildlife in the immediate vicinity. Some wildlife habitat could be impacted at the new weather station sites.

Visual Quality
The weather stations may be visible, thus posing an unnatural visual intrusion in pristine environments. Intrusions could include the actual visibility of the tower or glare reflected off the equipment.

Soundscape
Noise intrusions would occur during installation and maintenance of the weather stations due to presence of field crews and the aircraft used for site access. These noise intrusions could disrupt natural sounds in the parks.

Visitor Experience
Encountering a weather station in the parks could have a detrimental effect on the visitor's recreational experience. Visitors may see the new weather station sites as intrusions on the scenic integrity of the backcountry and designated wilderness areas. None of the proposed RAWS are in locations directly accessible by road vehicles or easily visible from popular visitor destinations.

Wilderness
Wilderness values throughout GAAR, NOAT, KOVA, CAKR, and BELA could be affected by the long-term installations within designated and eligible wilderness. In addition wilderness character could be affected by sights and sounds of aircraft and helicopters transporting equipment to the sites for installation and maintenance of weather station equipment in these areas.

A Minimum Requirements Decision Guide was completed for new proposed weather stations located in designated or eligible wilderness. Results for this analysis are included in Appendix B.

Cultural Resources
Unknown cultural resources may be adversely affected by the project.

1.6.2 Impact Topics Dismissed from Further Analysis

Executive Order 12898, "Environmental Justice"
Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-income Populations" requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. The EA alternatives would have no health or environmental effects on minorities or low-income populations or communities.

Soils
Small holes would be excavated during the installation of each new weather station. Small areas of soil, where it exists, may be compacted by the installation activities. This compaction, if any, would be minimal.

Floodplains and Wetlands
Proposed sites are not located in or adjacent to any floodplains, wetlands or riparian area**.**

Threatened and Endangered Species
In compliance with the Endangered Species Act, the NPS conducted an informal Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) (Swem, pers. com.).

Historically, spectacled eiders (threatened) nested along much of the coast of Alaska, from the Nushagak Peninsula in the southwest, north to Barrow, and east nearly to the Canadian border. Weather station sites in BELA and CAKR are outside the spectacled eider critical habitat (breeding, molting, and wintering areas) and would not be affected by station installation and maintenance activities. The project is not likely to adversely affect Steller's eiders.

Yellow-billed loons are considered a "candidate' for listing under the Endangered Species Act. Breeding populations of yellow-billed loons occur at low densities in both Cape Krusenstern National Monument and Bering Land Bridge National Preserve. Yellow-billed loons nest exclusively in coastal and inland low-lying tundra associated with large (33 acres, and greater than 2 m depths), permanent, fish-bearing lakes. As the sites chosen for potential weather stations in Cape Krusenstern National Monument and Bering Land Bridge National Preserve were chosen to be "higher elevation" there will be spatial separation between yellow-billed loons nesting habitat and the potential weather station sites. The USFWS concluded that the project is not likely to adversely affect Yellow-billed loons.

Subsistence
Effects on subsistence uses and resources are addressed in detail in the ANILCA Section 810 Evaluation (see Appendix A).

1.7 PERMITS AND APPROVALS NEEDED TO IMPLEMENT PROJECT

No permits are required for implementation of the Preferred Alternative (Alternative B).

CHAPTER 2: ALTERNATIVES

The Council on Environmental Quality (CEQ) regulations for implementing NEPA require that Federal agencies explore and objectively evaluate all reasonable alternatives to the Preferred Alternative and briefly discuss the rationale for eliminating any alternatives that were not considered in detail. This chapter describes the No Action Alternative and the Preferred Alternative; there were no alternatives that were considered and eliminated from further analysis.

2.1 ALTERNATIVE A: NO ACTION

Under the No Action alternative, no additional weather stations would be established in Gates of the Arctic National Park and Preserve, Noatak National Preserve, Kobuk Valley National Park, Cape Krusenstern National Monument, or Bering Land Bridge National Preserve.

2.2 ALTERNATIVE B: EXPAND THE CLIMATE MONITORING PROGRAM IN GAAR, NOAT, KOVA, CAKR, AND BELA (NPS PREFERRED ALTERNATIVE)

In support of the Arctic Alaska Inventory and Monitoring Program, the National Park Service would establish permanent remote automated weather stations in Gates of the Arctic National Park and Preserve (up to 4 sites, Figure 2-1), Noatak National Preserve (up to 6 sites, Figure 2-2), Kobuk Valley National Park (up to 1 site Figure 2-3), Cape Krusenstern National Monument (up to 2 sites, Figure 2-4), and Bering Land Bridge National Preserve (up to 4 sites, Figure 2-5). All weather stations would be located on NPS administered lands. Table 2-1 identifies the individual RAWS sites and provides information as to elevation, location, access, land status, and site preparation. Deployment of these stations is anticipated for 2010 and 2011.

The weather stations would collect basic weather observations including air temperature, precipitation, relative humidity, wind speed and direction, solar radiation and snow depth and transmit these observations hourly via satellite. These observations would be posted to the Western Regional Climate Center's (WRCC) web site in near real-time (http://www.wrcc.dri.edu/NPS.html). The climate stations were specifically designed for remote, high latitude, extreme cold conditions. Special consideration was taken to minimize visual and physical impacts by making the stations as compact as possible to fit in with the wilderness values within national park lands. The stations have a small footprint and low-impact anchoring systems. Stations are powered year-round by a solar panel and two sealed lead-acid batteries that are enclosed in an insulated cargo container.

Each weather station would be composed of a 10-foot tripod tower hosting all the sensors and a datalogger enclosure (Photo 2-1). The batteries would be enclosed in a separate enclosure at the base of the tripod. At a few select sites, an additional datalogger may be added to measure permafrost and soil conditions adjacent to the tower. These satellite systems would be no more than a few minute walk from the site and be imperceptible if looking from the site or from the air. The additional instrumentation at certain locations would be a good faith effort to monitor multiple vital signs at one location, with the priority being the basic suite of climate data.

In addition, if it becomes evident that the weather information from certain sites is useful for fire management issues, a 20 foot mast could be substituted for the 10-foot mast to obtain wind speed measurements in compliance with fire weather index standards.

The tripod tower would house the temperature, precipitation, relative humidity, solar radiation, wind speed and direction, and snow depth sensors, a GPS antenna, and a GOES satellite transmission antenna. A fiberglass equipment enclosure on the mast houses the electronic equipment such as the datalogger, and geostationary satellite transmitter (GOES). Soil sensors would be placed in the ground at 10cm and 50 cm with a 1" soil auger. The batteries are sealed, starved electrolyte-type batteries. The wind speed and direction sensors are located on the top of the 10-foot tall mast. The footprint of the tripod is approximately 12 feet in diameter. A 48"x13" solar panel would also be attached to the south side of the mast. The tower is typically anchored to the ground with 2-foot long steel pins. The tower components are assembled on site.

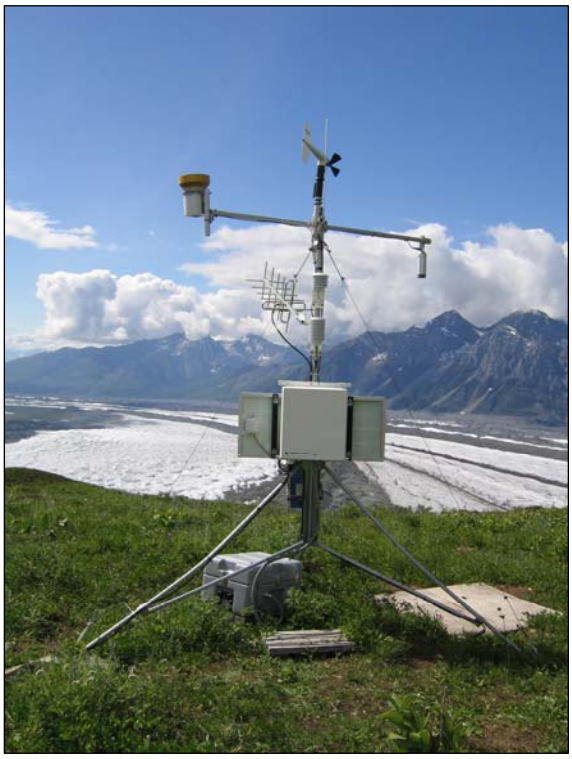


Photo 2-1. Example of a Tripod tower.

Installation

A Campbell Scientific, Inc. (CSI) weather station can be installed in a few hours by two people once all equipment is onsite. Getting the weather station to a deployment site would typically require one or two sling loads using a helicopter. A single helicopter flight would be required to transport personnel to each site. Getting a weather station to a point where helicopter operations can begin may require fixed-wing aircraft. Weather station installation would occur in June, July, and August. Consultation with subsistence managers would occur prior to the field season so the schedule could be adjusted to avoid any potential subsistence user conflicts. Hand tools would be used for weather station assembly.

Annual Maintenance

Each station would require one annual maintenance visit. Maintenance activities would be confined to a single day and would primarily occur from June through August, after consultation with park subsistence managers. Helicopter access would be necessary for most sites. Three to four hours would be required to change sensors and remove and download data and perform any necessary maintenance including periodic vegetation clearing at each weather station, if necessary.

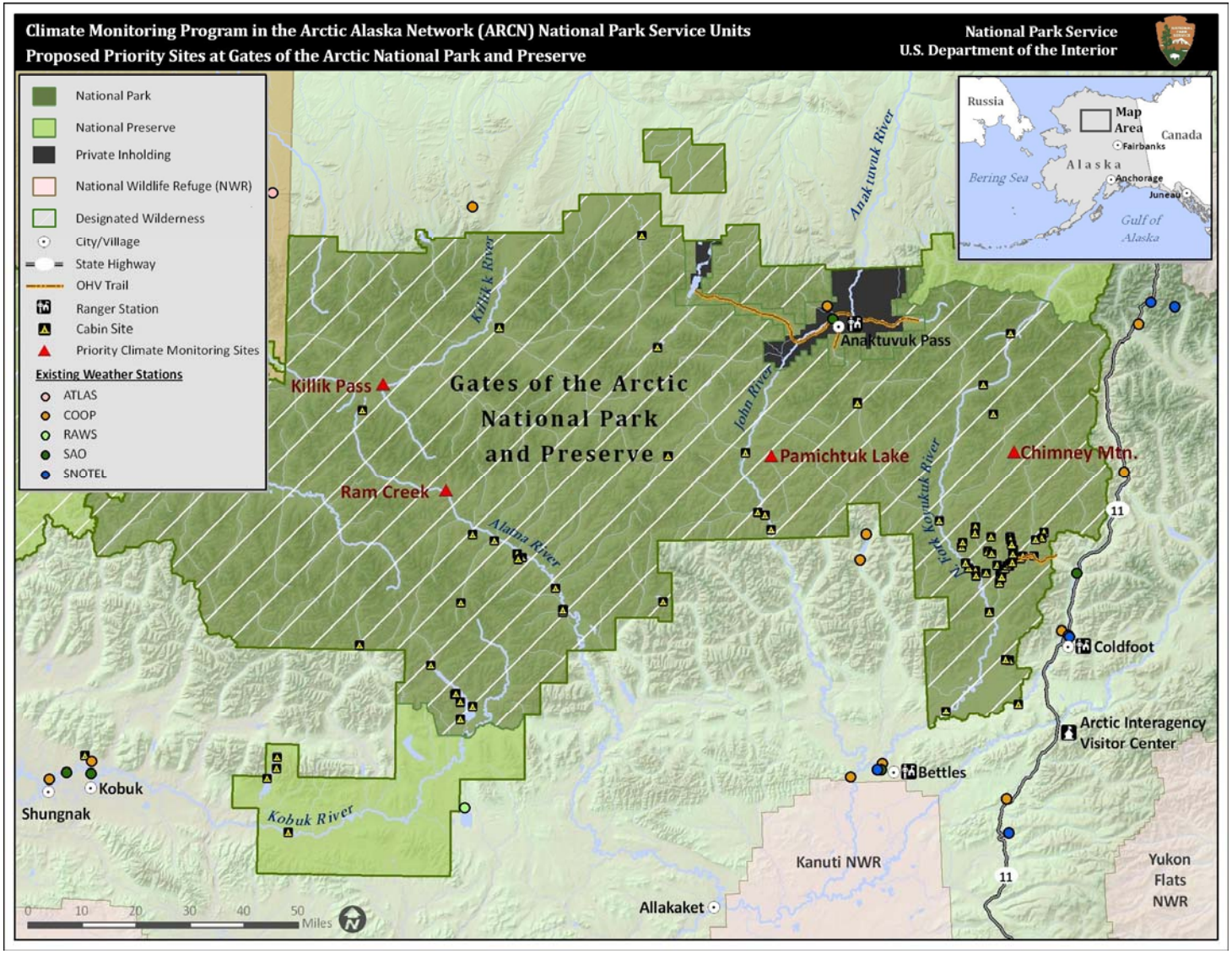


Figure 2-1. Alternative B: Expand Park Climate Monitoring Program – proposed weather stations at Gates of the Arctic National Park and Preserve.

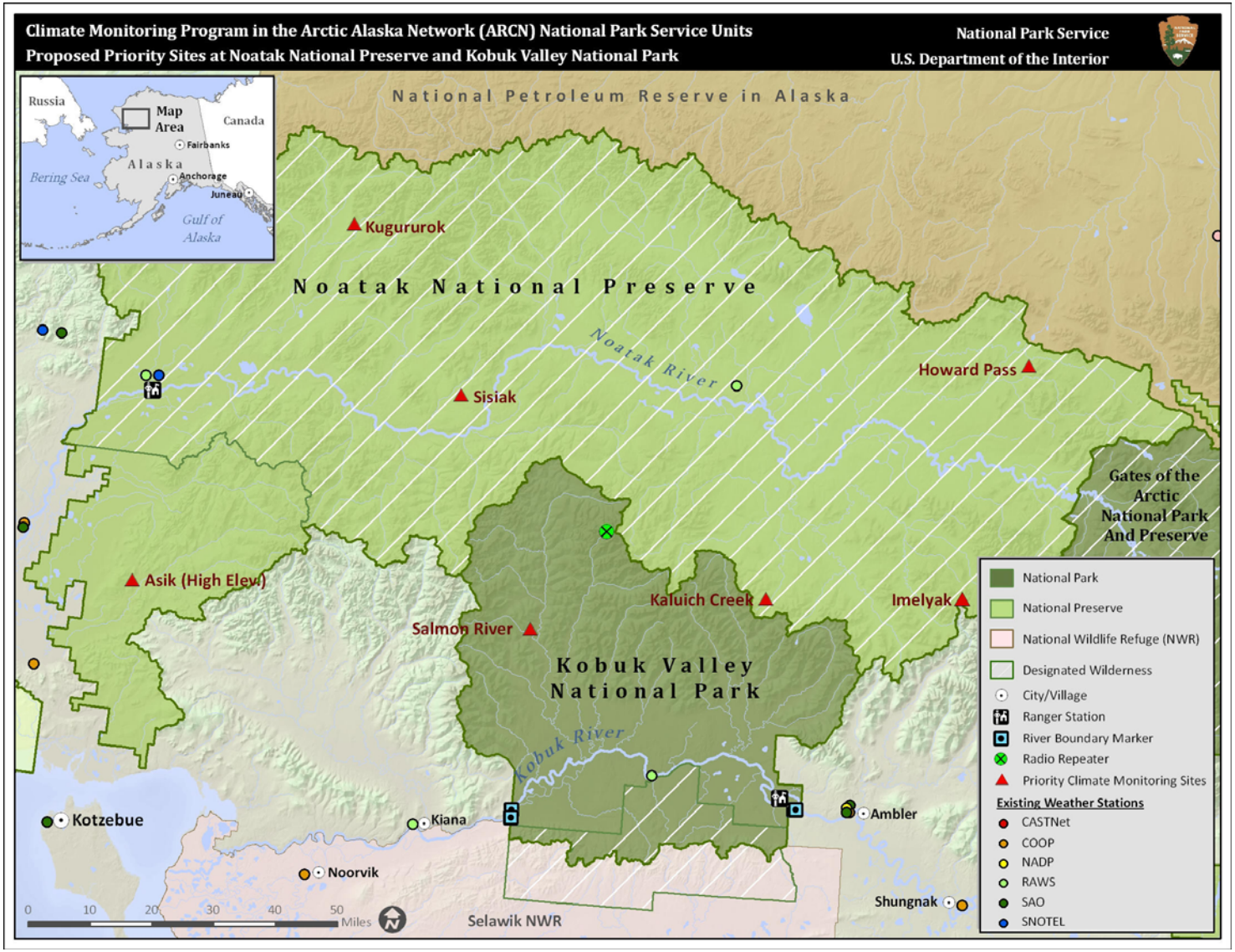


Figure 2-2. Alternative B: Expand Park Climate Monitoring Program – proposed weather stations at Noatak National Preserve and Kobuk Valley National Park.

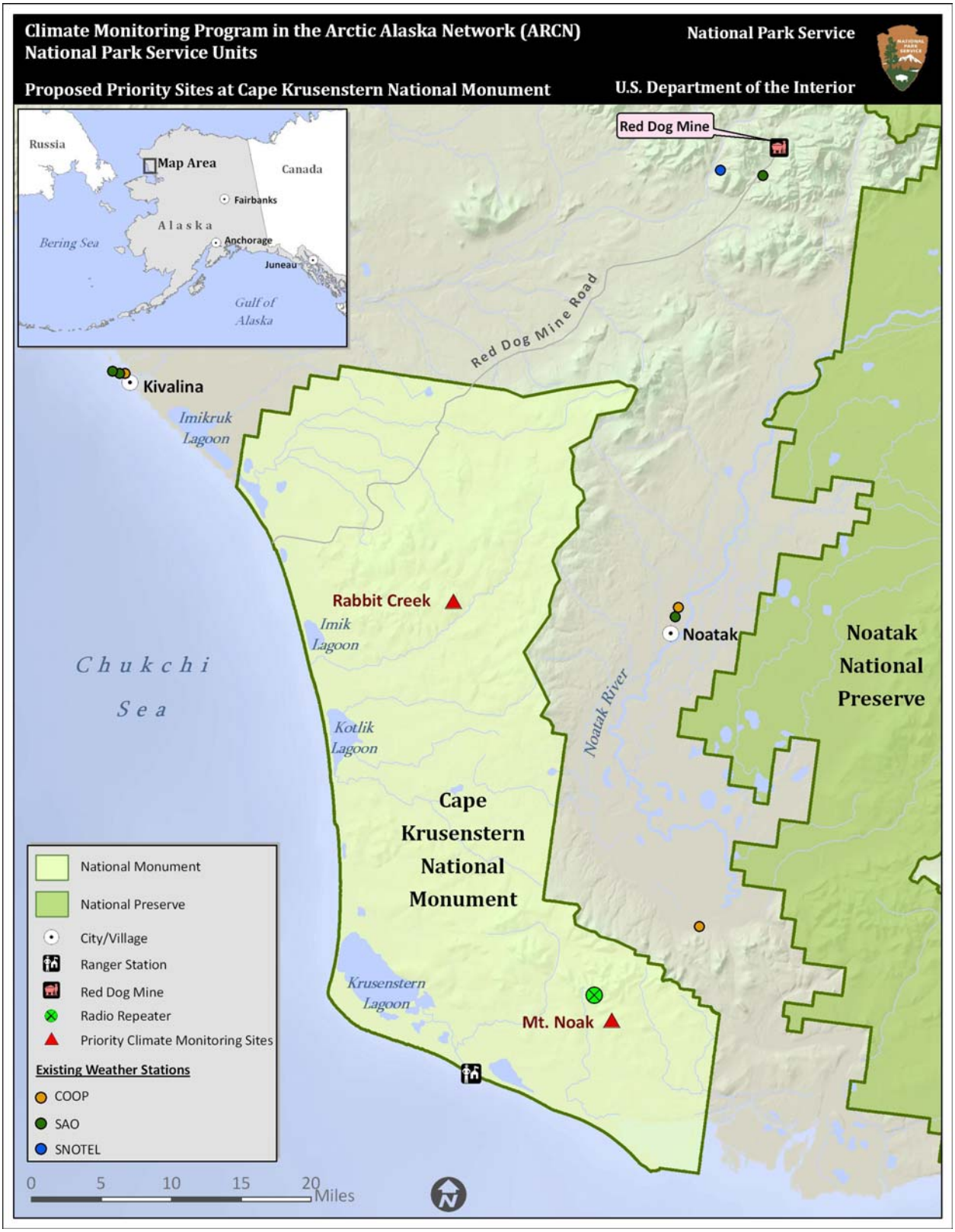


Figure 2-3. Alternative B: Expand Park Climate Monitoring Program – proposed weather stations at Cape Krusenstern National Monument.

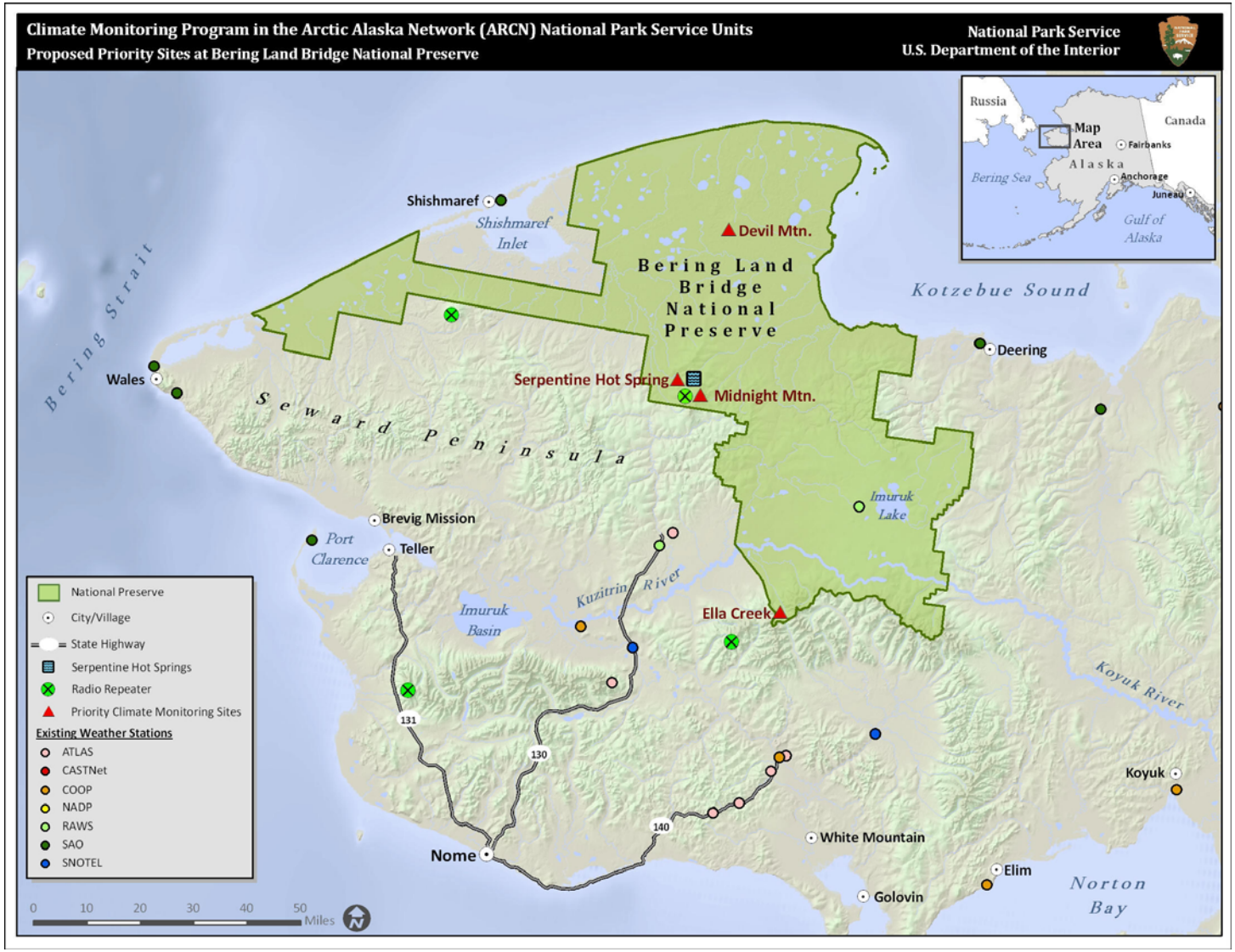


Figure 2-4. Alternative B: Expand Park Climate Monitoring Program – proposed weather stations at Bering Land Bridge National Preserve.

Table 2-1. Potential new weather station sites.

Park	Site Name	Elevation (ft)	Latitude DM_NAD83	Longitude DM_NAD83	Access for Maintenance	Land Status & (Wilderness)	Concurrent Land Uses	Required Site Preparation
GAAR	Chimney Lake	3,100	67° 45.3454’	150° 29.6020’	Helicopter or float plane	Park (Wilderness)	None	None
GAAR	Pamichtuk Lake	2,700	67° 46.3160’	152° 11.7000’	Helicopter or float plane	Park (Wilderness)	None	None
GAAR	Ram Creek	3,000	67°41.1110’	154° 28.3870’	Helicopter	Park (Wilderness)	None	None
GAAR	Killik Pass	3,000	67° 58.2210’	154° 55.4500’	Helicopter or float plane	Park (Wilderness)	None	None
NOAT	Kaluich Creek	2,486	67° 34.4030’	158° 25.9030’	Helicopter	Preserve (Wilderness)	None	None
NOAT	Imelyak	3,620	67°32.6890’	157° 04.6460’	Helicopter	Preserve (Wilderness)	None	None
NOAT	Howard Pass	2,062	68° 09.3610’	156° 53.7490’	Helicopter	Preserve (Wilderness)	None	None
NOAT	Sisiak	1,823	67° 59.7020’	160° 23.7390’	Helicopter	Preserve (Wilderness)	None.	None
NOAT	Kugururok	1,028	68° 19.9870’	161° 22.5530’	Helicopter	Preserve (Wilderness)	None	None
NOAT	Asik (High elevation)	1329	67° 28.4930’	162° 15.9860’	Helicopter	Preserve	None	None
KOVA	Salmon River	1,262	67° 27.5940’	159° 50.4750’	Helicopter	Park	None	None
CAKR	Mt. Noak	809	67° 08.4860’	162° 59.6720’	Helicopter	Monument	None	None
CAKR	Rabbit Creek	966	67° 33.0090’	163° 34.0310’	Helicopter	Monument	None	None
BELA	Midnight Mountain	2,267	65° 49.2200’	164° 32.5645’	Helicopter	Preserve	NPS Radio Repeater	None
BELA	Serpentine Hot Springs	518	65° 51.1380’	164° 42.4690’	Fixed-wing to Serpentine Hot Springs Airstrip	Preserve	None	None
BELA	Devil Mountain	285	66° 16.5530’	164° 31.851’	Helicopter	Preserve	None	None
BELA	Ella Creek	2258	65° 16.2890’	163° 48.6810’	Helicopter	Preserve	None	None

2.3 MITIGATION MEASURES

2.3.1 Vegetation

Most of these sites are located above treeline and in areas where the soils and vegetation are minimal. Where the surfaces of rocks are covered with lichen, disturbance of those rocks would be minimized. Where other plants are present, care would be taken to minimize disturbance (e.g., stepping on rocks where possible rather than on plants and clearing the minimal amount of vegetation necessary).

Mud, dirt, and plant material would be removed from project equipment, footwear, and clothing prior to traveling to the weather station sites, to minimize the possibility of introducing invasive plants to the parks. Weather station sites would be monitored, during the annual maintenance visit, for the presence of invasive species.

2.3.2 Wildlife

To the extent possible, installation and maintenance activities would be timed to avoid sensitive periods, such as nesting season, or caribou migration or subsistence activities involving wildlife. Care was taken in the site selection process to avoid locations that were in the main wildlife migration corridors, specifically in relation to movements of theWestern Arctic caribou herd through Noatak and Kobuk Valley.

In addition to meeting all Federal Aviation Administration and NPS helicopter policy and aircraft requirements, mitigation common to all alternatives for both fixed wing and helicopter flight paths would include:

- Maintenance of a 1,500 foot vertical or horizontal clearance from traditional summer and calving or other habitats supporting reproduction as well as adult animals whenever feasible. This includes brown and black bear, moose, caribou, Dall sheep, wolves, wolverines.
- Pilots would not hover over, circle, harass, or pursue wildlife in any way.
- To comply with the Migratory Bird Treaty Act, helicopter activity would be scheduled to avoid sensitive bird migration or nesting periods in the project areas. Known seabird colony areas would be avoided.

2.3.3 Visual Quality

Where possible, the antenna/tower would be installed in such a way so as not to protrude beyond the silhouette/horizon of a ridge.

2.3.4 Visitor Experience

Signs would be posted on the weather station equipment explaining its purpose and listing a person to contact if visitors who happen upon the site have any questions. Use of helicopters

during hunting season in areas of known hunting would be avoided. Flight paths would avoid known wilderness users and high use visitor areas where users are known to concentrate.

In planning flight paths, all feasible measures would be undertaken to avoid and/or minimize impacts to backcountry users. Planned flight routes would be approved by the park superintendent. Travel routes would be as efficient as possible to minimize flights over conflict areas. Helicopter and aircraft altitude and horizontal distances would be maintained according to the park policy.

2.3.5 Soundscape

To reduce adverse noise impacts to recreational users and wildlife in the parks, helicopters would maintain a minimum altitude of 2,000 to 2,500 feet above ground surface, other than during landing and takeoff, or when visibility is limited by cloud cover, pursuant to Federal Aviation Administration (FAA) Advisory Circular (AC91-36C), "Visual Flight Rules (VFR) Near Noise Sensitive Areas."

2.3.6 Wilderness

To minimize impacts on wilderness values, the stations would be as compact as possible and would be painted green or brown to blend in with the summer landscape the time of year when most visitors are in the area. Mitigation measures as described under Visual Quality, Soundscape, and Visitor Experience would also apply to Wilderness areas.

2.3.7 Cultural Resources

Only for one (Rabbit Creek) of the 17 proposed weather stations is there sufficient data to support a finding of "No potential to cause effect" (36 CFR 800.3(a)(1). At those proposed weather station sites where there are insufficient data to declare the absence of cultural resources, an archaeologist meeting the Secretary of Interior's Standards must determine the "area of potential effects" (36 CFR 800.4(a)(1) and conduct appropriate identification efforts (36 CFR 800.4(b)(1)) within that area. The area of potential effects includes: 1) the footprint of the weather station and precipitation gauge and a buffer surrounding them in which installation and maintenance activities will take place and 2) helicopter and fixed wing landing areas to support the annual maintenance work.

1) If no cultural resources are identified within the areas of potential effects by a qualified archaeologist, the archaeologist shall document a finding of "no historic properties affected" (36 CFR 800.4(d)(1) and no further cultural resource investigation is required. The qualified archaeologist, after considering known archaeological sites in the area, land cover, topography and sub-surface testing limitations (e.g. permafrost) may reach a finding of "no historic properties affected" on the basis of the review of existing data without completing a field examination of the site. Findings that "no historic properties will be affected" would be documented in the annual WEAR report to the SHPO.

2) If cultural resources are identified within the areas of potential effects, the archaeologist must evaluate the historic significance of the resources identified (36 CFR 800.4(c)) and then assess (36 CFR 800.5) and resolve (36 CFR 800.6) the adverse effects on resources eligible for listing on the National Register of Historic Places in consultation with concerned Alaska Native organizations, the Alaska State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation, as appropriate.

3) The NPS would not seek to minimize or mitigate adverse effects on historic properties. Instead, the NPS archaeologist will collaborate to reposition a weather station location to avoid adverse effects on historic properties (36 CFR 800.6(a)). The archaeologist would seek a new installation site for the weather station to insure that no historic properties would be affected. These instances of relocation to insure that no historic properties would be affected would be documented in the annual WEAR report to the SHPO.

4) All personnel installing and servicing the weather stations would complete an orientation to cultural resources prepared by archaeological staff. The purpose of this orientation is to enable non-archaeologists to recognize cultural resources and avoid inadvertent damage to them. If archaeological features are encountered during equipment installation, work would cease immediately and the Superintendent and park Cultural Resource Specialist would be notified.

The comments of the Alaska SHPO on this EA would constitute consultation for purposes of satisfying Section 106 of the NHPA with regard to the installation weather stations and the installation of weather stations in Cape Krusenstern National Historic Landmark Archaeological District and the Iyat (Serpentine Hot Springs) Cultural Landscape.

2.4 THE ENVIRONMENTALLY PREFERRED ALTERNATIVE

As stated in Section 2.7 (D) of the NPS DO-12 Handbook, "The environmentally preferred alternative is the alternative that will best promote the national environmental policy expressed in NEPA (Section 101(b))." The environmentally preferred alternative is the alternative that not only results in the least damage to the biological and physical environment, but that also best protects, preserves, and enhances historic, cultural, and natural resources. Alternative A (No Action) is the environmentally preferred alternative because no new adverse impacts to the environment would occur from installation of new weather stations. New weather stations, however, would provide valuable climate data, which would not occur under the No Action alternative.

2.5 ALTERNATIVES CONSIDERED BUT REJECTED

Replace Climate Monitoring Stations At Existing RAWS Sites. An alternative described in the Wilderness Minimum Requirements Decision Guide (Appendix B) proposed 8 sites instead of the 17 proposed in Alternative B. The alternative included 3 new sites (Mt. Noak, Midnight Mountain, Serpentine Hot Springs) and five sites with existing Remote Automated Weather Stations (RAWS). The existing RAWS in the ARCN have been in operation since 1990. These

stations are in fine working order and play a critical role in fire weather monitoring in the ARCN. The NPS have no intention of replacing the existing RAWS. The objective of the climate monitoring program is to add to the existing monitoring array in the ARCN not replace existing facilities.

Locate Climate Monitoring Stations Outside of the Park and Preserve Boundaries. During the scoping process for new climate stations, the NPS worked in collaboration with state and local agencies to assess the current spatial density of weather stations in the northwest Arctic region to determine where new NPS sites would provide the most value. The proposed sites were selected with these partners in mind, realizing that additional climate stations would be installed on lands surrounding the parks by other agencies and partners. The NPS will continue to work with these other entities as they develop monitoring plans to ensure adequate spatial coverage of climate data for the entire region.

Only a few climate stations now exist in this immense area, and a large portion has no monitoring at all, resulting in the lowest spatial climate station density of all NPS units nationwide. The climate data from outside the park and preserve boundaries is inadequate to describe spatial and temporal variations and trends with sufficient detail to understand the effects of fluctuations and slow changes in climate on ecological communities, hydrology, landscape alteration, and human activities.

2.6 COMPARISON OF ALTERNATIVES

Table 2-2 compares the potential environmental impacts associated with the No Action and Preferred alternatives. Potential impacts are provided for each environmental resource topic. Chapter 4, *Environmental Consequences*, of this EA contains a detailed discussion of the potential impacts by resource topic.

Table 2-2. Comparison of Alternatives.

Impact Topic	Alternative A: No Action	Alterative B: Expand Climate Monitoring Program
Vegetation	No impacts on vegetation *Minor adverse cumulative impacts*	Minor, long-term, adverse impacts to vegetation at all five parks from loss of plants due to anchoring of equipment & vegetation trampling during installation & maintenance of weather stations. *Minor adverse cumulative impacts*
Wildlife	No impacts on wildlife	Minor, temporary, adverse impacts to wildlife & minor, long-term, adverse impacts to wildlife habitat from displacement of wildlife & disturbance of wildlife habitat

Impact Topic	Alternative A: No Action	Alterative B: Expand Climate Monitoring Program
	Minor adverse cumulative impacts	during installation & maintenance of weather stations. *Minor adverse cumulative impacts*
Visual Quality	No impacts to visual quality *Minor adverse cumulative impacts*	Minor adverse impacts to visual quality from the installation & presence of permanent weather stations. *Minor adverse cumulative impacts*
Soundscape	No impacts to the natural soundscape *Minor adverse cumulative impacts*	Minor adverse impacts on soundscape from temporary noise intrusions during installation & maintenance of weather stations. *Minor adverse cumulative impacts*
Visitor Experience	No impact to visitor experience *Minor adverse cumulative impacts.*	Negligible, temporary, adverse impacts to visitor experience from encounters with the stations & noise from overhead aircraft during installation & maintenance of weather stations. *Minor adverse cumulative impacts*
Wilderness	No impacts to designated or eligible wilderness *Minor adverse cumulative impacts*	Minor adverse impacts to wilderness from the installation & maintenance of 17 new weather stations in designated or eligible wilderness at the five NPS units. *Minor adverse cumulative impacts*
Cultural Resources	No impacts to cultural resources *No adverse cumulative impacts*	No impacts to cultural resources. *No adverse cumulative impacts*

CHAPTER 3: AFFECTED ENVIRONMENT

This chapter describes the existing environment and current conditions of important resources and values at GAAR, NOAT, KOVA, CAKR, and BELA. Topics characterized are vegetation, wildlife, visual quality, soundscape, visitor experience, wilderness, and cultural resources. These resources have the potential to be affected by an expanded climate monitoring program.

3.1 VEGETATION

Based on Nowacki et al. (2002) descriptions of the ecoregions of Alaska: GAAR spans two Divisions: the Arctic Tundra Division – Brooks Range (most of the park and preserve) and Brooks Foothills Ecoregions, and the Intermontane Boreal Division – Kobuk Ridges and Valleys Ecoregion; NOAT spans three Divisions: the Arctic Tundra Division – Brooks Range Ecoregion (most of the preserve), the Intermontane Boreal Division – Kobuk Ridges and Valleys Ecoregion, and the Bering Tundra Division – Kotzebue Sound Lowlands; KOVA spans two Divisions: the Intermontane Boreal Division – Kobuk Ridges and Valleys Ecoregion, and the Arctic Tundra Division – Brooks Range Ecoregion; CAKR spans three Divisions: the Bering Tundra Division – Kotzebue Sound Lowlands Ecoregion, the Intermontane Boreal Division – Kobuk Ridges and Valleys Ecoregion, and the Arctic Tundra Division – Brooks Foothills Ecoregion; BELA is located in the Bering Tundra Division – Kotzebue Sound Lowlands and Seward Peninsula Ecoregions. Ecoregions are large ecosystems primarily defined by climate and topography, with refinements from vegetation patterns, disturbance regimes, bedrock geology, and surficial deposits remaining from recent geomorphic activities such as glaciers, floods, and volcanic eruptions.

The Arctic Tundra Division stretches along the Arctic Ocean and sweeps inland to include the Beaufort Coastal Plain, the Brooks Foothills, and the Brooks Range. These open, wind-swept lands are gripped by polar conditions throughout the year. Tundra and low shrub communities predominate throughout the Arctic Tundra zone (Spencer et al., 2002). Vegetation of the foothills and lower mountain slopes of the Brooks Range is dominated by vast expanses of mixed shrub-sedge tussock tundra, interspersed with willow thickets along rivers and small drainages and Dryas tundra on ridges. Alpine tundra and barrens dominate at higher elevations along the entire crest of the range. On the south side, lower mountain slopes and valleys are covered with sedge tussocks and shrubs. The Arctic treeline is restricted to the south side of the Brooks Range. Here, sparse spruce and birch forests and tall shrublands occur in larger valleys.

The Bering Tundra Division includes lands and nearby waters in and near the Bering Sea. The Bering Sea has limited warming effects on the climate, so the adjacent lands are predominately cold, wind-swept, and treeless (Spencer et al., 2002). The cold soils and bitter climate support moist or wet tundra communities of sedges, grasses, low shrubs, and lichens interspersed with rocky cliffs and shorelines. Drier ridgetops on the Seward Peninsula and the islands have alpine Dryas-lichen tundra and barrens with low shrub tundra on hillsides and willows along streams. Scattered forest patches of balsam poplar and white spruce grow along the rivers in protected valleys of the easternmost Seward Peninsula and the Kotzebue lowlands.

The Intermontane Boreal Division in Alaska is a portion of the largest coniferous forest in the world. The boreal forest stretches across the northern circumpolar regions, including Canada, Alaska, Siberia, and Scandinavia. The highly productive vegetation along the major rivers supports vigorous stands of white spruce and balsam poplar. Robust wet sedge meadows and aquatic vegetation are invading sloughs and oxbow ponds. The adjacent permafrost dominated lowlands support black spruce woodlands, dwarf birch and low-growing ericaceous shrubs of the heath family, and sedge-tussock bogs.

All site and vegetation descriptions for each park below are from the Arctic Network Climate Monitoring site evaluation report (NPS, 2009d).

3.1.1 Gates of the Arctic National Park and Preserve

The Chimney Lake site is in eastern GAAR in the Clear River drainage off the North Fork of the Koyukuk at an elevation of 3,200 feet. There are rolling hills to the southwest of Chimney Lake. The site is just above treeline and consists of open tundra with a mix of dwarf shrubs, including ericaceous shrubs, *Betula nana*, possibly *Dryas*, dry alpine tundra, and rocky substrate.

Photo 3-1. Chimney Lake Site.

Photo 3-2. Pamichtuk Lake Site.

The Pamichtuk Lake site is on an exposed open bench above Pamichtuk Lake on the Upper Mashshooshalluk Creek between John and Tinayguk Rivers at an elevation of 2000 feet. Hills to the northeast rise up from Pamichtuk Lake. There are open tundra areas with exposed rock, dry ground, and wetter areas near lake. The site consists of very sparse vegetation with some prostrate shrubs, such as *Dryas*. Below the site there is a mix of low shrubs including, ericaceous shrubs, willow, and eventually alder.

The Killik Pass site northwestern GAAR is at an elevation of 3000 feet. Hills rise just north of the broad Killik Pass area. The site is above an obvious lake with a small island. Vegetation is low, wet, tussock tundra giving way to drier ridges to the north. Dwarf shrubs include *Dryas*, several species of ericaceous shrubs, and willow. The moister areas, like the swales, have dwarf birch-ericaceous shrubs.

Photo 3-3. Killik Pass Site.

Photo 3-4. Ram Creek Site.

The Ram Creek site is located in the mountainous region of the Alatna River valley at an elevation of 3000 feet. Gentle slopes occur to the south of Ram Creek. Shrubs below the site are willow or dwarf birch. On the knob at the site, the birch and willows thin out and there are prostrate shrubs, such as *Dryas*. Spruce is present in the river valley below.

3.1.2 Noatak National Preserve

The Asik high elevation site at 1,329 feet is in the Agashashok River drainage in the southwest corner of NOAT. The site is in gentle rounded hills with low alpine tundra near a geologic contact between limestone and noncalcerous metamorphic rock. Trees reach nearly to the site as krumholz. Vegetation is sparse alpine tundra with species such as *Dryas octapetala*, *Lupinus* spp., and *Calamagrostis purpurascens*.

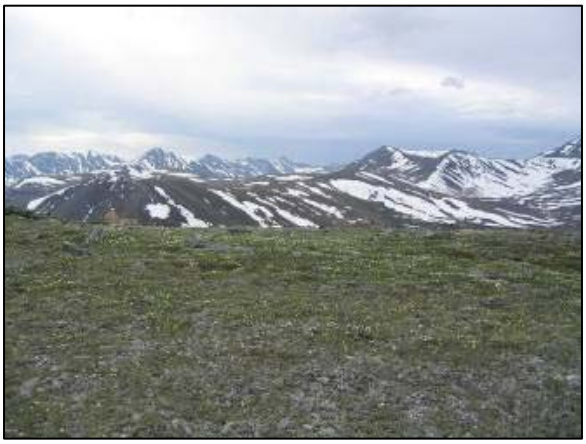
Photo 3-5. Asik (high elevation) Site.

The Kugururok site is located in the Kugururok River drainage at an elevation of 1,028 feet. It is on a knob above the river drainage, south of high exposed peaks to the north. Little vegetation occurs on the knob, which mainly consists of gravel and cobble sized blocky chert. Tussock tundra surrounds the knob with species including *Betula nana*, *Carex bigelowii*, *Eriophorum vaginatum*, *Sphagnum* moss, and *Ledum* spp.

Photo 3-6. Kugururok Site.

The Sisiak site is located in rolling tundra hills north of the Noatak River just before the river turns to the west in west-central NOAT at an elevation of 1,823 feet. Expansive low plateaus extend in every direction, and there are some higher peaks to the north. Dwarf shrub tundra occurs with channery metamorphic rock. Vegetation includes dwarf shrubs such as *Dryas octapetala*, *Betula nana*, and *Vaccinium* spp.

Photo 3-7 Sisiak Site.



The Kaluich Creek site is located on the high plateaus east of the Akiak Mountains, south of the Noatak River on the boundary between NOAT and KOVA at an elevation of 2,486 feet. The rocky substrate supports sparse vegetation of alpine flower mats interspersed with mosses and lichen. Just down slope is a good area for a satellite soil site with willow and alder (*Salix richardsonii*, *Carex bigelowii*, and *Equisetum* spp.).

Photo 3-8. Kaluich Creek Site.

The Imelyak site is located in the southeastern area of NOAT at the Imelyak River headwaters in a valley west of the Ambler River. The site is on a broad, flat-top exposed mountain top just inside the preserve boundary at an elevation of 3,569 feet. The site is characterized by low *Dryas* tundra and loamy-skeletal soils.

Photo 3-9. Imelyak Site.

Photo 3-10. Howard Pass Site.

The Howard Pass site is located in the northeastern area of NOAT in rolling hills south of Howard Pass and north of the Noatak River at an elevation of 2,109 feet. The site has rocky tor outcrops with *Dryas* tundra near the top and *Carex* spp., *Salix* spp., and *Cassiope* spp. just down slope. Specific care was taken to locate this site out of the main corridor of Howard Pass where caribou travel. The site is adjacent to rock tors and would not stand out on the landscape.

3.1.3 Kobuk Valley National Park

The Salmon River site is located in the hills north of Nikok Creek and the Salmon River confluence at an elevation of 1,262 feet. The site is on a bald ridge with alder and encroaching spruce. *Dryas* tundra, dwarf birch, and loamy skeletal soils occur at the proposed tripod site.

Photo 3-11. Salmon River Site.

3.1.4 Cape Krusenstern National Monument

Photo 3-12. Mt. Noak Site.

The Mt. Noak site is located on the western end of the broad sloping Igichuk Hills in southern CAKR two miles southeast of Mt. Noak at an elevation of 809 feet. The site is on the western edge of a spruce forest. Vegetation consists of dwarf shrub tundra with species including *Dryas integrifolia*, *Potentialla biflora*, *Salix arctica*, and *Arctous* spp. Channery metamorphic rock and loamy soils occur at the site.

The Rabbit Creek site is located in central CAKR in the broad, sloping Mulgrave Hills just north of the Rabbit Creek drainage at an elevation of 966 feet. The hills surrounding the site are higher, but more rocky and exposed. Vegetation consists of dwarf shrub tundra with hummocks including plants such as *Lupinus* spp., *Betula nana*, *Empetrum* spp., *Arctous alpine*, *Arternisia arctica*, *Ledum* spp., and *Hierchloe alpine*.

Photo 3-13. Rabbit Creek Site.

3.1.5 Bering Land Bridge National Preserve

Photo 3-14. Midnight Mountain Site

The Midnight Mountain site is a high elevation site located east of the Serpentine Hot Springs at an elevation of 2,247 feet. The site is on a large, flat open plateau with a dry, rocky and flat expanse and sparse alpine vegetation. The site has scattered sedges (*Carex* spp.) and grasses. There are a few prostrate shrubs, as well as *Cassiope tetragona* and some willows (*Salix* spp.). There is a radio repeater station on this ridge.

The Serpentine Hot Springs site is a low elevation site located in the Serpentine Hot Springs area at 518 feet. The site is in gentle, rolling hills surrounded by granite tors in a slightly sloping open area on the tundra. Vegetation consists of dwarf birch, lichens, and low tundra plants such as *Betula* spp., *Arctous* spp., and *Empetrum* spp. The site could be moved two miles west and out of the culturally significant area and retain the same site characteristics.

Photo 3-15. Serpentine Hot Springs Site

Photo 3-16. Devil Mountain Site.

The Devil Mountain site is located in a low-lying tundra expanse representative of the northern area of BELA directly southeast of Devil Mountain in the Devil Mountain Lake area at an elevation of 285 feet. The site is on a gentle slope off the southeast side of Devil Mountain, has silty, saturated soils, and is wet in low elevations. Vegetation consists of tussock tundra with Labrador Tea (Ledum spp.), Rubus chamaemorus, and saturated mosses (Spagnumspp.).

The Ella Creek site is located at a pass between Ella Creek and Pargon Creek in the Bendlebeen Mountains in southwestern BELA along the preserve boundary at an elevation of 2,326 feet. The site is on a broad, flat-top expanse with little vegetation. Vegetation at the site is sparse, but the site is surrounded by prostrate shrubs just off the high spot. Plant species include *Loiseleuria* spp., *Diaspensia* spp., *Therorhodion* spp., *Empetrum* spp., *Dryas* spp., *Salix* spp., and *Hierchloe alpine*.

Photo 3-17. Ella Creek Site.

3.2 WILDLIFE

3.2.1 Gates of the Arctic National Park and Preserve

Thirty-six species of mammals occur at GAAR, ranging in size from voles and lemmings to brown bear and moose (NPS, 1986a). Larger rodents include the arctic ground squirrel and Alaskan marmot. Furbearers, such as marten and lynx, are limited to the forested areas in the southern half of the park. Beaver, mink, and otter are limited by the scarcity of low-gradient aquatic habitats. Red fox, wolverines, and wolves are present throughout. Wolves prey primarily on caribou, but also on Dall sheep, moose, and small mammals. Brown bears, which occur throughout the park and preserve, are concentrated along most of the major streams and rivers, but especially the Chander, North Fork, Anaktuvuk, John, Natuvuk, Killik, and Itkillik rivers in spring and fall, and found commonly in alpine and tundra habitats. Black bears are common in the southern forested regions. Moose, Dall sheep, and caribou are the three ungulate mammals occurring in the area. Moose are most common in the forested regions south of the Brooks Range, but they extend up mountain valley and into the larger northern drainages wherever trees and shrubs provide food and critical winter habitat. Dall sheep are widespread throughout the mountainous alpine areas of GAAR where rugged terrain with cliffs, steep slopes, and rocky outcrops exist. Caribou of the western arctic herd range over the entire region, migrating through the park and preserve as it moves from wintering grounds to calving areas and summer range. Caribou of the central arctic herd occasionally use the northeastern park of the park during winter.

Over 133 species of birds have been observed in the park and preserve (NPS, 1986a). Nearly half of those recorded are associated with aquatic habitats. Raptors include species of eagles, hawks, falcons, and owls. The most widespread fish species at GAAR is the arctic grayling, which is found in nearly all permanent water bodies. Lake trout, northern pike, arctic char, whitefish, sheefish, salmon, long-nosed sucker, burbot, nine-spined stickleback, and slimy sculpin also occur (NPS, 1986a). The Kobuk and Koyukuk rivers are the major chum salmon spawning streams.

3.2.2 Noatak National Preserve

Thirty-seven species of mammals occur at NOAT (NPS, 1986b). Caribou found in the preserve are part of the western arctic herd, which ranges over the entire region. Hundreds of thousands of caribou of the western arctic herd cross the preserve, migrating to and from calving grounds. Moose are found within major drainages of northwest Alaska, including the middle Noatak drainage. The Kugururok River hosts particularly high numbers of the Noatak's moose population. Dall sheep are present throughout the Baird and DeLong mountains and west into the Wulik peaks. Within this region, Dall sheep reach the northwestern limit of their distribution. Brown bears frequent moist tundra and shrub associations along riverbanks throughout northwest Alaska; within the preserve, significant bear habitat occurs along the Cutler River. Black bears prefer forested areas and are known to inhabit the forested Kobuk drainage. Wolves are present within all major drainages, as are coyotes and red fox. Arctic fox prefer coastal and delta areas mostly within the Arctic Slope area, but is wide ranging in its feeding activities. Lynx occur in the forested areas of the lower Noatak. Six members of the

weasel family inhabit the preserve, including the wolverine, ermine, river otter, marten, least weasel, and mink. Beaver can be found in the Selawik and upper Kobuk drainages. Muskrats occur in the Noatak valley and on the lower Noatak flats. Other mammals include the masked shrew, arctic shrew, snowshoe hare, arctic hoary marmot, arctic ground squirrel, lemming, and porcupine.

Approximately 125 species of birds have been identified in the preserve (NPS, 1986b). The northwest Alaska region provide important bird habitat because it is a major breeding area for migratory birds and encompasses a zone of interchange between the flyways of Asia and North America. Waterfowl, including Canada goose, white-fronted goose, tundra swan, four species of loons, pintail, American wigeon, greater scaup, oldsquaw, and red-breasted merganser inhabit NOAT's wetland areas. Sixteen species of raptors also find important habitat in the Noatak drainage. Golden eagles are common on the lower Noatak, and bald eagles are rare in the preserve. Goshawk, sharp-shinned hawk, merlin, osprey, gyrfalcon, and American kestrel can be found. Both willow and rock ptarmigan are common in shrub areas and spruce and ruffed grouse in woodlands. Additionally, a variety of plovers, turnstones, snipes, sandpipers, phalaropes, gulls, terns, owls, larks, swallows, warblers, sparrows, finches, and thrushes are encountered.

Approximately 22 species of fish are found in the Noatak drainage (NPS, 1986b). Arctic grayling and arctic char are the most common sport fish. Chum salmon are found throughout the Noatak drainage; sockeye, coho, king, and pink salmon are found in fewer numbers and confined to the lower reaches of the Noatak River. Other species found in lakes and streams include sheefish, lake trout, burbot, northern pike, whitefish, long-nose sucker, slimy sculpin, nine-spined stickleback, blackfish, and least ciscos.

3.2.3 Kobuk Valley National Park

Thirty-two species of mammals occur at KOVA, including carnivores such as wolves, bears, lynx, fox wolverine, and weasels, three ungulates (moose, caribou, and Dall sheep), and rodents such as voles, squirrels, lemmings, muskrat, beaver, and porcupine (NPS, 1986c). Caribou of the western arctic herd move across the KOVA migrating to and from calving grounds. The Hunt River valley and the Mileut Creek and Redstone River drainanges are the primary corridors for migration through the Baird Mountains. Primary moose range in the park is along the Kobuk River. Although the park does not contain prime Dall sheep habitat, they occasionally inhabit the portion of the Baird Mountains that lies in the park. Brown and black bears both occur in the park, with brown bears found in tundra and shrub habitat and along rivers, and black bears in forested areas. Wolves are predators of caribou and moose and travel near migrating caribou in the spring and fall. Some wolves are permanent residents of KOVA while other are transient, residing in the valley only during winter months. Good lynx habitat exists in forested areas of the park.

One hundred nineteen bird species have been identified at KOVA. Prime waterfowl nesting areas occur in the extensive lowlands in the Kobuk Valley (NPS, 1986c). Raptors inhabiting the park include rough-legged hawk, marsh hawk, golden eagle, osprey, merlin, and American kestrel. Willow and rock ptarmigan are both common in the park. Spruce and ruffed grouse are found in the area's woodlands.

Twenty-five species of fish are found within the Kobuk River drainage (NPS, 1986c). Although all five species of Pacific salmon occur in waters of the region, only chum, king, and pink salmon occur in the drainages of KOVA, with chum salmon being the most abundant. The Salmon and Tutuksuk rivers are major spawning and production tributaries of the Kobuk River for chum salmon. Arctic grayling and arctic char are distributed throughout the waters of the park. Sheefish inhabit the Kobuk River. Northern pike, whitefish, burbot, long-nosed sucker, slimy sculpin, and least ciscos also inhabit river and lakes in the park.

3.2.4 Cape Krusenstern National Monument

Twenty-one species of terrestrial mammals occur at CAKR and twenty-one species of marine mammals use the adjacent waters of the Chukchi Sea and Kotzebue Sound (NPS, 1986d). Included among terrestrial mammals are caribou, brown bear, musk-ox, moose, Dall sheep, wolf, fox, weasel, and wolverine. Marine mammals include ringed seal, bearded seal, Stellar sea lion, walrus, bowhead whale, finback whale, beluga whale, and harbor porpoise. Migrating caribou of the western arctic herd move through the Cape Krusenstern area. Caribou winter in the Kivalina drainage and within the Mulgrave Hills, and some of the herd moves across the Wulik River. Brown bears are not plentiful in the monument, but are common along stream courses and the shoreline near mountainous terrain. Although the last naturally occurring muskox died in Alaska in 1865, they were reintroduced in 1970 and 1977. They have since dispersed into the monument, with the Mulgrave Hills identified as summer and winter muskox range. Wolves inhabit the major drainages within the monument. Dall sheep are present throughout the Baird and DeLong mountains, west to the Wulik Peaks. Dall sheep move in and out of the monument's western Igichuk Hills in sparse numbers. Small mammals in the monument include red and arctic fox, snowshoe and arctic have, voles, and ground squirrels.

About 120 birds occur at CAKR. Most birds found in the monument are summer nesters or migrants. Moist tundra lowlands and wet sedge meadows near the coast are especially important habitat areas. Species in the monument include mallard duck, green-winged teal, shoveler, greater scaup, common eider, black scoter, red-breasted merganser, Canada goose, American widgeon, horned and red-necked grebes, and loons. The two largest birds in the monument are the tundra swan and sandhill crane.

The coastal and inland waters of the monument support a variety of fish. Whitefish, cisco, and char occur in large quantities at Sheshalik Spit. Grayling overwinter in the Rabbit Creek drainage and streams draining the Igichuk Hills. All five species of salmon are found in the Kotzebue Sound, but only chum is found in major quantity. Many species of fish occur in the monument some of the more notable include burbot, dolly varden, cod, flounder, sculpin, and herring.

3.2.5 Bering Land Bridge National Preserve

Brown bears occur throughout the Seward Peninsula and in the preserve (NPS, 1986e). Brown bears typically use the river valleys and coastal areas in spring and the coastal lowlands in summer and fall where salmon streams are located. Black bears are not found in the preserve. Wolves occur throughout BELA. The Western Arctic Herd occurs in BELA, both in the summer

and winter and at times numbers in the thousands. Although muskox originally ranged over the Seward Peninsula, they were eliminated some time during recent times. They were reintroduced on the peninsula in 1970, and about 1/3 of the muskoxen on the peninsula are estimated to be within the preserve. Moose on the Seward Peninsula have large home ranges, and they may frequently move into and out of the preserve. Within the preserve, moose occur in all the major drainages, but not generally along the coast. Small mammals on the preserve include red and arctic fox, muskrats, arctic ground squirrel, short-tailed and least weasels, and wolverine. The preserve does not include marine waters off its shores, but it does include several small islands southeast of Cape Espenberg which are important seal haulouts. Marine mammals include ringed, bearded, and spotted seals, Stellar sea lion, walrus, bowhead whale, finback whale, beluga whale, and harbor porpoise. Polar bears are found along the Chukchi Sea coast in winter where they move into the area with pack ice.

The Seward Peninsula is a rich and diverse area for birds, with at least 170 known to occur, of which approximately 108 species are found on the preserve (NPS, 1986e). This diversity is related in part to the preserve's nearness to Asia and also to the occurrence of three distinct habitats – marine/estuarine, tundra, and boreal forest. Some Asian birds regularly migrate across the Bering Strait and breed on the peninsula. The salty grasslands and marshes at the mouths of the Nugnugaluktuk, Pish, and Goodhope rivers and Cape Espenberg are especially important for waterfowl. Colonies of seabirds are found in the preserve, as well as pelagic seabirds and gulls found in the waters immediately off the Chukchi Sea coast. The tundra habitat supports the majority of passerine birds, as well as hawks, owls, and other predatory birds. Relatively few boreal forest birds are found in the preserve, but such species as varied thrush, American robin, and warblers may occur along the eastern boundary.

Fish found in the preserve include species of stickleback, grayling, char, and salmon (NPS, 1986e). Salmon runs occur in the lower parts of the Arctic and Serpentine rivers in the preserve and also in the Inmachuk.

3.3 VISUAL QUALITY

In selecting sites for the climate stations, particular care was taken to select locations that were not near popular hiking or river floating routes so that the visual impact of the station would disturb as few people as possible. Common air traffic corridors were also avoided. Views at the potential weather station sites include expansive vistas of mountains, undulating hills, grassy knolls, plateaus, lakes, and river valleys. All site descriptions below for visual quality for each park are from the Arctic Network Climate Monitoring site evaluation report (NPS, 2009d).

3.3.1 Gates of the Arctic National Park and Preserve

The Chimney Lake site is in the rolling hills southwest of Chimney Lake. The weather station would be located so that it was not visible by hikers using the Chimney Lake area or the Clear River drainage. If hikers did gain access to the ridge they would see the station. Overflights in the area are less common than some of the major river travel routes, but pilots and passengers would be able to see the site from the air if they were looking for it.

The Pamichtuck Lake site is in the hills to the northeast rising up from Pamichtuk Lake. The site would be located on the bench above the lake so that it was not visible to anyone who might access the lake for recreational purposes. The area is not a particularly popular hiking area, but if visitors did travel through the valley, the station would be out of view. However if they hiked up the ridge it would become visible. Overflights in the area are less common than in the adjacent John River corridor, but pilots and passengers would be able to see the site from the air if they were looking for it.

The Killik Pass site is in the hills rising just north of the broad Killik Pass area. The site selected is on the northern edge of the Killik Pass area, away from the main river drainages that would be the most common access routes in the area. The site is on a bench above a lake that is not the preferred lake for landing floatplanes. The site would be located on a bench above the lake on an exposed rock outcrop and could potentially be visible if visitors are hiking or traveling along the northern edge of the pass. Extra care would be taken at this exposed site to camouflage the station to blend in with the summer landscape.

The Ram Creek site is in a mountainous region in the Alatna River valley. People floating the Alatna River would not be able to see the station from the river valley. The site is not in an area that is common for hikers, but could be visible if anyone chose to gain access to the bench from the river. River floaters hiked up the ridge. Overflights in the area may be more common in the Alatna River drainage, and pilots and passengers would potentially see the site from the air if they were looking for it. Extra care would be taken at this exposed site to camouflage the station to blend in with the summer landscape.

3.3.2 Noatak National Preserve

The Asik (high elevation) site is on gentle rounded hills with low alpine tundra and southern exposure. The site would not be visible from the river corridor. Overflights in the area are more common in the main river valley, but pilots and passengers would be able to see the site from the air if they were looking for it.

The Kugururok site is on a knob above the Kugururok River drainage, south of high exposed peaks to the north. Extra care would be taken at this site to locate the station so that it would not be visible from the river corridor. The station would potentially be visible from aircraft that are flying up the main Kuguruok River valley.

The Sisiak site is in rolling tundra hills just north of the Noatak River just before the river turns to the west. It is unlikely that hikers would come upon this site; the location is high enough above the main Noatak River corridor that river users would most likely not see this site. Overflights in the area are more common in the main river valley, but pilots and passengers would be able to see the site from the air if they were looking for it.

The Kaluich Creek site is on a high plateau in southern NOAT on the boundary of KOVA. It is unlikely that visitors would see this site because it is located away from the main Noatak River Valley and there are no topographical attributes in the area that would focus any use towards this

ridge. Overflights in the area are rare, but pilots and passengers would be able to see the site from the air if they were looking for it.

The Imelyak site is on a broad, flat-top exposed high elevation mountain top. This remote area is not a popular destination for hiking, subsistence or river use and it is unlikely that anyone using the area would see the site. Overflights in the area are rare, but pilots and passengers would be able to see the site from the air if they were looking for it.

The Howard Pass site is on a rocky tor outcrop on rolling hills about four miles southeast of Howard Pass. This area is a main migration route for the Western Arctic caribou herd and also a culturally significant area that is still used regularly. Specific attention was given to siting a station in this location. The site selected is on the edge of the pass, away from the main southern migration route. The potential site is located about I mile north of a ridge that is a culturally significant site where rock cairns line the ridge line. This technique was traditionally used by local peoples to guide caribou movements towards the hunters. The station would be located along a ridge with (natural) rocky tor outcrops so that the site would not distract caribou that were moving through the area. This would also dampen any visual impact of the station from the open pass area. Hikers or subsistence users, as well as pilots and passengers flying over the area, could potentially see the site if they were looking for it, but special care would be taken to camouflage the station to blend in with the summer landscape.

3.3.3 Kobuk Valley National Park

The mid-elevation Salmon River site is in the hills north of Nikok Creek and the Salmon River confluence. The site would not be visible from the river corridor which is the main travel route in the area for subsistence users and recreational river floaters. Hikers that gain access to the ridge from the river could potentially see the station. Overflights in the area are more common in the main river valley, but pilots and passengers would be able to see the site from the air if they were looking for it.

3.3.4 Cape Krusenstern National Monument

The Mt. Noak site is among broad sloping hills with excellent southern exposure. The main travel corridors are along the coast and along the Noatak River so this site would most likely not be visible to anyone traveling through the area by foot or by snowmachine. Overflights in the area are more common in the main river valley and along the coast, but pilots and passengers would be able to see the site from the air if they were looking for it.

The Rabbit Creek site is representative of extensive low mountains and plateaus in region. The main travel route in the area is along Rabbit Creek to the south; the station would not be visible from the river corridor and it is unlikely that travelers would notice the station. The station is off any main flight path, but pilots and passengers would be able to see the site from the air if they were looking for it.

3.3.5 Bering Land Bridge National Preserve

The Midnight Mountain site is on a large, flat open plateau with 360° views. A co-located radio repeater is visible at the site at the northwestern end of a very broad mountain top. The site would not be visible from the Serpentine Hot Springs area. The ridge top is 5 miles from the airstrip, but hikers that gained access to the ridge would potentially see the station. Pilots and passengers would be able to see the site from the air if they were looking for it, although the main travel route in the area is generally west of this ridge, closer to Serpentine Hot Springs.

The Serpentine Hot Springs site is located in gentle, rolling hills surrounded by granite tors. The trail from Nome to Shishmaref runs just south of the site. The location of the site is out of view of the nearby airstrip and the Serpentine Hot Springs buildings. The preferred location was on the airstrip adjacent to the wind sock at the southern end of the airstrip, but the ridge to the southwest blocks the sun that is necessary to power the solar panel and battery that run the station. Because the site adjacent to existing infrastructure did not work, the site that was selected was located out of the main viewshed of the airstrip and buildings. This site could also be adjusted so that the location was a few miles away from this popular destination area.

The Devil Mountain site is on a gently sloping tundra expanse directly southeast of Devil Mountain. It is approximately 1.5 miles southeast in a non-descript area adjacent to thaw ponds. The area is wide open and expansive, so anyone traveling through the area could potentially see the site. In the summer, access is difficult due to the difficulty in navigating through wetlands. Access during winter and early spring is via smowmoble. Main access points are Devil Mountain Lakes approximately 6 miles to the north and by boats along river corridors. Pilots and passengers would be able to see the site from the air if they were looking for it, care would be taken to camouflage the site to blend in with the summer landscape.

The Ella Creek site is on a broad, flat-top expanse with good southern exposure and views of the Bendlebeen Mountains. Access to this site is difficult, so it is unlikely that hikers or subsistence users would see this site. The location is up and out of view of the main pass that could potentially be used as a travel corridor. Overflights in the area are rare, but pilots and passengers would be able to see the site from the air if they were looking for it.

3.4 SOUNDSCAPE

The ambient sounds at the proposed weather station sites consist predominantly of natural sounds, including wind and rain. On this natural background can occasionally be heard the manmade sounds of transiting high altitude commercial regional airlines on established flight paths and low level local fixed-wing aircraft utilized for transport of park visitors into the backcountry. Human voices may occasionally be heard at sites where limited visitor access is possible and from hunting activities. Table 3-1 compares decibel levels of sounds that may be heard near weather stations. Actual noise levels at any particular site depend on the type of airplane or helicopter, wind direction and speed, whether an airplane or helicopter is approaching or departing, landing or taking off, flying at different altitudes, using a high-pitched prop (floatplanes), turbine or gas-powered.

Table 3-1. Decibel Levels of Ambient and Human-induced Sounds.

Source	Decibels (dBA)
Rainfall	50
Normal Conversation	60
Wind	35-85
Shouting	90
Airplanes (overhead)	100
Helicopter (at site)	105
Helicopter (5 seconds away)	95
Helicopter (10 seconds away)	85
Helicopter (15 seconds away)	80

(Data derived from the following sources: ASHA, no date; Hamilton, 2003; Miller, 2002; UCSC, no date).

3.4.1 Gates of the Arctic National Park and Preserve

Natural sounds predominate at the Chimney Lake and Pamichtuk Lake sites (Sousanes, 2009). The Ram Creek and Killik Pass sites, where natural sounds predominate as well, are subject to occasional noise from aircraft bringing recreationists in for popular river float trips, especially during summer months. Noise from commercial regional aircraft overflights can also be heard several times a day year-round at these two sites. Noise from caribou hunting in the fall may be heard at the Killik Pass site. Also, approximately four miles south of the Killik Pass site is an inholding with a cabin which people fly in to; noise from these flights may be heard at the site.

3.4.2 Noatak National Preserve

Natural sounds predominate at the Kaluich Creek, Imelyak, Sisiak, and Asik sites (Sousanes, 2009). The Howard Pass and Kugururok sites, where natural sounds predominate as well, are subject to occasional noise from aircraft bringing in hunters and river floaters, especially during summer months. Hunting noise in the fall may be heard at the Howard Pass site, and it is possible that noise from the research station below the Asik site may be heard there.

3.4.3 Kobuk Valley National Park

Natural sounds predominate at the Salmon River site (Sousanes, 2009). Occasional aircraft noise may be heard in the Salmon River corridor from people accessing the river for recreational purposes. Noise may also be heard from the occasional helicopter and/or small fixed wing aircraft in support of research or NPS operations.

3.4.4 Cape Krusenstern National Monument

The Mt. Noak and Rabbit Creek sites, where natural sounds predominate, receive noise from commercial regional aircraft overflights several times a day year-round (Sousanes, 2009). In winter, snowmachine noise may be heard at the Rabbit Creek site from the winter corridor from Noatak to the coast.

3.4.5 Bering Land Bridge National Preserve

Natural sounds predominate at the Devil Mountain and Ella Creek sites (Sousanes, 2009). The Midnight Mountain and Serpentine Hot Springs sites receive noise from commercial regional aircraft overflights several times a day year-round. Noise from aircraft using the nearby air strip and from people at the nearby hot springs may reach the Serpentine Hot Springs site. During the summer Serpentine Hot Springs receives a fair of smaller fixed wing aircraft traffic (this has been estimated as averaging at least 10 aircraft per week). Serpentine Hot Springs is also subject to occasional small fixed wing aircraft access during the winter. Additional traffic to the hot springs includes relatively frequent snowmachines access in the winter. There is also occasional year round access by helicopter or fixed wing aircraft for research and NPS operations support.

The existing NPS radio repeater at the midnight Mountain site makes little, if any, noise.

3.5 VISITOR EXPERIENCE

Use of the backcountry at GAAR, NOAT, KOVA, CAKR, and BELA for those seeking a remote experience includes activities such as hiking, mountaineering, hunting, fishing, rafting and kayaking. Opportunities for solitude abound and a primitive and unconfined type of recreation can be expected in the Wilderness areas of all the parks, as well as most other backcountry locations. Recreationists in designated and eligible wilderness do not expect to encounter any modern man-made structures. Most of the potential weather station sites are remote and inaccessible other than by aircraft.

3.5.1 Gates of the Arctic National Park and Preserve

Annual visitation at GAAR was 11,397 in 2008 (NPS, no date). Recreational activities in the park and preserve include river float or canoe trips, backpacking, mountaineering, and fishing. Trapping and sport hunting occur in the two preserve areas. Winter recreational activities include cross-country skiing, snowshoeing, and dog-sledding. Most visitors gain access to the park by aircraft; others backpack from the Dalton Highway or the village of Anaktuvuk Pass. There are no maintained roads, trails, or constructed air strips. Once in the park, most recreational visitors travel on rivers by raft, canoe, or kayak, or on foot. The most used areas for recreational activities are around Walker Lake and Anaktuvuk Pass. Other use areas are float trip routes or traversable corridors near the Dalton Highway, including Walker Lake/Kobuk River, Upper Noatak River, Summit Lake/North Fork of the Koyukuk River, and Arrigetch Peaks areas (NPS, 1986a). In 2008, there were over 6,200 backcountry overnight stays in the park and preserve (NPS, no date).

The Chimney Lake and Pamichtuk Lake sites are located near lakes that are accessible by float plane (Sousanes, 2009). However, neither of the lakes near these sites is currently very popular with visitors. The Ram Creek site is located above the Alatna River which is a popular float trip route. The Killik Pass site is near an area used for caribou hunting in the fall.

3.5.2 Noatak National Preserve

Annual visitation at NOAT was 2,147 in 2008 (NPS, no date). Sportfishing, floating on the Noatak River, hiking in the Brooks Mountains, and hunting account for the majority of recreational uses in the preserve (NPS, 1986b). There are no existing roads or trails in the preserve, and airstrips are unimproved gravel bar strips. Travel by foot is possible throughout the preserve except for the steeper snow-covered mountain peaks. During summer, access for recreation is by boat or airplane. Travel down rivers is by riverboat, canoe, kayak, or raft. In winter, most of the Noatak River is used as a winter trail, mainly by snowmachine. The gravel bar at the Kelly River confluence receives approximately half of all visitor use in the preserve as it serves as the drop-off or pick-up point for many recreational activities. In the upper river, the area near the mouth of the Cutler River receives a smaller but still high amount of use. In 2008, there were over 710 backcountry overnight stays in the preserve (NPS, no date).

The Kaluich Creek, Imelyak, and Asik sites are not accessible to visitor use (Sousanes, 2009). The Howard Pass site is near an area used for caribou hunting in the fall. The Sisiak site is about four or five miles away from the main Noatak River corridor which is the route of a popular river float trip. The Kugururok site is just above the river route of another popular float trip.

3.5.3 Kobuk Valley National Park

Annual visitation at KOVA was 1,565 in 2008 (NPS, no date). Recreational use of the park consists of floating on the Kobuk River in non-motorized boats, visiting the Great Kobuk Sand Dunes, hiking in the Baird Mountains, and sportfishing. Sport hunting is prohibited in the park; however, fall caribou subsistence hunting, particularly in the vicinity of Onion Portage, comprises a largest use of the park (NPS, 1986c). Access in summer is by plane or boat. In winter, vehicles use the Kobuk River as a highway for such purposes as travel between the villages of Kiana and Ambler on either side of the park. Snowmachines are used in winter for subsistence hunting and trapping, particularly along the Kobuk River and broad lowlands. No roads or constructed airstrips exist in the park. In 2008, there were 334 backcountry overnight stays in the park (NPS, no date).

The Salmon River is used by recreational river floaters and access is by fixed-wing aircraft to gravel bars along the river. The Salmon River site is above the river corridor and would require helicopter access, and therefore would not receive much visitor use.

3.5.4 Cape Krusenstern National Monument

Annual visitation at CAKR was 1,575 in 2008 (NPS, no date). Both local residents and visitor to the region recreate in the monument. Kayaking, fishing, camping, hiking, and backpacking opportunities abound in the summer. In winter, snow machining, skiing and dog mushing are possible. Visitors also come to the monument to see special archeological features (NPS, 1986d) such as the beach ridges of Cape Krusenstern which provide a broad, horizontal stratigraphy that includes virtually all phases of cultural history known in northwest Alaska. The monument is usually accessed by plane, boat, ATVs, snowmachine or dogsled. In the summer, people use small, shallow, draft boats or skiffs along the coast. Most users are local residents who come to

hunt, fish, trap, or recreate. No roads exist in the monument or anywhere nearby. An often-used winter trail exists between the communities of Kotzebue and Kivalina along the coastline of the monument. In 2008, there were 267 backcountry overnight stays in the monument (NPS, no date).

Visitor access to the Mt. Noak site occurs rarely in the summer (Sousanes, 2009). The Rabbit Creek site is located above the creek, which is used as a winter corridor for access from Noatak to the coast.

3.5.5 Bering Land Bridge National Preserve

Camping, hiking, backpacking, hunting, fishing, and coastal boating are among the many possible activities in the preserve. Winter offers opportunities for snowmobiling, dog sledding, and some crosscountry skiing. The Preserve and surrounding areas offer opportunities to observe and learn about historic reindeer herding. Serpentine Hot Spring is the most frequently visited site in the preserve, and on the Seward Peninsula (NPS, 1986e). Visitors go to the hot springs year-round for bathing, healing, hunting, trapping, and hiking. The greatest use is in the winter and early spring via snowmobile. Visitation in summer is by small aircraft. Facilities at the hot springs include a cabin, bathhouse, outhouse, and an unimproved landing strip. The other landing strip in the preserve is located adjacent to Ear Mountain, and wheeled planes can also land on sandy beaches and gravel bars. Floatplanes are also used to access the preserve by visitors. Visitors can also access the preserve by boat from Deering or Shishmaref to points on the coast or in the lagoons. Hiking from nearby roads or from Deering and Shishmaref is also possible. Several winter trails used by snowmachines and dogsleds cross the preserve.

In the summer there is no direct access to Midnight Mountain, Devil Mountain, and Ella Creek sites, although aircraft bringing visitors can land on lakes or gravel bars nearby and potentially hike to the sites (Sousanes, 2009). The Serpentine Hot Springs site is located about 1/2 mile away from the hot springs, landing strip, public use cabin, and a hiking trail. This site could be moved two miles west of the culturally significant area.

3.6 WILDERNESS

Alaska's national parks contain the largest areas of undeveloped wilderness lands in the United States of America. They encompass some of the best examples of the wide diversity of ecosystems in Alaska including mountain summits, rolling tundra, massive icefields, beaches, boreal forest and coastal rainforest on a scale not possible elsewhere in the USA. Their size and scope give them a national and international recognition as wilderness resources. They also protect significant wildlife habitat, archeological resources, and opportunities for subsistence and recreational activities. The Wilderness Act of 1964 (P.L. 88-577) describes wilderness as an area "untrammeled by man…retaining its primeval character and influence, without permanent improvements of human habitation… [with] outstanding opportunities for solitude or a primitive and unconfined type of recreation."

These five national park units comprise approximately 20.24 million acres of land, approximately 13.1 million of which were designated wilderness with the passage of the Alaska National Interest Lands Conservation Act (ANILCA). These lands are managed as wilderness under the Wilderness Act of 1964 and under the provisions of ANILCA. Approximately an additional 6.5 million acres are considered eligible for wilderness designation by the Congress based on the wilderness suitability reviews conducted in compliance with ANILCA section 1317(a) and included in the park General Management Plans published in the mid 1980's. The full wilderness review process required under ANILCA section 1317(b) has not yet been completed on those eligible lands. Although EISs were completed there was no final action taken in the Secretary of the Interior's office and no record of decision was published in the Federal Register. This leaves the eligible wilderness acreage managed under NPS policies that protect wilderness character until Congress can act.

Four qualities of wilderness character, as adapted from Landres et al. (2008a and 2008b), are considered in this EA:

- Untrammeled – Wilderness is essentially unhindered and free from modern human control or manipulation. This quality is degraded by modern human activities or actions that control or manipulate the components or processes of ecological systems inside the wilderness.

- Natural – Wilderness ecological systems are substantially free from the effects of modern civilization. This quality is degraded by intended or unintended effects of modern people on the ecological systems inside the wilderness since the area was designated.

- Undeveloped – Wilderness retains its primeval character and influence, and is essentially without permanent improvement or modern human occupation. This quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment.

- Solitude or Primitive and Unconfined Recreation – Wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation. This quality is degraded by settings that reduce these opportunities, such as visitor encounters, signs of modern civilization, recreation facilities, and management restrictions on visitor behavior.

3.6.1 Gates of the Arctic National Park and Preserve

Section 701 of ANILCA designated 7.17 million acres of GAAR as wilderness, and directed that this wilderness be managed in accordance with the Wilderness Act of 1964, except as otherwise expressly provided for in ANILCA (NPS, 1986). Additional lands, consisting of approximately 1.05 million acres, were determined eligible for wilderness designation and will be managed under the terms of ANILCA to maintain the wilderness character and values of the lands until designation recommendations have been proposed. There are no lands that are not eligible for wilderness designation (except for privately owned lands within the park and preserve. Land status for lands around Anaktuvuk Pass was resolved in a land exchange with that village, so that there are no remaining lands that fall in the "ineligible" category (Alderson, 2010).

The Chimney Mountain, Pamichtuk Lake, Ram Creek, and Killik Pass sites are all located within the designated wilderness of GAAR.

3.6.2 Noatak National Preserve

Section 701 of ANILCA designated 5.77 million acres of NOAT as wilderness, and directed that this wilderness be managed in accordance with the Wilderness Act of 1964, except as otherwise expressly provided for in ANILCA (NPS, 1986). Additional lands, consisting of approximately 757,175 acres, were determined eligible for wilderness designation and will be managed under the terms of ANILCA to maintain the wilderness character and values of the lands until designation recommendations have been proposed. Lands not eligible for wilderness designation, due mainly to the presence of Native allotments and Native corporation selected lands, comprise 51,879 acres.

The Kaluich Creek, Imelyak, Howard Pass, Sisiak, and Kugururok sites are located within the designated wilderness of NOAT. The Asik site is located in an area determined eligible for wilderness designation.

3.6.3 Kobuk Valley National Park

Section 701 of ANILCA designated 174,545 acres of KOVA as wilderness, and directed that this wilderness be managed in accordance with the Wilderness Act of 1964, except as otherwise expressly provided for in ANILCA (NPS, 1986). Additional lands, consisting of 1.49 million acres, were determined eligible for wilderness designation and will be managed under the terms of ANILCA to maintain the wilderness character and values of the lands until designation recommendations have been proposed. Lands not eligible for wilderness designation, due mainly to the presence of Native allotments and Native corporation selected lands, comprise 81,376 acres.

The Salmon River site is located in an area determined eligible for wilderness designation.

3.6.4 Cape Krusenstern National Monument

No lands were designated as wilderness in CAKR under the enabling legislation (ANILCA, sec. 701). However, 633,587 acres in the monument are eligible for designation as wilderness (NPS, 1986d). These lands meet the criteria for designation found in the Wilderness Act of 1964. Lands in the monument that are not eligible for wilderness designation are due mainly to presence of Native allotments and impacts associated with the Red Dog mine road and facilities, comprising 26,220 acres. CAKR is managing lands as eligible wilderness to maintain the wilderness character and values of the lands until a final decision has been made.

The Mt. Noak and Rabbit Creek sites are both located in areas considered eligible for wilderness designation.

3.6.5 Bering Land Bridge National Preserve

No lands were designated as wilderness in BELA under the enabling legislation (ANILCA, sec. 701). However, 2.69 million acres in the park are eligible for designation as wilderness (NPS, 1986e). These lands meet the criteria for designation found in the Wilderness Act of 1964. Lands in the park that are not eligible for wilderness designation are due mainly to presence of Native allotments and mining claims, comprising 94,781 acres. BELA is managing lands as eligible wilderness to maintain the wilderness character and values of the lands until a final decision has been made.

The Midnight Mountain, Serpentine Hot Springs, Devil Mountain, and Ella Creek sites are all located in areas considered eligible for wilderness designation.

3.7 CULTURAL RESOURCES

3.7.1 Gates of the Arctic National Park and Preserve

Cultural resource inventories have been conducted in the general vicinity of three of the proposed weather station sites: Pamichtuk Lake, Killik Pass, and Ram Creek (Rasic, 2010). No cultural resources inventory has been conducted near Chimney Lake. An absence of known sites generally indicates the lack of an inventory effort in a specific area rather than the true absence of cultural resources. None of the sites located near the potential climate station installations have been evaluated for eligibility for the National Register of Historic Places.

No archaeological inventory has been conducted in the general vicinity of Chimney Mountain. No cultural resource sites are known in this area. The archaeological potential of the area is unknown; however, the kind of landform (a raised position that offers good views of the surrounding landscape and proximity to water) is generally the kind of location that has at least moderately good archaeological potential.

The Pamichtuk Lake area has received a relatively thorough reconnaissance-level archaeological survey in 1986 and 2003. No sites have been identified in the immediate area of the proposed climate station, although the specific landform for which the is proposed has not been inventoried for archaeological resources. Based on the paucity of sites in the area, and the fairly thorough inventory of the surrounding area, the landform on which the climate station is proposed is considered to have low probability to contain archaeological resources. The nearest site, 4,600 meters away, contains several black chert flakes that were noted in an exposure at the southeast end of a rocky outcrop.

The Killik Pass area has received a moderately intensive but still reconnaissance-level archaeological survey in 2003. The survey resulted in the identification of several sites in the general and immediate area. The general area is one with a high density of known archaeological sites. The landform on which the climate station is proposed has not been thoroughly examined for archaeological sites. One known site, XSP-00326 is located only 300 m from the proposed installation. This landform has a high probability to contain archaeological

resources. No subsurface testing has been conducted at nearby sites and vegetation cover limits surface visibility so there are likely more sites present in this area that were not detected in the cursory surface examination conducted during the previous survey. Features at four of the closest sites include small surface flake scatter, a historic age rifle shell, cache or trap feature located in a bedrock outcrop, and a pit feature composed of approximately 30 boulders.

The Ram Creek area has received a cursory, reconnaissance-level archaeological survey in 2003. The landform on which the climate station is proposed has not been inventoried for archaeological sites, but similar landforms in the Alatna River valley have been found to be prime locations for archaeological sites. This landform has a high probability to contain archaeological resources. The nearest known site, which is 2,200 meters away from the proposed climate site, is a small, shallowly buried flake scatter exposed through subsurface testing. Artifacts are black chert flakes.

3.7.2 Noatak National Preserve

The proposed weather station at the headwaters of Kaluich Creek is in an area for which no historical data – archaeological, ethnographic, historic – is available. The knoll on which the Kaluich Creek weather station will be installed may have been used as a lookout/flaking station for its views to the northeast.

The proposed location of the Imelyak weather station falls between two historic passes (Burch's Routes #25, #26) in rugged terrain. Archaeological surveys in the Amakomanak valley ten miles to the west have dated human occupation there to over 8,000 years ago. No cultural resource survey data is available for this location; its archaeological potential cannot be assessed.

One hundred and thirty-eight stone inuksuich or cairns extend in three alignments across several kilometers in the immediate vicinity of the proposed Howard Pass weather station. These stone alignments have been recorded as XHP-00069 and were used to drive or 'drift' caribou to killing grounds. Archaeological sites associated with these cairn alignments have not been identified.

No archaeological surveys have been conducted in the immediate vicinity of the proposed Sisiak weather station. The view from this weather station is commanding to the west and to the southeast. Late Prehistoric winter villages are reported at the mouths of Sisiak and Isaoktuvik creeks and two archaeological sites were found on the banks of the western fork of Sisiak Creek, four miles west of the proposed weather station.

The proposed Kuguruok weather station is probably located on Hall's site MIS-00096, a lookout/flaking station identified in 1974. The cultural material at this site is thought to extend under the sod in places so intact hearths and other features may remain intact. Two modest flaking station sites, MIS-00380 and MIS-00381, are located at a higher elevation north of MIS-00096.
A reconnaissance-level archaeological survey is planned for a section of the Agashashok River due east of Asik Mountain in 2010. The proposed Asik weather station site will be examined during the survey.

3.7.3 Kobuk Valley National Park

In 1983 an NPS archaeologist briefly examined the confluence of Nikok Creek and the Salmon River, downslope of the proposed Salmon River weather station. There is no record of an archaeological survey traverse and no sites were reported. No other archaeologists have surveyed the area. The Salmon River was an overland route used to travel between the Kobuk and Noatak rivers via Sapun Creek (Burch's Route #22). According to Burch and Anderson, Kuuvangmitt men left their families at summer fish camps along the Kobuk River and hunted sheep in the Baird Mountains which they accessed by the Salmon and other south-flowing Kobuk tributaries. The archaeological remains of this activity including lookouts, camps, caches and butchering sites may be encountered at the proposed weather station site.

3.7.4 Cape Krusenstern National Monument

All of Cape Krusenstern National Monument is located within the Cape Krusenstern National Archaeological District and National Historic Landmark. Both of these properties are listed on the National Register of Historic Places and consultation with the Alaska State Historic Preservation Officer prior to weather station installation is required.

The proposed Mount Noak weather station site is located on an 800-foot knoll that lies between Mount Noak and Igisukruk Mountain. A reconnaissance traverse of Mount Noak by NPS archaeologists revealed no cultural resources. Hall and then later NPS archaeologists examined Igisukruk Mountain and report four historic period sites: NOA-00108, NOA-00109, NOA-00110 and NOA-00259. The sites consist of log cabins, tent frames and corrals. Two Native allotments are located on Igisukruk Mountain and may have been filed by herders familiar with the area. The Mount Noak weatherstation would be visible from these allotments. No archaeological surveys have been conducted at the knoll proposed for the new weather station but the probability of encountering historic resources relating to reindeer herding is increased by their presence on nearby Igisukruk Mountain.

Fourteen archaeological sites have been reported within two miles of the proposed Rabbit Creek weather station. One of these sites, NOA-00189 is located 500 meters downslope to the southeast of the proposed weather station site. NOA-00189 consists of a circular stone tent-ring-like feature and some grey chert flakes. 1987 NPS survey transects crisscross the proposed weather station site. No additional archaeological investigation is required before the weather station is installed.

3.7.5 Bering Land Bridge National Preserve

The proposed Midnight Mountain weather station will be co-located with the NPS Midnight Mountain radio repeater. No archaeological survey of the area was conducted prior to the installation of the radio repeater. Due to the lack of survey data, the archaeological potential of the Midnight Mountain site cannot be estimated. The nearest known archaeological site is a solitary cairn of bedrock slabs (BELA00294) stacked to 1 meter in height. It is located approximately 1 mile northwest of the NPS Midnight Mountain repeater at an elevation of 2,000 feet. BEN-00117 lies 2 miles to the southeast of the NPS Midnight Mountain repeater at an

elevation of 1,250 feet and has five stone structures that are possibly Prehistoric or Proto-Historic in age.

Reconnaissance-level archaeological surveys have only been conducted in the vicinity of the proposed Serpentine Hot Springs weather station. The proposed Serpentine Hot Springs weather station site lies within the National Register of Historic Places-listed "Iyat (Serpentine Hot Springs) Cultural Landscape" (3330-6). The Alaska State Historic Preservation Officer has identified "Hot Springs Creek, valley, surrounding hills and tors, Serpentine Hot Springs site, hot springs pool, cold water diversion ditch, pond, Arctic Hot Springs site, and archaeological sites BEN-00170 and BEN-00085" as contributing components of the listed cultural landscape. According to Section 106 of the National Historic Preservation Act, the NPS must consult with the Alaska State Historic Preservation Officer and perhaps the President's Advisory Council on Historic Preservation prior to erecting the weather station within the boundaries of the cultural landscape.

No archaeological surveys have been conducted in the vicinity of the proposed Devil Mountain weather station. The nearest known archaeological sites lie about 6 miles to the north on the slopes of Devil Mountain. These sites consist of rock structures and are identified as BEN-00049. Topography and vegetation suggest that this location has low archaeological potential. However, the shore of the nearby lake has greater potential.

No archaeological surveys have been completed along Ella Creek. The headwaters of Ella Creek and Minnie Creek offer easily traversed passes into the resource-rich McCarthy's Marsh area via the Pargon River and Boston Creek respectively. A spot reconnaissance examination at the headwaters of Minnie Creek in 1997 revealed no sites. The archaeological data potential of the proposed Ella Creek weather station site cannot be estimated due to the lack of data.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

This EA evaluates the effects of the proposed weather stations on Gates of the Arctic National Park and Preserve, Noatak National Preserve, Kobuk Valley National Park, Cape Krusenstern National Monument, and Bering Land Bridge National Preserve. The chapter is organized by alternative and, where applicable, the environmental effects of the alternatives are discussed by national park. This information is based on readily available environmental information, information from NPS resource specialists, and field reconnaissance.

4.1 METHODOLOGY

For each issue selected for detailed analysis (see section 1.6) and for which the subject resources are described in Chapter 3, the direct, indirect, and cumulative effects are analyzed. The effects to the subject resources are analyzed on the basis of the duration, extent, and intensity of the impacts. Summary impact levels (characterized as negligible, minor, moderate, or major) are given for each issue topic in the analyses. Definitions of impact terms are provided below. Table 4-1 presents a summary of impact level thresholds.

Intensity of Impact:
Low – A change in resource condition is perceptible, but does not measurably alter the resource function in the park ecosystem, cultural context, or visitor opportunity.
Medium – A change in a resource condition is measurable or observable and an alteration is detectable to the resource function in the park ecosystem, cultural context, or visitor opportunity.
High – A change in a resource condition is measurable or observable and an alteration to the resource function in the park ecosystem, cultural context, or visitor opportunity is clearly and consistently observable.

Duration of Impact:
Temporary – Impacts would last only a single visitor season or for the duration of the discreet activity, such as weather station installation or maintenance.
Long-term – Impacts would extend for several years up to the life of the facility.
Permanent – Impacts are a permanent change to the resource that would last beyond the life of the facility even if the actions causing the impacts were to cease.

Context:
Common – The affected resource is widespread and is not identified in enabling legislation as important to the park, nor is it rare within or outside the park. The portion of the affected resource does not fill a unique role within the park or its region of the park.
Important – The affected resource is identified by enabling legislation or is rare either within or outside the park. The portion of the affected resource does not fill a unique role within the park of its region of the park.
Unique – The affected resource is identified by enabling legislation and the portion of the affected resource uniquely fills a role within the park and its region of the park.

Table 4-1. Summary Impact Levels

Negligible	Minor	Moderate	Major
Effects would generally be low intensity, temporary, & would not affect unique resources.	Effects would tend to be low intensity & short duration, but common resources may sustain medium intensity & long-term effects.	Common resources would be affected by higher intensity & longer term impacts while important & unique resources are affected by medium to low intensity & shorter-term to temporary impacts, respectively.	Effects are generally medium to high intensity, long-term to permanent & affect important to unique resources.

Impact levels to cultural resources can be classified only as "Major" according to the classes in summary Table 4-1. Cultural resources are non-renewable resources; adverse effects to cultural resources destroy resources forever. "An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative." (36 CFR 800.5(a)(1).

4.2 CUMULATIVE IMPACTS

Cumulative impacts were assessed by combining the potential environmental impacts of the alternatives with the impacts of projects that have occurred in the past, are currently occurring, or are proposed in the future within each of the five ARCN units. Known past, present, and reasonably foreseeable future projects and actions in the authorized boundaries of the five parks include areas of nonfederal land, human habitation, trails, cabins, weather stations, air strips, and radio repeaters.

4.2.1 Gates of the Arctic National Park and Preserve

There are a variety of human structures located in both the wilderness and non-wilderness of GAAR (Figure 2-1), including two existing weather stations both located at Anaktuvuk Pass (many more exist outside of the park and preserve boundary), one ranger station at Anaktuvuk Pass (two more are located outside of the park and preserve), numerous cabin sites, several miles of OHV (off highway vehicle) trails, and private inholdings.

4.2.2 Noatak National Preserve

There are very few human installations located in the eligible wilderness and non-eligible wilderness areas of NOAT (Figure 2-2). There is a ranger station on the Noatak River near the western boundary of the preserve, and two existing RAWS stations and one SNOTEL station.

4.2.3 Kobuk Valley National Park

There are almost no human installations located in the wilderness and non-wilderness areas of KOVA (Figure 2-2). An NPS radio repeater is located in the north part of the park and a ranger station along the Kobuk River on the eastern boundary. There is one existing RAWS station.

4.2.4 Cape Krusenstern National Monument

There are very few human installations located in the eligible wilderness and non-eligible wilderness areas of CAKR (Figure 2-3). The Red Dog Mine Road crosses the northern section of the monument. There is also an NPS radio repeater some distance north of the proposed Mt. Noak site, a ranger station on the southern coast, and a northern coast shelter cabin maintained by the NPS.

4.2.5 Bering Land Bridge National Preserve

There are very few human installations located in the eligible wilderness and non-eligible wilderness areas of BELA (Figure 2-4). The predominant human installations in the preserve are the facilities, trails, and air strip associated with the Serpentine Hot Springs. There is one existing RAWS station, one NPS radio repeater at the Midnight Mountain site and 3 shelter cabins (Grayling Creek, Ear Mountain, and Nuluk River).

4.3 ALTERNATIVE A: NO ACTION

4.3.1 Vegetation

Under the No Action Alternative, no new weather stations would be installed in GAAR, NOAT, KOVA, CAKR, or BELA. No impacts to vegetation would occur as a result of this alternative.

Cumulative Impacts
Overall, vegetation in the parks is untouched and untrammeled. Small areas of vegetation in parts of the parks have been cleared for construction of cabins and other buildings, trails, and air strips. Besides the actual footprint of facilities, plants in the immediate surrounding areas have been impacted by trampling from pedestrian and off-road vehicle traffic. There may also be dispersed vegetation impacts caused by off-trail pedestrian traffic.

Although not established in every park, backcountry installations such as radio repeaters, RAWS, and other weather stations impact very small areas of vegetation. The area of vegetation trampling from foot traffic and helicopter landings during maintenance would both be minimal

and limited to the area immediately surrounding the stations. Maintenance activities at these existing stations would continue to impact vegetation. The cumulative impact on vegetation from human installations, plus the more extensive impacts from past mining development, human habitation, trails, and buildings would be minor. This alternative would not contribute any adverse cumulative impacts on vegetation in any of the five parks.

Conclusion: The No Action Alternative would not have any effects on vegetation in GAAR, NOAT, KOVA, CAKR, or BELA. The level of impact to vegetation from the No Action Alternative would not result in impairment of park resources that fulfill specific purposes identified in the enabling legislations or that are essential to the natural and cultural integrity of the parks.

4.3.2 Wildlife

Under the No Action Alternative, no new weather stations would be installed in the parks. No impacts to wildlife would occur as a result of this alternative.

Cumulative Impacts
Overall, wildlife habitat in the parks is untouched and untrammeled. Wildlife habitat in parts of the parks has been cleared for construction of cabins and other buildings, trails, and air strips. Besides the actual footprint of facilities, habitat in the immediate surrounding areas has been impacted by trampling from pedestrian and vehicle traffic. The backcountry installations in the parks, including radio repeaters, RAWS, and other weather stations impact very small areas of wildlife habitat. Park visitation in the backcountry, and the presence of field crews maintaining monitoring stations, could cause localized, temporary displacement of wildlife and disturbance of wildlife habitat. The area of wildlife habitat disturbed by foot traffic and helicopter landings during maintenance activities would be minimal and limited to the area immediately surrounding the stations. Subsistence and sport hunting also contribute to the disturbance, and destruction, of wildlife. These actions have resulted in long and short-term habitat loss, displacement of wildlife, and increased human-wildlife conflicts.

The cumulative impact on wildlife and habitat from human installations, plus the more extensive impacts from past mining development, human habitation, trails, and buildings would be minor. The No Action alternative would not contribute any adverse cumulative impacts on wildlife and habitat in each of the five parks.

Conclusion: The No Action Alternative would not have any effects on wildlife and habitat in GAAR, NOAT, KOVA, CAKR, or BELA. The level of impact to wildlife from the No Action Alternative would not result in impairment of park resources that fulfill specific purposes identified in the enabling legislations or that are essential to the natural and cultural integrity of the parks.

4.3.3 Visual Quality

Under the No Action Alternative, no new weather stations would be installed in the ARCN units, and there would be no impacts on visual quality.

Cumulative Impacts
Visual quality is affected by the presence and operation of human installations in the backcountry as described in the Cumulative Impacts sections for each park under Section 4.2. Few hikers and river floaters view existing weather stations, which continue to have a minor impact on the pristine visual quality of the areas. During the summer months, however, pilots and passengers could see these stations and other structures located in the parks. The cumulative impact on visual quality from human installations, plus the more extensive impacts from past mining development, human habitation, trails, and buildings would be minor. The No Action Alternative would not contribute any cumulative impacts on visual quality in any of the five parks.

Conclusion: The No Action Alternative would not have any adverse effects on visual quality at any of the five parks. The level of impact to visual quality from the No Action Alternative would not result in impairment of park resources that fulfill specific purposes identified in the enabling legislations or that are essential to the natural and cultural integrity of the parks.

4.3.4 Soundscape

Under the No Action Alternative, no new weather stations would be installed, thus there would be no impact on the natural soundscapes of the parks.

Cumulative Impacts
Cumulative effects to the natural soundscapes of the parks include the regular overflights of regional passenger planes and small aircraft bringing visitors to the backcountry. Aircraft noise disturbances are much more frequent during the summer months than other times of year. Helicopter use would be required to access existing RAWS (some every year for routine maintenance), NPS repeaters, and other installations or research projects in the backcountry. These helicopter flights would be direct from the heli-base to the sites and of limited duration, thus noise intrusions would be temporary and of short duration, although spread throughout the parks. Human voices may occasionally be heard at sites where visitor recreation occurs.

Existing and potential noise disturbance in the parks would have minor adverse cumulative impacts on soundscape. The No Action Alternative would not contribute any cumulative impacts on soundscape in any of the five parks.

Conclusion: The No Action Alternative would not result in any impacts to the natural soundscape in any of the five parks. The level of impact to soundscape from the No Action Alternative would not result in impairment of park resources that fulfill specific purposes identified in the enabling legislations or that are essential to the natural and cultural integrity of the parks.

4.3.5 Visitor Experience

Under the No Action Alternative, no new weather stations would be installed in any of the parks, and there would be no impacts on visitor experience.

Cumulative Impacts
Park visitors encountering existing weather stations, radio repeaters, and other installations in the backcountry, and exposed to noise from aircraft flying over and landing to install or maintain equipment or shuttle backcountry visitors, would have a diminished visitor experience. Combined with known past, current and future projects and actions, there would be minor adverse cumulative impacts on visitor experience. The No Action Alternative would not contribute any cumulative impacts on visitor experience at any of the five parks.

Conclusion: The No Action Alternative would not have any adverse impacts on visitor experience in GAAR, NOAT, KOVA, CAKR, or BELA.

4.3.6 Wilderness

Under the No Action Alternative, no new weather stations would be installed in the ARCN units, and there would be no impacts on designated wilderness or areas eligible for wilderness designation.

Cumulative Impacts
Numerous cabin sites and several miles of OHV trail at GAAR are located in designated wilderness; there are also four cabins located in eligible wilderness. Two existing RAWS stations, a SNOTEL station, and a ranger station are located in designated wilderness, and one research station is located is eligible wilderness at NOAT. One existing RAWS and a ranger station are located in eligible wilderness at KOVA. There is the Red Dog Mine Road, an NPS radio repeater, and a ranger station in the eligible wilderness at CAKR. There is one existing weather station and one NPS radio repeater located in eligible wilderness at BELA. These human developments are relatively small and the cumulative effects on the resources and values of the vast area of wilderness and eligible wilderness at each park are considered to be minor. This alternative would not contribute any cumulative impacts on wilderness since no new stations would be installed.

Conclusion: The No Action Alternative would not result in any impacts to designated or eligible wilderness areas in GAAR, NOAT, KOVA, CAKR, or BELA. The level of impact to wilderness from this alternative would not result in impairment of park resources that fulfill specific purposes identified in the enabling legislations or that are essential to the natural and cultural integrity of the parks.

4.3.7 Cultural Resources

Under the No Action Alternative, no new weather stations would be installed in GAAR, NOAT, KOVA, CAKR, or BELA, and there would be no new impacts on cultural resources as a result of selecting this alternative.

Cumulative Impacts
All five NPS units contain historic and archeological sites which evidence rich cultural histories of prehistoric habitation, early native Alaskan camps and villages, and European exploration and settlement. Prehistoric sites at the five units normally occur as lithic scatters on ridges or hill

tops, or as settlements near stream mouths and confluences. Impacts to historic and prehistoric resources associated with human activities in the NPS units could include exposure of buried sites, changes in artifact condition, destruction of artifacts or structures, loss of context of artifacts, site covering, and contamination of sites. This alternative would not contribute any cumulative effects on cultural resources since no new weather stations would be installed.

Conclusion: The No Action Alternative would result in no effects to cultural resources in any of the five NPS units. The level of impact to cultural resources from the No Action Alternative would not result in impairment of park resources that fulfill specific purposes identified in the enabling legislations or that are essential to the natural and cultural integrity of the parks.

4.4 ALTERNATIVE B: EXPAND CLIMATE MONITORING PROGRAM

4.4.1 Vegetation

Under Alternative B, up to four new weather stations would be installed at GAAR, up to six at NOAT, one at KOVA, up to two at CAKR, and up to four at BELA. RAWS have a combined footprint of about 144 square feet (about 0.003 acre). Many sites consist of dwarf shrub tundra and sparse alpine tundra, and some sites consist of large areas of rock rubble and small pockets of soil supporting low growing herbaceous vegetation. Direct impacts on vegetation would result from anchoring of equipment and foot traffic.

Vegetation may be trampled or destroyed by anchoring techniques, but vegetation clearing would not be needed as all sites have low growing plants. There would also be localized vegetation trampling from foot traffic during installation and maintenance; however, the area trampled would likely be minimal and limited to the area immediately surrounding the weather stations. Additionally, localized trampling of any existing vegetation from helicopter landings would occur; however, helicopters would land on bare rock or snow wherever possible. Foot traffic and landing zones at each new site would comprise an area of about 360 square feet (about 0.008 acre). If float plane access is used for maintenance trips at the Pamichtuk, Chimney, and Killik Lake sites, additional vegetation would be impacted from hiking up from the nearby lake to the site.

The maximum direct impacts to vegetation from the installation of four stations at GAAR, including the equipment footprint (0.012 acres) and foot traffic and landing zones (0.032 acres), would be about 0.044 acres.

The maximum direct impacts to vegetation from the installation of six stations at NOAT, including the equipment footprint (0.018 acres) and foot traffic and landing zones (0.048 acres), would be about 0.066 acres.

The maximum direct impacts to vegetation from the installation of one station at KOVA, including the equipment footprint (0.003 acres) and foot traffic and landing zones (0.008 acres), would be about 0.011 acres.

The maximum direct impacts to vegetation from the installation of two stations at CAKR, including the equipment footprint (0.006 acres) and foot traffic and landing zones (0.016 acres), would be about 0.022 acres.

The maximum direct impacts to vegetation from the installation of four stations at BELA, including the equipment footprint (0.012 acres) and foot traffic and landing zones (0.032 acres), would be about 0.044 acres. The Midnight Mountain site, which would be co-located with an NPS radio repeater would already have some ground disturbance, thus any new vegetation disturbance should be minimal.

Exotic plants or seeds could be transported to the sites on equipment, clothing and footwear. New introductions could allow for exotic plants to become established and spread, especially in areas where the ground is disturbed by installation activities. However, mitigation to ensure that equipment, clothing and footwear do not contain exotic plant material would be implemented.

Impacts on vegetation, although long-term, would be minor since very little trampling and destruction of plants would occur, especially when compared to thousands of acres of undisturbed vegetation at each park.

Cumulative Impacts
Overall, vegetation in the parks is untouched and untrammeled. Small areas of vegetation in parts of the parks have been cleared for construction of cabins and other buildings, trails, and air strips. Besides the actual footprint of facilities, plants in the immediate surrounding areas have been impacted by trampling from pedestrian and off-road vehicle traffic. There may also be dispersed vegetation impacts caused by off-trail pedestrian traffic.

Although not established in every park, backcountry installations such as radio repeaters, RAWS, and other weather stations impact very small areas of vegetation. The area of vegetation trampling from foot traffic and helicopter landings during maintenance would both be minimal and limited to the area immediately surrounding the stations. Maintenance activities at these existing stations would continue to impact vegetation.

Combined with known past, current and future projects and actions, there would be minor adverse cumulative impacts on vegetation. This alternative would contribute minor adverse cumulative impacts on vegetation in each of the five parks.

Conclusion: Alternative B would result in minor, long-term, adverse impacts to vegetation at all five parks from loss of plants due to anchoring of equipment and vegetation trampling during installation and maintenance of weather stations. The level of impact to vegetation from Alternative B would not result in impairment of park resources that fulfill specific purposes identified in the enabling legislations or that are essential to the natural and cultural integrity of the parks.

4.4.2 Wildlife

Under Alternative B, installation of new weather stations would temporarily displace wildlife in the immediate vicinity during installation of up to four new weather stations at GAAR, up to six at NOAT, one at KOVA, up to two at CAKR, and up to four at BELA. Disturbance would be temporary as installation would require only one day at each site. Wildlife would be disturbed temporarily by helicopters accessing the sites and by the presence of people. Although there have not been any reports of wildlife disturbance or habituation at existing RAWS and other monitoring sites, it is documented that wildlife startle responses to helicopters include fleeing, cessation of foraging, and disruption of bedding (Cote, 1996; Larkin, 1996; Frid, 1999a and 1999b). Frid (1999c) found that activity disruptions occurred when the helicopter was a median distance of 1 km away. Helicopter disturbance during installation would be minor as there would be two to three round-trip flights at each site. Disturbance from maintenance activities on wildlife would be minor as each site would be visited only once every year. Most sites would be accessed by helicopter or plane for yearly maintenance.

RAWS have a combined footprint of about 144 square feet, or about 0.003 acre. Although some sites consist of rock rubble and/or small pockets of soil supporting low growing herbaceous vegetation, direct impacts to wildlife habitat would result from anchoring of equipment and from foot traffic. There would also be localized habitat disturbance from foot traffic during installation and maintenance; however, this area would likely be minimal and limited to the area immediately surrounding the weather stations. Additionally, localized habitat disturbance from helicopter landings would occur; however, helicopters would land on bare rock or snow wherever possible. Foot traffic and landing zones at each new site would comprise an area of about 360 square feet or about 0.008 acre.

The maximum direct impacts to wildlife habitat from the installation of four stations at GAAR, including the equipment footprint (0.012 acres) and foot traffic and landing zones (0.032 acres), would be about 0.044 acres. The Chimney Lake, Pamichtuk Lake, and Killik Pass sites could all be accessed by float plane for annual maintenance, which would lessen the impacts on wildlife as compared to those incurred by helicopters.

The maximum direct impacts to wildlife habitat from the installation of six stations at NOAT, including the equipment footprint (0.018 acres) and foot traffic and landing zones (0.048 acres), would be about 0.066 acres.

The maximum direct impacts to wildlife habitat from the installation of one station at KOVA, including the equipment footprint (0.003 acres) and foot traffic and landing zones (0.008 acres), would be about 0.011 acres.

The maximum direct impacts to wildlife habitat from the installation of two stations at CAKR, including the equipment footprint (0.006 acres) and foot traffic and landing zones (0.016 acres), would be about 0.022 acres.

The maximum direct impacts to wildlife habitat from the installation of four stations at BELA, including the equipment footprint (0.012 acres) and foot traffic and landing zones (0.032 acres),

would be about 0.044 acres. The Midnight Mountain site, which would be co-located with an NPS radio repeater, would already have some ground disturbance, thus any new disturbance to wildlife habitat should be minimal. The Serpentine Hot Springs site would be accessed by plane for annual maintenance, which would lessen the impacts on wildlife as compared to incurred by helicopters.

Mammals such as Dall sheep, coyote, gray wolf, red fox, lynx, black bear, and wolverine and birds including ptarmigan, grouse, raptors, and waterfowl may occur at the proposed sites, but do not tend to stay for long periods of time for feeding or resting. The Arctic ground squirrel, Alaskan marmot, and various hares, voles, and shrews are likely to inhabit underground burrows at the proposed sites. Moose and brown bear occur in the vicinity of small water bodies, wetlands, and riverine areas. Large numbers (on the order of hundred of thousands) of caribou migrate through the parks from wintering grounds to calving areas and summer range. However, it is unlikely that wildlife species would be susceptible to high levels of disturbance from the installation and maintenance of the weather stations as these sites were selected so as not to be located within sensitive nesting, breeding, or foraging areas.

Impacts on wildlife and habitat would be minor since human activity during installation and maintenance would be temporary and of short duration, and very little habitat would be disturbed when considering thousands of acres of untouched habitat in each park.

Cumulative Impacts

Overall, wildlife habitat in the parks is untouched and untrammeled. Wildlife habitat in parts of the parks has been cleared for construction of cabins and other buildings, trails, and air strips. Besides the actual footprint of facilities, habitat in the immediate surrounding areas has been impacted by trampling from pedestrian and vehicle traffic. The backcountry installations in the parks, including radio repeaters, RAWS, and other weather stations impact very small areas of wildlife habitat. Park visitation in the backcountry, and the presence of field crews maintaining monitoring stations, could cause localized, temporary displacement of wildlife and disturbance of wildlife habitat. The area of wildlife habitat disturbed by foot traffic and helicopter landings during maintenance activities would be minimal and limited to the area immediately surrounding the stations. Subsistence and sport hunting also contribute to the disturbance, and destruction, of wildlife. These actions have resulted in long and short-term habitat loss, displacement of wildlife, and increased human-wildlife conflicts.

Combined with known past, current and future projects and actions, there would be minor adverse cumulative impacts on wildlife. This alternative would contribute minor adverse cumulative impacts on wildlife and habitat in each of the five parks

Conclusion: Alternative B would result in minor, temporary, adverse impacts to wildlife and minor, long-term, adverse impacts to wildlife habitat from displacement of wildlife and disturbance of wildlife habitat during installation and maintenance of weather stations. The level of impact to wildlife from Alternative B would not result in impairment of park resources that fulfill specific purposes identified in the enabling legislations or that are essential to the natural and cultural integrity of the parks.

4.4.3 Visual Quality

Under Alternative B, up to four new weather stations would be installed at GAAR, up to six at NOAT, one at KOVA, up to two at CAKR, and up to four at BELA. The visual quality and aesthetics at each site would be affected by the 10-foot tripod mast which would be visible to visitors who may encounter the sites. The proposed sites were selected so that the weather stations, once installed, were not near popular hiking or river floating routes so that the visual impact of the station would disturb as few people as possible. There is the possibility that the stations could be visible to a few hikers from a short distance away, but varies greatly with the viewing angle and whether the towers are silhouetted against the sky or against terrestrial background. During the summer months, however, pilots and passengers would see the weather stations from low-flying aircraft, if they are looking for them.

At GAAR, the Ram Creek and Killik Pass sites could be seen by pilots and passengers in overhead aircraft bringing recreationists into the backcountry in the summer and by commercial regional aircraft which fly overhead several times a day year-round. There is also the possibility that caribou hunters may see the Killik Pass site in the fall. There is a low probability that Chimney Lake and Pamichtuk Lake sites would be seen by passengers in aircraft as these sites are out of the main flight paths.

The Kaluich Creek, Imelyak, Sisiak, and Asik sites at NOAT would not generally be seen visitors, other than perhaps the Asik site when researchers visit the station in the river valley below. The Kugururok site could be seen by pilots and passengers in overhead aircraft bringing river floaters into the backcountry in the summer. The Howard Pass site could possibly be seen by caribou hunters in the fall.

At KOVA, few if any visitors would see the Salmon River site as the Salmon River does not receive much visitor use.

At CAKR, the Mt. Noak and Rabbit Creek sites could be seen by pilots and passengers in commercial regional aircraft which fly overhead several times a day year-round. There is a small possibility that the Rabbit Creek site may also be seen in winter by travelers using the creek corridor between Noatak and the coast.

The Midnight Mountain and Serpentine Hot Springs sites at BELA could be seen by pilots and passengers in commercial regional aircraft which fly overhead several times a day year-round. It is also possible that the Devil Mountain site could be seen by visitors in overhead aircraft which can land on a lake three to four miles to the north. The Serpentine Hot Springs site has the greatest likelihood of all the sites of being seen by visitors as it is close to an established hiking trail and to the popular hot springs about a half mile away. It could also be seen by passengers in aircraft using the nearby air strip. The Ella Creek site would not generally be seen visitors.

The overall impact on the pristine visual quality of the areas would be minor because installations would be small and visible only from short distances away by few visitors.

Cumulative Impacts

Visual quality is affected by the presence and operation of human installations in the backcountry as described in the Cumulative Impacts sections for each park under Section 4.2. Few hikers and river floaters view existing weather stations, which continue to have a minor impact on the pristine visual quality of the areas. During the summer months, however, pilots and passengers could see these stations and other structures located in the parks. Combined with known past, current and future projects and actions, there would be minor adverse cumulative impacts on visual quality. This alternative would contribute minor cumulative impacts on visual quality in each of the five parks.

Conclusion: Alternative B would result in minor adverse impacts to visual quality from the permanent installation and presence of weather stations. The level of impact to visual quality from Alternative B would not result in impairment of park resources that fulfill specific purposes identified in the enabling legislations or that are essential to the natural and cultural integrity of the parks.

4.4.4 Soundscape

Under Alternative B, up to four new weather stations would be installed at GAAR, up to six at NOAT, one at KOVA, up to two at CAKR, and up to four at BELA. Helicopters, which would be required for initial installation of the stations, would intrude upon the natural soundscape for one day at each site, with two to three round-trip flights that day. Noise from power tools, which would be used for weather station assembly, would be temporary.

Subsequent to initial weather station installation, site visits would be conducted annually for routine maintenance at all sites. Maintenance of most stations would require helicopter access; four of the sites could be reached by fixed wing aircraft on wheels or floats (Table 2-1), which produce less noise than helicopters. Use of fixed wing aircraft would reduce the amount of helicopter flight time and associated noise intrusions at three sites in GAAR and one site in BELA. All access for maintenance would require one helicopter or fixed wing round-trip flight per site once a year.

The four new stations at GAAR would require eight to twelve helicopter flights for station installation. A helicopter would be used for maintenance at the Ram Creek site since it is the only means available for access. The Chimney Lake, Pamichtuk Lake, and Killik Pass sites could be accessed by float plane, as well as helicopter, for annual maintenance. Thus every year, there would be a minimum of one helicopter flight day for station maintenance at GAAR, and possibly as many as two.

The six new stations at NOAT would require twelve to eighteen helicopter flights for station installation. Helicopter would be used for maintenance at all the sites since it is the only means available for access. Thus every year, there would be between two and four helicopter flight days for station maintenance at NOAT, which would be combined with maintenance trips to the eastern Noatak sites.

The one new station at KOVA would require two to three helicopter flights for station installation. Helicopter would be used for maintenance at this site since it is the only means available for access. Thus every year, there would be one helicopter flight day for station maintenance at KOVA.

The two new stations at CAKR would require four to six helicopter flights for station installation. Helicopter would be used for maintenance at both sites since it is the only means available for access. Thus every year, there would be one helicopter flight days for station maintenance at CAKR, which would be combined with maintenance trips to the western Noatak sites.

The four new stations at BELA would require eight to twelve helicopter flights for station installation. Helicopter would be used for maintenance at Midnight Mountain, Devil Mountain and Ella Creek sites since it is the only means available for access. Annual maintenance at the Midnight Mountain site could be coordinated to occur at the same time as maintenance of the co-located NPS radio repeater; thus only one helicopter trip would be needed for maintenance of the two stations at this site. As there is already helicopter noise once a year for maintenance of the radio repeater, this would not be a new noise intrusion at the Midnight Mountain site. The Serpentine Hot Springs site would be accessed by fixed-wing plane to the nearby airstrip for annual maintenance. Thus every year, there would be two helicopter flight days for station maintenance at BELA.

Natural sounds predominate at all the proposed sites, despite occasional noise from overflights, hunting, and visitor activities at some of them. Since helicopter-produced sound can be heard at long distances (see Table 3-1 for sound levels of helicopters at various distances), the natural soundscape would be diminished at each park. However, these intrusions of the natural soundscape would be minor as they would be temporary and of short duration, and would occur very few days each year at each park.

Cumulative Impacts

Cumulative effects to the natural soundscapes of the parks include the regular overflights of regional passenger planes and small aircraft bringing visitors to the backcountry. Aircraft noise disturbances are much more frequent during the summer months than other times of year. Helicopter use would be required to access existing RAWS (some every year for routine maintenance), NPS repeaters, and other installations or research projects in the backcountry. These helicopter flights would be direct from the heli-base to the sites and of limited duration, thus noise intrusions would be temporary and of short duration, although spread throughout the parks. Human voices may occasionally be heard at sites where visitor recreation occurs.

Combined with known past, current and future projects and actions, there would be minor adverse cumulative impacts on soundscape. Alternative B would contribute minor cumulative impacts on soundscape in each of the five parks.

Conclusion: Alternative B would result in temporary, minor, adverse impacts on the soundscape from noise intrusions during installation and maintenance of weather stations. The level of

impact to soundscape from Alternative B would not result in impairment of park resources that fulfill specific purposes identified in the enabling legislations or that are essential to the natural and cultural integrity of the parks.

4.4.5 Visitor Experience

Under Alternative B, up to four new weather stations would be installed at GAAR, up to six at NOAT, one at KOVA, up to two at CAKR, and up to four at BELA. Park visitors encountering RAWS equipment at close range, or subjected to overhead aircraft noise during installation and maintenance, could have a diminished visitor experience as they are likely expecting a pristine backcountry experience. Due to the remote location and inaccessibility of many of the sites, as well as the limited time during which sites would be installed or maintained, it is estimated that a very small percentage of annual visitors at each of the five parks would be impacted. It is possible helicopters could disturb park visitors along the route to the sites; however, they would be flying at high altitudes while in route and would pass by quickly.

At GAAR, the Ram Creek site is located above the popular float trip route on the Alatna River. It is likely that visitors in the area would be disturbed by helicopter access to the site for installation and maintenance. This disturbance, however, would be temporary and of short duration. It is less likely that visitors who are in the area for a float trip would encounter the weather station as it is a steep ascent to reach it. The Chimney Lake and Pamichtuk Lake sites are located near lakes that are accessible by float plane. However, as neither of the lakes near these sites receives many visitors, there is a very low possibility for visitors to encounter the weather stations or to be disturbed by aircraft during installation and maintenance. Hunters in the area near the Killik Pass site may encounter that weather station or be disturbed by aircraft accessing the site. Again, aircraft disturbance would be temporary and of short duration.

At NOAT, it is unlikely that visitors would encounter the Kaluich Creek, Imelyak, and Asik sites as they are not easily accessible to visitor use. Hunters in the Howard Pass area may encounter that site or be disturbed by aircraft accessing the site. However, aircraft disturbance would be temporary and of short duration. Noise from helicopters accessing the Sisiak and Kugururok sites would likely disturb float trip recreationists in those areas. The Sisiak site is about four or five miles away from the route of a popular river float trip, thus those visitors would likely to be less disturbed than those visitors near the Kugururok site, which sits just above the river. Again, helicopter disturbance would be temporary and of short duration. Additionally, there is low probability that visitors near either site would encounter the weather stations as they are there for river float trips; if visitors do hike around, it is more likely that they would encounter the Kugururok site, which is closer to the river than the Sisiak site.

At KOVA, it is unlikely that visitors would encounter the Salmon River site as that area does not receive much visitor use. Likewise, it is unlikely that aircraft overflights to access the site for installation and maintenance would disturb many if any visitors on the ground.

At CAKR, it is unlikely that visitors would encounter the Mt. Noak or Rabbit Creek sites as they are not easily accessible to visitor use. Likewise, it is unlikely that aircraft overflights to access either site for installation and maintenance would disturb many if any visitors on the ground. In

winter, it is possible that visitors traveling along the winter corridor between Noatak and the coast could encounter the Rabbit Creek site. As there is no helicopter access of the site in winter, these visitors would not be disturbed by overflights.

At BELA, the Serpentine Hot Springs site is the only site where visitors may encounter the weather station due to its accessibility via a nearby hiking trail and close proximity to the popular hot springs. If this site remains near the Serpentine Hot Springs area, access to the site for installation and maintenance would be via the nearby airstrip, which already receives regular air traffic, thus would not add any noticeable disturbance of visitors. However, if the site were moved two miles to the west and out of the culturally significant area the installation and maintenance would require the use of a helicopter. This disturbance, however, would be temporary and of short duration. The Midnight Mountain, Devil Mountain, and Ella Creek sites are not accessible to visitor use, although aircraft bringing visitors can land on a lake three to four miles north of the Devil Mountain site. These sites would have very little likelihood of encounters by visitors, but visitors in the vicinity of the Devil Mountain site may be disturbed by helicopters during installation and maintenance. Again, this disturbance would be temporary and of short duration.

The impact on visitor experience at all five parks would be negligible as the likelihood of visitors encountering the sites would be very low and few visitors would be disturbed by aircraft accessing the sites for installation and maintenance.

Cumulative Impacts
Park visitors encountering existing weather stations, radio repeaters, and other installations in the backcountry, and exposed to noise from aircraft flying over and landing to install or maintain equipment or shuttle backcountry visitors, would have a diminished visitor experience. Combined with known past, current and future projects and actions, there would be minor adverse cumulative impacts on visitor experience. Alternative B would contribute negligible cumulative impacts on visitor experience at the five parks as very few visitors are likely to encounter the new weather stations.

Conclusion: Alternative B would likely result in negligible, temporary, adverse impacts to visitor experience from encounters with the weather stations and noise from overhead aircraft during installation and maintenance of weather stations.

4.4.6 Wilderness

Under Alternative B, up to four new weather stations would be installed at GAAR (all in designated wilderness), up to six at NOAT (five in designated wilderness, one in eligible wilderness), one at KOVA (in eligible wilderness), up to two at CAKR (both in eligible wilderness), and up to four at BELA (all in eligible wilderness).

The four qualities of wilderness character (described in Section 3.6): untrammeled, natural, undeveloped, and solitude or primitive and unconfined recreation, would experience some impacts from helicopter, fixed wing airplane, and float plane visits to install and maintain the weather stations, and from the RAWS facilities which would remain in the wilderness

indefinitely. A Minimum Requirements/ Minimum Tool Analysis for this project is included in Appendix B.

Of the 17 stations proposed in wilderness or eligible wilderness, one (the Midnight Mountain site at BELA) would be co-located with an existing radio repeater site which would already have some ground disturbance and visual impacts; the remaining 16 proposed RAWS in wilderness or eligible wilderness, would be located on previously undisturbed sites.

The undeveloped quality of wilderness would be diminished by the addition of 17 new long-term installations. The footprints of the impacts would be small and inconspicuous (0.003 acre at each site), but the stations would affect the intrinsic value of large, untrammeled and undeveloped wilderness landscapes over the long-term as they are not proposed to be removed. Natural ecosystem processes would continue unchanged and the naturalness of the wilderness would not be negatively affected. By better understanding the effects of climate change with data from weather stations, managers attempting to apply adaptive management to the parks would be able to make decision that promote naturalness and allow natural changes to occur. These installations would not change the untrammeled character of the wilderness because their presence would not manipulate or change the ecological processes at work in the study area. The solitude or primitive and unconfined recreation value of wilderness would be adversely impacted by the installation of the 17 new RAWS. A wilderness experience is partly dependent on a wilderness setting without facilities or where "the imprint of mans work (is) substantially unnoticeable" (Wilderness Act Sec. 2(c) (1)).

Killik Pass (GAAR), Howard Pass and Kugururok (NOAT), Rabbit Creek (CAKR), and Devil Mountain (BELA) are in the remotest parts of their respective park units. These sites would be in areas that are more relatively free of human intrusions and have no modern human developments. These five sites would be more impacted than the other sites due to their more remote nature, the open character of the tundra making them relatively more visible, and the very high expectation for unaffected wilderness character.

Placement of these five monitoring stations would reduce these areas' ability to provide outstanding opportunities for solitude or primitive and unconfined recreation in the most remote pristine areas of their respective park units.

The presence of the stations and the yearly maintenance visits via helicopter, fixed wing airplane, or float plane would have a minor temporary and site specific effect on the opportunity for solitude or primitive and unconfined recreation. Maintenance visits would be a permanent long-term addition to the flights in the five NPS units.

Cumulative Impacts
A number of cabin sites and several miles of OHV trail at GAAR are located in designated wilderness; there are also four cabins located in eligible wilderness. Two existing RAWS stations, a SNOTEL station, and a ranger station are located in designated wilderness, and one research station is located is eligible wilderness at NOAT. One existing RAWS and a ranger station are located in eligible wilderness at KOVA. There is the Red Dog Mine Road, an NPS

radio repeater, and a ranger station in the eligible wilderness at CAKR. There is one existing weather station and one NPS radio repeater located in eligible wilderness at BELA.

These human developments are small and the cumulative effects on the resources and values of the vast area of wilderness and eligible wilderness are considered to be minor. This alternative would contribute minor adverse cumulative impacts from the installation of four new stations in designated wilderness at GAAR, five new stations in designated wilderness and one in eligible wilderness at NOAT, one in eligible wilderness at KOVA, two in eligible wilderness at CAKR, and four in eligible wilderness at BELA. Combined with known past, current and future projects and actions, there would be minor adverse cumulative impacts on wilderness.

Conclusion: Alternative B would result in minor adverse impacts to wilderness from the installation and maintenance of 17 new weather stations in designated or eligible wilderness at the five parks. The level of impact to wilderness from Alternative B would not result in impairment of park resources that fulfill specific purposes identified in the enabling legislations or that are essential to the natural and cultural integrity of the parks.

4.4.7 Cultural Resources

At GAAR, the areas around three of the proposed sites have been surveyed for cultural resources. No archaeological inventory has been conducted at Chimney Mountain and no cultural resource sites are known in this area, although the landform is generally in the kind of location that has at least moderately good archaeological potential. At Pamichtuck Lake, no cultural sites have been identified in the immediate area of the proposed climate station, and the landform on which the climate station is proposed is considered to have low probability to contain archaeological resources. At Killik Pass, surface archeological sites have been previously found near the site, so there is potential for cultural resources to exist at or near the site as well, and the landform has a high probability to contain archaeological resources. The landform in the Ram Creek area has a high probability to contain archaeological resources, although the nearest known cultural site is some distance away. Known archeological sites would not be approached during installation or maintenance of the stations. At the climate sites where there is potential for occurrence, installation of new weather stations could impact cultural resources; however, mitigation measures including on-site monitoring by archeologists would greatly reduce any potential impacts to cultural resources.

At NOAT, there is a high likelihood of finding cultural resources at the Howard Pass site, and the proposed Kugururok site may be located on a known archaeological site. The Kaluich Creek site is far removed from known exploitable resources, but it may have provided a good lookout for sheep or for game approaching from the northeast. The Imelyak site is located at a high elevation at considerable distance from Imelyak Creek but also could have served as a lookout for caribou or sheep moving through the Baird Mountains. The Asik site is also very high and affords a good view of the Agashashok River valley, but several potential lookouts from lower elevations would provide equally advantageous views and are more strategically located to game paths. All of the proposed NOAT weather station sites would require archaeological field assessment prior to installation of weather stations.

At KOVA, the proposed Salmon River weather station is located in a historic sheep hunting area at an elevation that would afford a good viewscape for locating sheep. This site would require archaeological field assessment prior to installation of a weather station.
At CAKR, no archaeological assessment would be required prior to the installation of the Rabbit Creek weather station. The proposed Mount Noak weather station site would require an archaeological assessment prior to its installation.

At BELA, the vicinity of the Midnight Mountain radio repeater and weather station should be field checked. The proposed Serpentine Hot Springs site should be inspected before station installation and maintenance crews should look for cultural material rotated to surface since the previous inspection. Both the Devil Mountain and Ella Creek sites have low archaeological potential. The Devil Mountain site would not require an archaeological assessment prior to installation. An archaeological assessment should be conducted for the Ella Creek site.

Cumulative Impacts
All five NPS units contain historic and archeological sites which evidence rich cultural histories of prehistoric habitation, early native Alaskan camps and villages, and European exploration and settlement. Prehistoric sites at the five parks normally occur as lithic scatters on ridges or hill tops, or as settlements near stream mouths and confluences. Impacts to historic and prehistoric resources associated with human activities in the parks could include exposure of buried sites, changes in artifact condition, destruction of artifacts or structures, loss of context of artifacts, site covering, and contamination of sites. This alternative would contribute no adverse cumulative impacts on cultural resources.

Conclusion: Alternative B would result in no adverse effects to cultural resources because sites with cultural resources would be avoided. The level of impact to cultural resources from Alternative B would not result in impairment of park resources that fulfill specific purposes identified in the enabling legislations or that are essential to the natural and cultural integrity of the parks.

CHAPTER 5: CONSULTATION & COORDINATION

5.1 PUBLIC INVOLVEMENT

This environmental assessment is available for public review and comment for 30 days. It is available online at the National Park Service Planning, Environment, and Public Comment (PEPC) website. Go the http://parkplanning.nps.gov to access the PEPC site. Public comments on this environmental assessment can also be provided on the PEPC website.

In compliance with the Endangered Species Act, the NPS conducted an informal Section 7 consultation with the US Fish and Wildlife Service (Swem, pers. com.)

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APPENDIX A: ANILCA SECTION 810(A) SUMMARY EVALUATION AND FINDINGS

I. INTRODUCTION

Public Law 96-487, the Alaska National Interest Lands Conservation Act (ANILCA), Title VIII, Section 810, subtitled Subsistence and Land Use Decisions, requires Federal agencies having jurisdiction over lands in Alaska to evaluate the potential restrictions to subsistence to uses and needs. This analysis evaluates potential restrictions which could result from National Park Service (NPS) expansion of the Remote Automated Weather Station (RAWS) network within the Arctic Alaska Inventory and Monitoring Network (ARCN). The RAWS network collects basic climate data including air and soil temperature, precipitation, relative humidity wind speed and direction, solar radiation and snow depth. The following NPS conservation units are part of Arctic Alaska Inventory and Monitoring Network

- Bering Land Bridge National Preserve (BELA)
- Cape Krusenstern National Monument (CAKR)
- Gates of the Arctic National Park and Preserve (GAAR)
- Kobuk Valley National Park(KOVA)
- Noatak National Preserve (NOTA)

II. THE EVALUATION PROCESS

Section 810(a) of ANILCA states:

"In determining whether to withdraw, reserve, lease, or otherwise permit the use, occupancy, or disposition of public lands … the head of the federal agency … over such lands … shall evaluate the effect of such use, occupancy, or disposition on subsistence uses and needs, the availability of other lands for the purposes sought to be achieved, or disposition of public lands needed for subsistence purposes. No such withdrawal, reservation, lease, permit, or other use, occupancy or disposition of such lands which would significantly restrict subsistence uses shall be effected until the head of such Federal agency -

(1) gives notice to the appropriate State agency and the appropriate local committees and regional councils established pursuant to Section 805;
(2) gives notice of, and holds, a hearing in the vicinity of the area involved;
(3) determines that (A) such a significant restriction of subsistence uses is necessary, consistent with sound management principles for the utilization of the public lands, (B) the proposed activity will involve the minimal amount of public lands necessary to accomplish the purposes of such use, occupancy, or other disposition, and (C) reasonable steps will be taken to minimize adverse impacts upon subsistence uses and resources resulting from such actions."

ANILCA created new units and additions to existing units of the national park system in Alaska.

Bering Land Bridge National Preserve, containing approximately two million four hundred and fifty-seven thousand acres of public land, was created by ANILCA, section 201(2) for the following purposes:

> To protect and interpret examples of arctic plant communities, volcanic lava flows, ash explosions, coastal formations and other geologic processes; to protect habitat for internationally significant populations of migratory birds; to provide for archeological and paleontological study, in cooperation with Native Alaskans, of the process of plant and animal migration, including man, between North America and the Asian Continent, to protect habitat for, and populations of, fish and wildlife including, but not limited to, marine mammals, brown/grizzly bears, moose and wolves; subject to such reasonable regulations as the Secretary may prescribe, to continue reindeer grazing use, including necessary facilities and equipment, within the areas which on January 1, 1976, were subject to reindeer grazing permits, in accordance with sound range management practices; to protect the viability of subsistence resources; and in a manner consistent with the foregoing, to provide for outdoor recreation and environmental education activities including public access for recreational purposes to the Serpentine Hot Springs area. The Secretary shall permit the continuation of customary patterns and modes of travel during periods of adequate snow cover within a one-hundred-foot right-of-way along either side of an existing route from Deering to the Taylor Highway, subject to such reasonable regulations as the Secretary may promulgate to assure that such travel is consistent with the foregoing purposes.

Cape Krusenstern National Monument, containing approximately five hundred and sixty thousand acres of public lands, was created by ANILCA, section 201(3) for the following purposes:

> The monument shall be managed for the following purposes, among others: To protect and interpret a series of archeological sites depicting every known cultural period in arctic Alaska; to provide for scientific study of the process of human population of the area from the Asian Continent, in cooperation with Native Alaskans, to preserve and interpret evidence of prehistoric and historic Native cultures, to protect habitat for seals and other marine mammals; to protect habitat for and populations of, birds, and other wildlife, and fish resources; and to protect the viability of subsistence resources. Subsistence uses by local residents shall be permitted in the monument in accordance with the provisions of Title VIII.

Gates of the Arctic National Park, containing approximately seven million fifty-two thousand acres of public lands, Gates of the Arctic National Preserve, containing approximately nine hundred thousand acres of Federal lands, was created by ANILCA, section 201(4)(a) for the following purposes:

> The park and preserve shall be managed for the following purposes, among others: To maintain the wild and undeveloped character of the area, including opportunities for visitors to experience solitude, and the natural environmental integrity and scenic beauty of the mountains, forelands, rivers, lakes, and other natural features; to provide continued

> opportunities, including reasonable access, for mountain climbing, mountaineering, and other wilderness recreational activities, and to protect habitat for and the populations of, fish and wildlife, including, but not limited to, caribou, grizzly bears, Dall sheep moose, wolves, and raptorial birds. Subsistence uses by local residents shall be permitted in the park, where such uses are traditional, in accordance with the provisions of Title VIII.

Kobuk Valley National Park, containing approximately one million seven hundred and ten thousand acres of public land, was created by ANILCA, section 201(6) for the following purposes:

> The park shall be managed for the following purposes, among others: To maintain the environmental integrity of the natural features of the Kobuk River Valley, including the Kobuk, Salmon, and other rivers, the boreal forest, and the Great Kobuk Sand Dunes, in an undeveloped state, to protect and interpret, in cooperation with Native Alaskans, archeological sites associated with Native cultures; to protect migration routes for the Arctic caribou herd; to protect habitat for, and populations of, fish and wildlife including but not limited to caribou, moose, black and grizzly bears, wolves, and waterfowl and to protect the viability of subsistence resources. Subsistence uses by local residents shall be permitted in the park in accordance with the provisions of Title VIII. Except at such times when, and locations where, to do so would be inconsistent with the purposes of the park, the Secretary shall permit aircraft to continue to land at sites in the upper Salmon River watershed.

Noatak National Preserve, containing approximately six million four hundred and sixty thousand acres of public lands, was created by ANILCA, section 201(8) (a), for the following purposes:

> To maintain the environmental integrity of the Noatak River and adjacent uplands within the preserve in such a manner as to assure the continuation of geological and biological processes unimpaired by adverse human activity; to protect habitat for, and populations of, fish and wildlife, including but not limited to caribou, grizzly bears Dall sheep, moose, wolves, and for waterfowl, raptors, and other species of birds; to protect archeological resources; and in a manner consistent with the foregoing, to provide opportunities for scientific research. The Secretary may establish a board consisting of scientists and other experts in the field of arctic research in order to assist him in the encouragement and administration of research efforts within the preserve.

The potential for significant restriction must be evaluated for the proposed action's effect upon "… subsistence uses and needs, the availability of other lands for the purposes sought to be achieved and other alternatives which would reduce or eliminate the use."

III. PROPOSED ACTION ON FEDERAL LANDS

Global weather studies indicate that climate changes will have the most dramatic effect in arctic regions. The ARCN program's primary objective is to monitor and record weather conditions at representative locations in order to identify long and short-term trends, provide reliable climate data to other researchers, and to participate in larger scale climate monitoring and modeling

efforts. Consequently the NPS is considering installation of new permanent automated remote weather stations in NPS areas in northwest Alaska. The Environmental Assessment contains a detailed description of the proposed alternatives.

Alternative A: No Action
Under the No Action alternative, no additional weather station would be established in BELA, CAKR, GAAR, KOVA and NOAT.

Alternative B (NPS preferred Alternative): Expand the climate monitoring program in BELA, CAKR, GAAR, KOVA and NOAT. Under Alternative B, the NPS would establish as many as four RAWS sites in BELA, two locations in CAKR, four locations in GAAR, one location in KOVA, and six sites in NOAT. The Environmental Assessment contains a detailed description and maps of the proposed installation sites.

Each weather station would consist of a 10-foot high mast on tripod base. The tripod tower houses the temperature, relative humidity, solar radiation, wind speed and direction, and snow depth sensors, a GPS antenna and a satellite transmission antenna. A fiberglass equipment enclosure on the mast houses the electronic equipment such as the data logger and geostationary satellite transmitter. Batteries would be enclosed in a separate enclosure at the base of the tripod and are of the sealed, starved, electrolyte type. A 48" x13" solar panel would also be attached to the side of the mast. A 10" diameter precipitation gauge would be attached to the tripod and would require a reservoir of propylene glycol mixture to melt snow. Each tripod would have a footprint of approximately 12 feet in diameter.

Installation of each site would occur during June, July and August. Each installation would require helicopter and fixed wing aircraft access support to transport equipment and construction crews to the work site. Annual maintenance activities would include swapping sensors and removing and replacing the antifreeze solution as well as other routine maintenance including periodically clearing vegetation at each site.

IV. **PROPOSED ACTION ON FEDERAL LANDS**

A summary of the affected environment pertinent to subsistence uses is presented here.

BELA contains approximately 2,784,960 acres (96% of which is federally owned) and is located in northwestern Alaska about 500 miles northwest of Anchorage and occupies about one-third of the Seward Peninsula. It has a gradient of landforms from coastal plain along the northern coast rising to a central plateau, and bordered in the south by a mountain range. The climate shows both maritime and continental influences and is strongly affected by whether or not the surrounding maritime waters are frozen over or are ice-free (generally mid June to early November). Over 350 vascular plants and 60 lichens have been collected from the preserve. Brackish/salt marsh grasslands occur in estuaries and around lagoons with drier grasslands on sandy seashore dunes. Wet tundra is common throughout the coastal lowlands with moist tundra (tussock grass with some shrubs around thaw and maar lakes) on drier hills and slopes. Moist tundra predominates throughout the uplands of the plateau and foothills generally as tussock grass but with shrubs in patches and thickets along river courses. Alpine tundra predominates in

the mountainous areas. Willow, alder and birch make up some of the more noticeable shrub thickets. The preserve's varied habitats support a rich avifauna and some 180 species have been collected in or around the preserve. The marine/estuarine habitats along with extensive freshwater lakes and ponds support large populations of migratory geese, ducks, and shorebirds. Varied tundra habitats especially in the uplands support the majority of the preserve's passerine birds. Important large mammals include Brown bear, moose, caribou, and muskoxen. Furbearers include wolf, wolverine, red and arctic foxes, beaver, muskrats, arctic ground squirrels. While the preserve does not actually contain offshore marine waters, those waters contain a diverse group of marine mammals many of which are important for subsistence. These include polar bear, bowhead whale, beluga whale, walrus, bearded seal, and several smaller seals such as spotted and ringed seals. Some of the seals use islands (part of the preserve) in the Cape Espenberg area as well as Espenberg beaches as haul out areas.

CAKR contains approximately 659,807 acres (of which 93% is federally owned) and is located in northwestern Alaska about 450 miles northwest of Fairbanks an 10 miles northwest of Kotzebue (the regional hub). It is bordered on the west by the Chukchi Sea, Kotzebue Sound on the South, and to the north the drainage of the Wulik River, and to the east the drainage of the Noatak River. The landforms of the monument consist of a coastal plain dotted by sizeable lagoons and backed by gently rolling limestone hills. On the east the coastal plain meets an ancient sea cliff now mantled by tundra and limestone rubble. Lying north of the Arctic Circle, the climate is arctic maritime and strongly influenced by whether the adjacent waters are ice-free or frozen over. In terms of vegetation, the majority of the monument is characterized by moist tundra. There is a strip of wet tundra on the southern boundary facing Kotzebue Sound. Alpine tundra is found in isolated upland areas. Waterfowl are the most important birds and include mallard duck, green-winged teal, shoveler, oldsquaw, greater scaup, common eider, black scoter, red-breasted merganser, Canada and snow goose, yellow billed and arctic loon, American widgeon, American pintail, and horned and necked grebes. Terrestrial mammals include caribou, moose, muskoxen, Brown Bear, wolf, wolverine, red and arctic foxes, weasel, porcupine, hares and an occasional Dall sheep. Marine mammals use the adjacent waters of the Chukchi Sea and Kotzebue Sound and include bowhead, gray, finback and beluga whales; bearded, spotted ribbon and ringed seals; polar bear and walrus. The coastal and inland waters of the monument a variety of fish including four species of whitefish, arctic char, grayling, northern pike, and five species of salmon are found within Kotzebue Sound with chums and pinks most abundant.

GAAR boundaries include 8,229,946 acres of federal land of which approximately 7,052,000 acres are designated wilderness and 242,136 acres are private land. The park and preserve lie in the central Brooks Range and occupy lands on either side of the continental divide from the eastern boundary at the Trans-Alaska Pipeline Utility Corridor and the Dalton Highway to the NOAT boundary on the west. The northern boundary runs along the range front; the North Slope stretches beyond to the Arctic Ocean. The southern boundary runs through the taiga forest including some of the southern foothills within the park. The Nunamiut community of Anaktuvuk Pass is located within GAAR.

Nomadic peoples have used and occupied the area for thousands of years, following caribou herds and traveling to regional trading areas to meet with other Native groups. These peoples

were from at least three distinct Alaska Native cultures: Koyukon Athapaskan Indians, Kobuk Eskimo, and Nunamiut Eskimo. Archeological sites found today trace their history and use, and may give clues to the earliest human inhabitants of northern Alaska. The temporal range of known sites in the park/preserve covers at least the last ten millennia. The variety of known archeological sites includes seasonal villages, long- and short-term camps, hunting and butchering locales, caribou fences, lookout sites, fish camps, trapping camps, and resource harvesting locations such as birch bark gathering. Local rural residents still depend upon traditional areas and a wide array of resources in the park to sustain a subsistence way of life.

Subsistence harvest of fish and wildlife is allowed in GAAR by qualified subsistence users subject to Federal subsistence management regulations and park-specific regulations and policies. ANICLA protects subsistence uses by local rural residents as a priority consumptive use over other non-subsistence consumptive uses. Hunting, fishing, trapping and gathering remain a vital part of a subsistence way of life for local residents that continue to evolve in this region. Major subsistence resources include lake trout, Arctic grayling, Arctic char, ptarmigan, furbearers, waterfowl, squirrels, brown bears, moose, wolves, Dall sheep, caribou and several species of berries. Occasionally subsistence users will make special trips into specific areas such as Chandler Lake or other large lakes to fish for arctic char and lake trout. Arctic grayling are caught in large numbers on lower Ekokpuk Creek near the confluence with Kollutarak Creek. Summer and fall hunting for caribou, Dall sheep, moose, grizzly bear, arctic ground squirrel and birds occurs opportunistically whenever people leave the village. Winter trapping efforts concentrate on the harvest of lynx, wolverine, wolves, marten and red fox. These and other subsistence activities occur throughout the year and are concentrated in a large region surrounding the community in the central, northern and eastern portions of the park and preserve.

KOVA contains approximately 1,750,421 acres (of which 99% is federally owned) and is located in northwest Alaska, north of the Arctic Circle, and about 350 miles northwest of Fairbanks and 75 miles east of Kotzebue. The primary landforms are the two different mountain ranges (Baird Mountains to the north and Waring Mountains to the south} and the lowlands in between containing the Kobuk River valley and its terraces. The Baird Mountains rise up abruptly from the lowland to the south to heights of 2,500 to 4,760 feet. The Waring Mountains to the south of the Kobuk River are broadly folded, northeast trending mountains and are of a different geological history than the Baird Mountains. A distinctive landform is the approximately 200 thousand acres of silt and sand deposited during an interglacial by strong easterly winds and down-valley movement of large volumes of silt and sand from glacio-fluvial deposits on river bars and outwash plains. Most of this dune area is vegetated today by tundra and forest except for three active dune areas. The climate is characterized by short cool summers and long cold winters. Unlike the coast, the Kobuk River drainage experiences a more continental climate with more seasonal variation in temperatures and almost twice the precipitation as Kotzebue. Both forest and tundra vegetation types are broadly represented in the park since it lies between the more interior forested area of Alaska and the more northern and western tundra areas. Terrestrial mammals include caribou, Brown bear, black bear, wolves, coyotes, red fox, lynx, wolverine, ermine, river otter, marten, least weasel, mink, hares, porcupine, arctic ground squirrel, arctic hoary marmot and a variety of voles and shrews. Eighty-three species of birds have been identified within the park. Prime waterfowl nesting areas occur in the extensive wet lowlands of the Kobuk river valley. Other important birds include rock and willow ptarmigan, as well as

spruce and ruffed grouse. Twenty-five species of fish are found within the Kobuk River drainage. Important species include chum salmon, arctic char, arctic grayling, sheefish, northern pike, whitefish, burbot, long-nosed sucker, slimy sculpin and least cisco.

NOAT contains approximately 6,574,481 acres (99% of which is federally owned) and is located in northwestern Alaska, north of the Arctic Circle, and about 350 miles northeast of Fairbanks and 16 miles northeast of Kotzebue at its closest point. It encompasses over 250 miles of the Noatak River basin. The basin is the largest mountain- ringed basin in the United States that is relatively unaffected by human activities. The landforms basically include the Noatak River basin which is a plateau valley flanked to the north by the DeLong Mountains and to the south the Baird Mountains. The DeLong Mountain range contains rugged, narrow, glaciated ridges between 4.000 and 4,900 feet in elevation with a local relief of 1,500 to 3000 feet. To the south of the Noatak drainage the Baird Mountains range from 2,500 to 3,000 feet in elevation and slope gently northward toward the Noatak basin. The Noatak River is 435 miles long, crosses more than a third of arctic Alaska, and drains the interior plateau valley of 12,600 square miles. The climate is characterized by long, cold winters and cool, sometimes wet, summers. In contrast to the coastal area with its maritime influence, NOAT with its interior influences experiences a more continental climate with greater seasonal variations in temperatures and precipitation. In terms of vegetation, the majority of the preserve supports a low mat of tundra while boreal forest covers much of the lower drainage. Moist tundra is the most extensive type in the preserve and includes cottongrass and a variety of shrubs such as willow, dwarf birch, Labrador tea. Thirty-seven mammal species are known or believed to inhabit the Noatak Valley and include caribou, moose, Dall sheep, Brown bear, wolf, wolverine, red fox, lynx, marten, beaver, and muskrat with and a small number of muskoxen. A rich birdlife inhabits the preserve, particularly during the summer months when migrating species visit the region. Some 25 species of waterfowl inhabits Noatak's wetlands and include the Canada goose, white-fronted goose, snow goose, tundra swan, pintail, American wigeon, greater scaup, oldsquaw, red-breasted merganser, black brant, mallard, green-winged teal, shoveler, common goldeneye, and all four species of loons. Approximately 22 species of fish are found within the Noatak drainage. And include chum salmon, arctic grayling, arctic char, sheefish, lake trout, burbot, long-nosed sucker, slimy sculpin, and blackfish.

The NPS recognizes that patterns of subsistence use vary from time to time and from place to place depending on the availability of wildlife, other renewable natural resources, and regulatory openings and closings of areas. A subsistence harvest in a given year may vary considerably from previous years because of such factors as weather, surface snow conditions for traveling, wildlife migration patterns, natural population cycles, and regulatory changes.

V. SUBSISTENCE USES AND NEEDS EVALUATION

To determine the potential impact on existing subsistence activities for the proposed action three evaluation criteria were analyzed relative to existing subsistence resources.

The evaluation criteria are:

- the potential to reduce important subsistence fish and wildlife populations by (a) reductions in numbers; (b) redistribution of subsistence resources; or (c) habitat losses;

- what effect the action might have on subsistence fisherman or hunter access;

- the potential for the action to increase fisherman or hunter competition for subsistence resources.

1) The potential to reduce populations:

(a) Reduction in Numbers:

The proposed actions to expand the climate monitoring program establishing as many as four RAWS sites in BELA, two locations in CAKR, four locations in GAAR, one location in KOVA, and six sites in NOAT are not expected to cause a significant decline of wildlife species in the affected areas.

(b) Redistribution of Resources:

The proposed actions are not expected to cause a significant displacement of subsistence resources in the affected areas. The proposed construction and maintenance activities may cause minor disturbance, resulting in temporary displacement of wildlife resources. However, this is not expected to result in significant wildlife population declines or long term population movements.

(c) Habit Loss:

The proposed actions are not expected to result in significant habitat losses. The sites are relatively small, widely dispersed, and operate quietly. There would be very limited disturbance to habitat during installation and maintenance visits. The sites are not expected to significantly alter patterns of behavior of subsistence wildlife resources.

2) Restriction of Access:

The proposed actions are not expected to significantly restrict Federally qualified subsistence users or their use patterns on Federal public lands within the affected area. It is possible that, depending on location and timing, installation and maintenance visits might result in subsistence users avoiding a specific area that they might otherwise use. However, maintaining higher flight altitudes, using direct flight paths, and avoiding repeated flying through the river corridors, locating most sites inland and conducting installation and maintenance visits during summer months should mitigate if not prevent these impacts. The proposed weather station sites are widely spaced and installation- maintenance activities will be of short duration.

3) Increase in Competition:

The proposed actions are not expected to significantly restrict or increase competition for subsistence resources on Federal public lands within the affected area. ANILCA requires that rural residents have a priority over other users to take wildlife for subsistence uses on Federal public lands and waters. Subsistence uses of resources in areas managed by the National Park Service are subject to Federal law regulations and policy.

VI. AVAILABILITY OF OTHER LANDS

The proposed actions are consistence with NPS mandates, ANILCA and the NPS approve general management plans for each of the affected NPS areas. The amount of public land affected by the proposed actions is minimal.

VII. ALTERNATIVES CONSIDERED

No other alternatives that would reduce or eliminate the use of public lands needed were identified or evaluated.

VIII. FINDINGS

This analysis concludes that the proposed action will not result in a significant restriction of subsistence uses.

APPENDIX B: WILDERNESS MINIMUM REQUIREMENT/MINIMUM TOOL ANALYSIS

ARTHUR CARHART NATIONAL WILDERNESS TRAINING CENTER

MINIMUM REQUIREMENTS DECISION GUIDE WORKSHEETS

". . . except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act..."

– the Wilderness Act, 1964

Please refer to the accompanying MRDG *Instructions* for filling out this guide.
The spaces in the worksheets will expand as necessary as you enter your response.

Step 1: Determine if any administrative action is necessary.

Description: Briefly describe the situation that may prompt action.

It is generally accepted that global warming is occurring, and that it is especially evident in high latitude regions (Sanzone, 2006). The arctic parks are forecasted to have the most ecological change due to climate change yet scientists have little information going into climate models to make those predictions.

According to the 2006 Climate Inventory Report, there are large portions of the ARCN park units that have no station coverage, including western GAAR, northern KOVA, far eastern and west-central portions of NOAT, all of CAKR, and northwestern areas of BELA (Davey et al, 2006). In general there are very few observations from the interior of the Seward Peninsula, and there are no climate stations that adequately characterize the higher elevation of the Brooks Range, the upland areas of the Noatak River drainage or the northern mountainous areas of Kobuk Valley. There is also a lack of weather observations as you move from the coast of the Chukchi Sea to the inland areas of Cape Krusenstern. These are the areas of focus that could help characterize the changing arctic climate.

Numerous studies describe the effects of climate change on selected ecosystems, but it is important to quantitatively monitor meteorological conditions directly so that a reliable record of long term change can be established. Climatic variations are a primary driver of ecosystem dynamics, impacting both terrestrial and aquatic flora and fauna. Some of

the potential implications of a changing climate regime within the arctic national parks include lake ice duration, precipitation, precipitation as snow, glacier mass balance, snow duration, growing season duration and thawed active layer – depth and duration, permafrost dynamics, snowpack persistence, variations in timing of wildlife migrations, plant phenology, albedo, and sea ice extent and duration. It will also change how people, who are interested in subsistence and/or recreation, use the land.

The NPS can contribute to more accurate climate modeling by collecting more instrumented information from parklands at high elevations since most of the existing climate stations sites are located in low elevations.

The monitoring program has the opportunity to advance understanding of the ecosystems that encompass the network of parks. This understanding would come in the form of the monitoring data that would be collected, analyzed, interpreted, and reported. Further, the NPS recognizes that while scientific work has been conducted in each of the network parks, this information needs to be incorporated with NPS monitoring efforts to improve its understanding of the holistic functioning of ecosystems within the network. An understanding of ecosystem function is important because it will allow NPS to fulfill the legislative mandate to manage parks in a manner that leaves them unimpaired for the enjoyment of future generations. At the most basic level, the NPS cannot evaluate appropriate ecosystem function when bounds of natural variability are not known because it is not possible to identify when conditions are outside an expected range of variation. Similarly, in this situation, reliable identification of resource trends is also difficult (MacCluskie and Oakley, 2002).

These data will be used by a myriad of researchers and park staff to understand other research and monitoring questions; it is the foundation data for understanding changes in the arctic parks. Additionally, the benefits of enhancing understanding of climate change reach beyond the individual parks to the circumpolar realm.

To determine if administrative action is necessary, answer the questions listed in A - F on the following pages.

A. Describe Options Outside of Wilderness

Is action necessary within wilderness?

Yes: X☐ **No:** ☐

Explain: Consideration was given in this evaluation to whether the climate of GAAR or NOAT could be monitored sufficiently well to meet the goals of the I&M Program, by means of a set of stations located just outside the periphery of the park unit, or through remote sensing means from above (satellites) or the side (e.g., radar). Here, "sufficiency" consists of the following: the ability to reconstruct the spatial variability of climate inside the park unit, the ability to distinguish differing elevation effects, or the ability to track slow and sometimes subtle changes in climate associated with changes in ecological communities, or in near surface soil conditions, in wind patterns, in the

diurnal cycles of weather (temperature in particular), in the occurrence of extreme events (wind bursts, heat or cold spells, heavy precipitation) that lead to physical or biological disturbances, or in the ability to retrospectively identify changes in climate behavior that led to ecological changes noted after the fact rather than at the time of their occurrence. A network should be able to provide these things. A wide consensus of climatologists would conclude that this is not really possible to accomplish within acceptable error limits using only "edge" measurements.

B. Describe Valid Existing Rights or Special Provisions of Wilderness Legislation

Is action necessary to satisfy valid existing rights or a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that allows consideration of the Section 4(c) prohibited uses? Cite law and section.

Yes: ☐ **No:** X☐ **Not Applicable:** ☐

Explain: There is no provision in ANILCA which requires the NPS to place these facilities for its own purposes; ANILCA 1310(b) does not apply in this situation.

C. Describe Requirements of Other Legislation

Is action necessary to meet the requirements of other laws?

Yes: ☐ **No:** X☐ **Not Applicable:** ☐

Explain: Monitoring climate is not required in any other legislation. However, for NOAT, section 201 of the Alaska National Interest Lands Conservation (ANILCA) states that the preserve shall be managed for the following purposes, among others:

- To maintain the environmental integrity of the Noatak River and adjacent uplands within the preserve in such a manner as to assure the continuation of geological and biological processes unimpaired by adverse human activity;
- To protect habitat for and populations of fish and wildlife, including but not limited to caribou, grizzly bears, Dall sheep, moose, wolves, waterfowl, raptors, and other species of birds;
- To protect archeological resources;
- To provide opportunities for scientific research.

D. Describe Other Guidance

Is action necessary to conform to direction contained in agency policy, unit and wilderness management plans, species recovery plans, or agreements with tribal, state and local governments or other federal agencies?

Yes: ☐ **No:** X ☐ **Not Applicable:** ☐

Explain: While the project is not necessary to conform to policy, NPS Management Policies 2006 (NPS, 2006a) addresses the importance of and need for weather and climate monitoring efforts in a number of sections:

Section 4.7.2 *Weather and Climate* "parks containing significant natural resources will gather and maintain baseline climatological data for perpetual reference".

Section 4.2 *Studies and collections* "The Service will encourage appropriately reviewed natural resource studies whenever such studies are consistent with applicable laws and policies. These studies support the NPS mission by providing the Service, the scientific community, and the public with an understanding of park resources, processes, values, and uses that will be cumulative and constantly refined... Studies include projects conducted by researchers and scholars in universities, foundations and other institutions, tribal colleges and organizations, other federal and state agencies, and Service staff".

Section 2.3.1.5 *Science and Scholarship* "The collection and analysis of information about park resources will be a continuous process that will help ensure that decisions are consistent with park purposes."

Section 6.3.6 *Scientific Activities in Wilderness* "The statutory purposes of wilderness include scientific activities, and these activities are encouraged and permitted when consistent with the Service's responsibilities to preserve and manage wilderness".

Section 6.3.6.1 *General Policy* "The National Park Service has a responsibility to support the appropriate scientific activities in wilderness and to use science to improve wilderness management. The Service recognizes that wilderness can and should serve as an important resource for long-term research into, and study, and observation of, ecological processes and the impacts of humans on these ecosystems. The National Park Service further recognizes that appropriate scientific activities may be critical to the long- term preservation of wilderness".

"Scientific activities are to be encouraged in wilderness. Even those scientific activities (including inventory, monitoring, and research) that involve a potential impact to wilderness resources or values (including access, ground disturbance, use of equipment, and animal welfare) should be allowed when the benefits of what can be learned outweigh the impacts on wilderness resources or values. However, all such activities must also be evaluated using the minimum requirement concept and include documented compliance that assesses impacts against benefits to wilderness. This process should ensure that the activity is appropriate and utilizes the minimum tool required to accomplish project objectives".

E. Wilderness Character

Is action necessary to preserve one or more of the qualities of wilderness character including: untrammeled, undeveloped, natural, outstanding opportunities for solitude or a primitive and unconfined type of recreation, or unique components that reflect the character of this wilderness area?

Explain:

Natural: **Yes:** X☐ **No:** ☐ **Not Applicable:** ☐

Explain: When using adaptive management to support stewardship of parklands it's important to understand the pattern of climate change. Information collected by this project would help managers make decisions that would promote naturalness and allow natural changes to occur.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation:

Yes: ☐ **No:** X ☐ **Not Applicable:** ☐

Explain:

Other unique components that reflect the character of this wilderness:

Yes: ☐ **No:** ☐ **Not Applicable:** X ☐

Explain:

F. Describe Effects to the Public Purposes of Wilderness

Is action necessary to support one or more of the public purposes for wilderness (as stated in Section 4(b) of the Wilderness Act) of recreation, scenic, scientific, education, conservation, and historical use?

Explain:

Scenic: **Yes:** ☐ **No:** X☐ **Not Applicable:** ☐

Explain:

Scientific: **Yes:** X☐ **No:** ☐ **Not Applicable:** ☐

Explain: The monitoring program has the opportunity to advance understanding of the ecosystems that encompass the network of arctic parks. This understanding would come in the form of the monitoring data that would be collected, analyzed, interpreted, and reported. Further, the NPS recognizes that while scientific work has been conducted in each of the network parks, this information needs to be incorporated with NPS monitoring efforts to improve its understanding of the holistic functioning of ecosystems within the network. An understanding of ecosystem function is important because it will allow NPS to fulfill the legislative mandate to manage parks in a manner that leaves them unimpaired for the enjoyment of future generations. At the most basic level, the NPS cannot evaluate appropriate ecosystem function when bounds of natural variability are not known because it is not possible to identify when conditions are outside an expected range of variation. Similarly, in this situation, reliable identification of resource trends is also difficult (MacCluskie and Oakley, 2002).

It is generally accepted that climate change is occurring and that it is especially evident in high-latitude regions (NAST 2001); The temperature increases in the ARCN that have been observed in the last several decades (e.g. Stottlemyer et al. 2001) will likely have

significant impacts on permafrost in the ARCN (Lachenbruch and Marshall 1986; Osterkamp and Romanovsky 1999; Jorgenson et al. 2001; NAST 2001; Hinzman et al. 2005; Sanzone et al. 2005). In particular, higher temperatures may be associated with increased soil active layer depth and permafrost depth which may in turn be linked to alterations in characteristics such as soil moisture, soil temperature, and soil respiration rates. These in turn can alter rates of nutrient inputs into the ARCN ecosystems, which could have far reaching impacts on the biological community of the ARCN.

Long-term changes in climate are also associated with reductions in sea ice cover (Maslanik et al. 1996; Maslanik et al. 1999) and changes in the distributions of various organisms in the ARCN region (Serreze et al. 2000; Hinzman et al. 2005). In the North, the most conspicuous and well-studied expression of this is the location of the treeline. Changing climate and associated factors have already resulted in increased plant growth (Myneni et al. 1997) and associated advancement of treeline into the tundra biome (Sanzone et al. 2005).

Numerous studies describe the effects of climate change on selected ecosystems, but it is important to quantitatively monitor meteorological conditions directly so that a reliable record of long term change can be established. These data will be used by a myriad of researchers and park staff to understand other research and monitoring questions; it is the foundation data for understanding changes in the arctic parks. It is also data that can be used in a circumpolar perspective of cimate change and the immediate and long term effects on global arctic ecosystems.

Education: **Yes:** ☐ **No:** X☐ **Not Applicable:** ☐

Explain: National parks have a significant interpretive mission. Climate has always been an element in that interpretation, and climate change is rapidly being incorporated into that mission. The interpretation messages can address climate itself, or the relation of climate to other ecological communities and physical processes in a given park. However, while it is anticipated that there will be wide interest in access to ARCN data via internet from many sources, this particular project is not necessary to support the education purpose of wilderness.

Conservation: **Yes:** ☐ **No:** X☐ **Not Applicable:** ☐

Explain:

Historical use: **Yes:** ☐ **No:** X☐ **Not Applicable:** ☐

Explain:

Step 1 Decision: Is any administrative action necessary in wilderness?

Explain: The proposed weather station installation and maintenance project is supported by the National Park Service polices related to scientific activities within wilderness. Climate is a fundamental driver to ecological condition and the patterns of

plant and animal communities found in NPS park units. Changes in climate will impact these ecosystems. Although the proposed project would not contribute directly to the preservation of the untrammeled or undeveloped qualities, nor to outstanding opportunities for solitude or a primitive and unconfined type of recreation within the wilderness, the project would indirectly contribute weather and climate information which could be used to monitor how the natural quality of wilderness is affected by global climate change. The project would also benefit the scientific purpose of wilderness.

These data will contribute resource data for park management decisions and will also contribute to future efforts in broader-scale regional and circumpolar climate monitoring and modeling efforts.

Weather monitoring is important to understanding how climate variability and change relates to complex ecological systems within arctic network. Placing all of the weather stations outside of the wilderness would limit the precision and applicability of the data and would not meet the goals and objectives of the ARCN Vital Signs Monitoring Plan.

Using weather stations is the proposed way to collect this data over the long term and over diverse ecosystems and topography. The benefits of collecting this data outweigh the impacts associated with installation of permanent structures for the following reasons.

The results of this project would address an urgent stewardship issue, the urgency of which is likely to accelerate. Data from this project would address an important stewardship issue, one that affects one or more key biophysical or social aspects over a large area or long timeframe, with potential concern for human health/safety. While this applied research would have slight to moderate apparent applicability to a current stewardship issue, and managers could affect the issue only by trying to influence broad societal changes, the research is likely to be applicable in the future. The results of this project would be slightly to moderately applicable to the wilderness in which the research is conducted.

The results would benefit science in similar bioregions globally. Results would provide a long term benefit for people nationally or globally. This research would expand significantly on previous work and attempts to answer major questions. It would be conducted on a single process of the ecosystem or social system that affects many components.

The impacts of the project on wilderness character and values will be long term due to the permanence of the installations . If encountered by visitors, either directly or in their viewshed from the air or ground, it could negatively affect solitude and other wilderness experiential factors. Access by airplane or helicopter would have a short-term temporal affect on wilderness character in an given year, but would be a permanent long term increase in aircraft activity in the parks. That increase in activity would also affect solitude and primitive and unconfined recreation.

If action is necessary, proceed to Step 2 to determine the minimum activity.

Step 2: Determine the minimum activity.

Please refer to the accompanying MRDG *Instructions* for an explanation of the effects criteria displayed below.

Description of Alternatives

For each alternative, describe what methods and techniques will be used, when the activity will take place, where the activity will take place, what mitigation measures are necessary, and the general effects to the wilderness resource and character.

Alternative A (No Action)

Description:

Under the No Action alternative, no additional weather stations would be established in Gates of the Arctic National Park and Preserve, Noatak National Preserve, Kobuk Valley National Park, Cape Krusenstern National Monument, or Bering Land Bridge National Preserve.

Effects on Wilderness Character

Untrammeled – The ecological systems within the wilderness would not be further controlled or manipulated.

Undeveloped – The existing vast stretches of the arctic national parklands would remain undeveloped.

Natural – The natural conditions and biological diversity within the wilderness would continue to be protected.

Outstanding opportunities for solitude or primitive and unconfined recreation – Visitors to the arctic national parklands and associated wilderness areas would continue to experience opportunities for solitude or primitive and unconfined recreation.

Alternative B_(Expand Climate Monitoring Program: 17 Sites)

Description:

In support of the Arctic Alaska Inventory and Monitoring Program, the National Park Service would establish permanent remote automated weather stations in Gates of the

Arctic National Park and Preserve (up to 4 sites, Figure 2-1), Noatak National Preserve (up to 6 sites, Figure 2-2), Kobuk Valley National Park (1 site Figure 2-3), Cape Krusenstern National Monument (up to 2 sites, Figure 2-4), and Bering Land Bridge National Preserve (up to 4 sites, Figure 2-5). Table B-1 identifies the individual RAWS sites and provides information as to elevation, location, access, land status, and site preparation. Deployment of these stations is anticipated for 2010 and 2011.

The weather stations would collect basic weather observations including air temperature, precipitation, relative humidity, wind speed and direction, solar radiation and snow depth and transmit these observations hourly via satellite. These observations would be posted to the Western Regional Climate Center's (WRCC) web site in near real-time (http://www.wrcc.dri.edu/NPS.html)

Each weather station would be composed of a 10-foot tripod tower hosting all the sensors and a datalogger enclosure. The batteries would be enclosed in a separate enclosure at the base of the tripod.

The tripod tower would house the temperature, precipitation, relative humidity, solar radiation, wind speed and direction, and snow depth sensors, a GPS antenna, and a GOES satellite transmission antenna. A fiberglass equipment enclosure on the mast houses the electronic equipment such as the datalogger, and geostationary satellite transmitter (GOES). The batteries are sealed, starved electrolyte-type batteries. The wind speed and direction sensors are located on the top of the 10-foot tall mast. The footprint of the tripod is approximately 12 feet in diameter. A 48"x13" solar panel would also be attached to the south side of the mast. The tower is typically anchored to the ground with 2-foot long steel pins. The tower components are assembled on site.

Installation

A Campbell Scientific, Inc. weather station can be installed in a few hours by two people once all the parts and pieces are onsite. Getting the weather station to a deployment site would typically require one or two sling loads using a helicopter. A single helicopter flight would be required to transport personnel to each site. Getting a weather station to a point where helicopter operations can begin may require fixed-wing aircraft. Weather station installation would occur in June, July, and August. Hand tools would be used for weather station assembly.

Annual Maintenance

Each station would require one annual maintenance visit. Maintenance activities would be confined to a single day and would primarily occur from June through August. Helicopter access would be necessary for most sites, but fixed wing access and hiking to the site is possible for some of them. Three to four hours would be required to swap sensors and perform other routine maintenance.

Table B-1. Potential new weather station sites under Alternative B

Park	Site Name	Elevation (ft)	Latitude DM_NAD83	Longitude DM_NAD83	Access for Maintenance	Land Status & (Wilderness)	Concurrent Land Uses	Required Site Preparation
GAAR	Chimney Mountain	3,100	67° 45.3454’	150° 29.6020’	Helicopter or float plane	Park (Wilderness)	None	None
GAAR	Pamichtuk Lake	2,700	67° 46.3160’	152° 11.7000’	Helicopter or float plane	Park (Wilderness)	None	None
GAAR	Ram Creek	3,000	67°41.1110’	154° 28.3870’	Helicopter	Park (Wilderness)	None	None
GAAR	Killik Pass	3,000	67° 58.2210’	154° 55.4500’	Helicopter or float plane	Park (Wilderness)	None	None
NOAT	Kaluich Creek	2,486	67° 34.4030’	158° 25.9030’	Helicopter	Preserve (Wilderness)	None	None
NOAT	Imelyak	3,620	67°32.6890’	157° 04.6460’	Helicopter	Preserve (Wilderness)	None	None
NOAT	Howard Pass	2,062	68° 09.3610’	156° 53.7490’	Helicopter	Preserve (Wilderness)	None	None
NOAT	Sisiak	1,823	67° 59.7020’	160° 23.7390’	Helicopter	Preserve (Wilderness)	None.	None
NOAT	Kugururok	1,028	68° 19.9870’	161° 22.5530’	Helicopter	Preserve (Wilderness)	None	None
NOAT	Asik (High elevation)	1329	67° 28.4930’	162° 15.9860’	Helicopter	Preserve	None	None
KOVA	Salmon River	1,262	67° 27.5940’	159° 50.4750’	Helicopter	Park	None	None
CAKR	Mt. Noak	809	67° 08.4860’	162° 59.6720’	Helicopter	Monument	None	None
CAKR	Rabbit Creek	966	67° 33.0090’	163° 34.0310’	Helicopter	Monument	None	None
BELA	Midnight Mountain	2,267	65° 49.2200’	164° 32.5645’	Helicopter	Preserve	NPS Radio Repeater	None
BELA	Serpentine Hot Springs	518	65° 51.1380’	164° 42.4690’	Fixed-wing to Serpentine Hot Springs Airstrip	Preserve	None	None
BELA	Devil Mountain	285	66° 16.5530’	164° 31.851’	Helicopter	Preserve	None	None
BELA	Ella Creek	2258	65° 16.2890’	163° 48.6810’	Helicopter	Preserve	None	None

Effects on Wilderness Character

Untrammeled -- The stations would not control or manipulate the ecological systems within the wilderness.

Undeveloped -- The installation of 17 new permanent structures would considerably degrade the undeveloped character of these arctic parklands. All stations except Midnight Mountain and Serpentine Hot Springs would be installed in places that currently do not have any developments.

The weather monitoring stations would be placed primarily within undisturbed locations and would require a footprint of approximately 12 feet by 12 feet (144 sq ft).

Some site preparation would be necessary to facilitate erecting the previously-described structures. Visual impact of the structures in areas otherwise devoid of human presence would be long-term and would detract from the undeveloped wilderness character. All structures would be visible from the air.

The most remote pristine parts of these wilderness parks would no longer be free from developments. Killik Pass (GAAR), Howard Pass and Kugururok (NOAT), Rabbit Creek CAKR), Devil Mountain (BELA) are in the remotest parts of their respective park units. These sites would be in areas that are relatively free of human intrusions. Selection of this alternative would commit these wilderness areas to the long-term impact of permanent facilities.

The amount of helicopter and fixed-wing air traffic would increase due to the installation and maintenance of 17 new structures. Helicopter access would be required for most of the sites. It can be expected that due to severe weather at higher elevations and near the coast, weather stations in those areas would require additional maintenance to repair sites damaged by severe wind and ice. This increase in air traffic would be long-term given the permanent nature of the installations.

Natural -- The natural conditions and biological diversity within the wilderness would continue to be protected. Information collected by this project would help managers make decisions that would promote naturalness and allow natural changes to occur.

Outstanding opportunities for solitude or primitive and unconfined recreation -- Throughout much of the wilderness parklands visitors would continue to experience opportunities for solitude or primitive and unconfined recreation. However, those opportunities would be degraded and/or less frequent due to 17 new installations and increases in air traffic associated with installation and maintenance activities. All structures would be visible from the air and many would be on exposed ridges visible from great distances. Killik Pass (GAAR), Howard Pass and Kugururok (NOAT), Rabbit Creek (CAKR), Devil Mountain (BELA) are in the most remote pristine areas of their respective park units. Placement of monitoring stations in these remote areas would impact visitor experience.

The amount of helicopter and fixed-wing air traffic would increase due to the installation and maintenance of 17 new structures. Helicopter access would be required for most of the sites.. This increase in air traffic would be long-term given the permanent nature of the installations. Visitors may observe fixed-winged aircraft and/or helicopter activities within and surrounding the climate monitoring sites. Personnel may also be seen and heard. Noise from aircraft could diminish a sense of solitude in the vicinity, as motorized noise, especially helicopter noise, can be heard over long distances. These intrusions could extend beyond the immediate climate monitoring station site, but would be of short duration. Placement of monitoring stations in Killik Pass (GATES), Howard Pass

and Kugururok (NOAT), Rabbit Creek CAKR), Devil Mountain (BELA) would reduce these areas ability to provide outstanding opportunities for solitude or primitive and unconfined recreation in the most remote pristine areas of their respective park units.

The availability of such weather data also decreases the sense of self-reliance, adventure, and discovery of the wilderness areas. The knowledge that daily climate information is available, even if a person chooses not to view it, may diminish the sense of the area being unknown and unexplored. For some, the idea of a blank spot on the map has tremendous value; information collected by this project would add definition and consequently remove some of the mystery associated with those blank spots. In this sense, the project would decrease the sense of exploration, discovery, risk and adventure associated with these wilderness areas.

Other wilderness values -- Lands included in these wilderness parks are important spiritually and culturally for many local people and communities; seeing modern human developments like climate stations could detract from the sense of place come cultures associate with lands encompassed by the park units.

Safety of Visitors, Personnel, and Contractors

Providing additional information on current weather conditions in remote areas would enhance the safety of pilots and passengers traveling through these regions. Pilots would be able to make better informed decisions on flight routes.

Other Alternatives Considered (Alternative C:8 Sites)

In support of the Arctic Alaska Inventory and Monitoring Program, the National Park Service would establish permanent remote automated weather stations in Gates of the Arctic National Park and Preserve (2 sites), Noatak National Preserve (2 sites), Kobuk Valley National Park (1 site), Cape Krusenstern National Monument (1 sites), and Bering Land Bridge National Preserve (2 sites) (see Table B-2).

This alternative is the same as Alternative B except that 8 sites are proposed instead of 17 and all new climate stations would replace existing climate stations or be co-located with other existing facilities.

Table B-2. Potential new weather station sites under Alternative C

Park	Site Name	Elevation (ft)	Latitude DM_NAD83	Longitude DM_NAD83	Access for Maintenance	Land Status & (Wilderness)	Concurrent Land Uses	Required Site Preparation
GAAR	Norutak Lake				Helicopter	Outside park	None	Existing RAWS
GAAR	Anaktuvuk Pass				Fixed wing	Outside Park	None	Weather station near airstrip
NOAT	Kelly RAWS		67 28.9500	162 18.3000	Helicopter	Preserve (Wilderness)	None	replacement
NOAT	Noatak RAWS				Helicopter	Preserve (Wilderness)	None	replacement
KOVA	Salmon River	1,262	67° 27.5940’	159° 50.4750’	Helicopter	Park	None	Move several miles to repeater site or to existing RAWS site
CAKR	Mt. Noak	809	67° 08.4860’	162° 59.6720’	Helicopter	Monument	None	Moved ½ to repeater site
BELA	Midnight Mountain	2,267	65° 49.2200’	164° 32.5645’	Helicopter	Preserve	NPS Radio Repeater	No change
BELA	Serpentine Hot Springs	518	65° 51.1380’	164° 42.4690’	Fixed-wing to Serpentine Hot Springs Airstrip	Preserve	None	Moved ½ to administrative site

Effects on Wilderness Character

Untrammeled -- The stations would not control or manipulate the ecological systems within the wilderness.

Undeveloped -- The installation of 8 new permanent structures would degrade the undeveloped character of these arctic parklands.

The weather monitoring stations would be placed primarily within undisturbed locations and would require a footprint of approximately 12 feet by 12 feet (144 sq. ft.).

Some site preparation would be necessary to facilitate erecting the previously-described structures. Visual impact of the structures in areas otherwise devoid of human presence would be long-term and would detract from the undeveloped wilderness character. All structures would be visible from the air.

Under this alternative NPS would be able to retain the most remote pristine parts of these wilderness parks as free from developments. Since all installations would be co-located with existing installations or would replace existing installations, no new undeveloped areas would be degraded.

The amount of helicopter and fixed-wing air traffic would increase due to the installation and maintenance of 8 new structures. Helicopter access would be required for 5 of the sites. However, this alternative would produce less air traffic than Alternative B because

fewer installations are proposed, and the higher altitude sites that could potentially require more maintenance are not included in this alternative. The increase in air traffic would be long-term given the permanent nature of the installations.

Natural -- The natural conditions and biological diversity within the wilderness would continue to be protected. Information collected by this project would help managers make decisions that would promote naturalness and allow natural changes to occur.

Outstanding opportunities for solitude or primitive and unconfined recreation -- Throughout much of the wilderness parklands visitors would continue to experience opportunities for solitude or primitive and unconfined recreation. However, those opportunities would be degraded and/or less frequent due to 8 new installations and increases in air traffic associated with installation and maintenance activities. All structures would be visible from the air; however, the most visible locations (on exposed ridges) proposed in Alternative B were not included in this alternative.

The amount of helicopter and fixed-wing air traffic would increase due to the installation and maintenance of 8 new structures. Helicopter access would be required for 5 of the sites inside the parks. However, this alternative would produce less air traffic than Alternative B because there would be fewer sites and the higher altitude sites that could potentially require more maintenance are not included in this alternative. The increase in air traffic would be long-term given the permanent nature of the installations. Visitors may observe fixed-winged aircraft and/or helicopter activities within and surrounding the climate monitoring sites. Personnel may also be seen and heard. Noise from aircraft could diminish a sense of solitude in the vicinity, as motorized noise, especially helicopter noise, can be heard over long distances. These intrusions could extend beyond the immediate climate monitoring station site, but would be of short duration.

The availability of such weather data also decreases the sense of self-reliance, adventure, and discovery of the wilderness areas. The knowledge that daily climate information is available, even if a person chooses not to view it, may diminishes the sense of the area being unknown and unexplored. For some, the idea of a blank spot on the map has tremendous value; information collected by this project would add definition and consequently remove some of the mystery associated with those blank spots. The project would decrease the sense of exploration, discovery, risk and adventure, but to a lesser degree than in the other action alternatives because the existing undeveloped parts of the parks would remain undeveloped, climate data would not be available for those areas, and so for many people a sense of mystery would remain.

Other wilderness values -- Lands included in these wilderness parks are important spiritually and culturally for many local people and communities; seeing modern human developments like climate stations could detract from the sense of place come cultures associate with lands encompassed by the park units. Because all new structures would be co-located, no previously undisturbed areas would be disturbed.

Safety of Visitors, Personnel, and Contractors -- Providing additional information on current weather conditions in remote areas would enhance the safety of pilots and

passengers traveling through these regions. Pilots would be able to make better informed decisions on flight routes, but they would not have as much information as they would under Alternative B.

Comparison of Alternatives

It may be useful to compare each alternative's positive and negative effects in tabular form as they relate to each of the criteria that measure the quality of wilderness character, , keeping in mind the law's mandate to "preserve wilderness character."

	Alternative A (No-Action)	Alternative B (17 sites)	Alternative C (8 Sites)	Alternative B With Site Modifications
Untrammeled	0	0	0	0
Undeveloped	++	--	-0	--
Natural	0	++	+	++
Solitude or Primitive Recreation	++	--	0	-
WILDERNESS CHARACTER	++	--	**0**	-

Safety Criterion

If safety issues override impacts to wilderness character or other criteria, provide documentation that the use of motorized equipment or other prohibited uses is necessary because to do otherwise would cause increased risks to workers or visitors that cannot be satisfactorily mitigated through training, use of personal protective equipment (PPE), or other requirements to alleviate the safety risk. (This documentation can take the form of agency accident-rate data tracking occurrences and severity; a project-specific job hazard analysis; research literature; or other specific agency guidelines.)

Documentation: Field personnel would encounter risks associated with helicopter travel and travel to remote places. There would be a small chance of slips and falls as well as of encountering bears and other wildlife because field personnel would be in the field for short periods of time. Field personnel would be properly trained in helicopter travel, conducting backcountry field activities, and using personal protective measures such as bear resistant food containers, electric fences, bear-spray, and/or firearms.

Step 2 Decision: What is the Minimum Activity?

Please refer to the accompanying MRDG *Instructions* before describing the selected alternative and describing the rationale for selection.

Selected alternative: Alternative B with Site Modifications: (Install 12 sites)

<u>Rationale</u> for selecting this alternative (including documentation of safety criterion, if appropriate):

Weather monitoring is important to understanding how climate variability and change relates to complex ecological systems within the arctic network. Using weather stations is the proposed way to collect this data over the long term and over diverse ecosystems and topography. The benefits of collecting this data outweigh the impacts associated with installation of permanent structures.

Alternative B with site modifications would provide for 12 climate monitoring stations to be installed in Gates of the Arctic National Park and Preserve (3 sites), Noatak National Preserve (4 sites), Kobuk Valley National Park (1 site), Cape Krusenstern National Monument (1 sites), and Bering Land Bridge National Preserve (3 sites). Placement of monitoring stations in Killik Pass (GAAR), Howard Pass and Kugururok (NOAT), Rabbit Creek (CAKR), and Devil Mountain (BELA) would not occur because of the remoteness and visibility of these sites, as well as the higher potential of facilities to impact the undeveloped character of the area and the ability of the area to provide outstanding opportunities for solitude or primitive and unconfined recreation.

Howard Pass: The Howard Pass area is one of the finest examples of remote and pristine Arctic Wilderness within Western Arctic National Parklands. The area is a the drop off pointfor backcountry recreation user groups as a starting point for extended backpacking trips, canoe trips, and fishing trips. During the fall hunting seasons, this area receives a relatively high concentration of visitation from hunting groups. This portion of the Noatak Preserve is currently totally undeveloped and because of the distance from Kotzebue or Bettles, visitors to this area expect the highest wilderness character. Removing this location as a possible installation site would reduce the total number of helicopter flights within Western Arctic National Parklands on any given year due to the reduction in total overall sites.

Kugururok: The entire Kugururok River drainage is another of the finest examples of remote and pristine Arctic Wilderness within Noatak Preserve. The area is one of the most popular drop off points for backcountry recreation user groups.including hunters during the fall hunting season. This watershed is scenic, open tundra with rolling hills and higher terrain behind. Because of its relative popularity and the current lack of any facilities or installations, it provides a high degree of wilderness character that would be more affected by the placement of a weather station. Removing this location as a possible installation site would reduce the total number of helicopter flights within Western Arctic National Parklands on any given year due to the reduction in total overall sites.

Rabbit Creek: The entire Rabbit Creek drainage lies within Cape Krusenstern National Monument and is one of the least developed areas within the Monument. During the fall and winter hunting seasons, this area receives a relatively high concentration of visitation from subsistence hunting user groups. Removing this

location as a possible installation site would reduce the total number of helicopter flights within Western Arctic National Parklands on any given year due to the reduction in total overall sites.

Killik River: The Killik River is located in one of the lesser used portions of GAAR. It is open rolling tundra in the river valley with mountains all around providing an open, high visual quality which contributes significantly to the visitor seeking solitude. Because it is located at the maximum range for aircraft delivering visitors from Bettles or Kotzebue, expectations for the highest quality wilderness character exist and have been maintained. A facility in this area would have more effect on wilderness character as a result.

Devil Mountain: Located in BELA, the Devil Mountain region is characterized by a relatively flat volcanic field consisting of volcanic ash, volcanic cones and explosion craters (maars) but dominated by Devil Mountain. The remote and relatively inaccessible area does have possible airplane access in some of the lakes which would provide for visitor access and an extremely high degree of opportunity for solitude. Because of the remote nature of this part of the preserve, all of the qualities of wilderness character are at an extremely high level and could be more affected by the placement and maintenance of a permanent facility than other locations.

This alternative reflects a selection of stations that will minimally provide the monitoring information required by the ARCN network based on distribution among a variety of ecological and physiographical locations and will continue to preserve the more undeveloped parts of the parks in an undeveloped state. This alternative would also involve fewer flights than would occur under Alternative B, and would preserve areas as undeveloped that are places visitors wouldn't expect to see developments.

The selected alternative conforms to NPS 2006 Management Policies, and the parks' GMPs. The information obtained from the weather stations is important for the administration and preservation of wilderness ecosystems and cannot be obtained from a location outside of the wilderness without significant loss of precision and applicability and without successfully meeting the goals and objectives of the ARCN Vital Signs Monitoring Plan. The data collected by this alternative will contribute resource data for park management decisions and will also contribute to future efforts in broader-scale climate monitoring and modeling efforts.

While the No-Action Alternative and Alternative C would create the least impact to wilderness, neither of those alternatives would meet the goals of the project.

Cumulative Impacts: There currently exists the following number of structures/installations in the arctic parklands:

GAAR: (see attached chart)
WEAR: (see attached chart)

The following table lists facilities / installations that have been permitted by NPS and installed in WEAR.

	Number of Installations	Purpose	Notes
NPS Radio Repeaters	3	Supports communication and park operations	Permanent
NPS Administrative Cabins	7	Supports a variety of protection and research activities	Permanent
NPS Snow Course	1	Gathers information on snow conditions & water content to help predict stream flow.	Permanent
NPS Remote Automated Weather Station (RAWS) Installations	3	Collects basic climatological data including air & soil temperature, precipitation, relative humidity, wind speed and direction, solar radiation, & snow depth	Permanent

In addition, there are approximately 75 natural resource markers and approximately 25 cultural resource markers. They consist of either an aluminum stake with a stamped 3.25" cap, a wooden stake, or a tagged rebar stake. There are no plans for their removal.

The following table lists facilities/installations that have been permitted by NPS and installed in GAAR.

	Number of installations	Purpose	Notes
NPS/other cabins	6	Public health & safety, administrative and park operations use	Some maintained; some under permit
WBAN weather Station	1	Collects basic climatological data	Permanent

In addition, there are several hundred cultural resource markers consisting of a rebar stake buried in the ground with a small aluminum tag remaining above the surface. There are no plans for their removal.

Under Alternative B with modifications: The selected alternative would contribute 9 additional installations in WEAR, increasing the total number of installations by 64%....and 3 additional installations in GAAR increasing the total number of installations by 50%Counting only more similar installations, the total number of weather stations and radio repeaters in WEAR is 7 and adding 9 additional weather

stations would increase the number by 129%. In GAAR there is currently 1 station, so adding 3 would increase the number by 300%.

The cumulative impact of airplane and helicopter landings and flights would also increase by approximately 10-13 additional helicopter flights per year in the 5 park areas, assuming that an additional 3-5 additional fixed wing flights were used where that type of access is feasible. If a helicopter were used exclusively for access under this alternative, there would be approximately 12-16 additional helicopter flights annually. There is currently no accurate data to approximate the existing total number of helicopter and fixed wing flights so it is difficult to assess the affects to the cumulative total.

Under Alternative B: This alternative would contribute 13 additional installations in WEAR, increasing the number of installations by 93%, and 4 additional installations in GAAR increasing the number of installations by 66%. Counting only more similar installations, the total number of weather stations and radio repeaters in WEAR is 7 and adding 13 additional weather stations would increase the number by 186%. In GAAR there is currently 1 station, so adding 4 would increase the number by 400%.

The cumulative impact of airplane and helicopter landings and flights would also increase by approximately 14-18 additional helicopter flights per year, assuming that an additional 3-5 additional fixed wing flights were used where that type of access is feasible. If a helicopter were used exclusively for access under this alternative, there would be approximately 17-21 additional helicopter flights annually. There is currently no accurate data to approximate the total existing number of helicopter and fixed wing flights so it is difficult to assess the affects to the cumulative total.

Mitigation requirements under all alternatives:

When technology improves (i.e. wireless instruments, portable instruments) existing structures will be replaced with less intrusive techniques.

The selected alternative would mitigate adverse impacts to the wilderness resource by minimizing the number and duration of field activities, minimizing ground disturbance to the smallest practicable footprint, and installing each weather station in such a manner as to ensure its appearance would not adversely affect wilderness character. Construction activities would be attempted during times when visitor use is minimal. Flight paths will be used that minimize or avoid impacts to sensitive wildlife or higher public use areas.

The sites are to be anchored in a way that yields minimum disturbance to the substrate (by means of rods driven into the ground), rather than a typical concrete plug, for example. To avoid guy wires, the towers are shortened from the recommended WMO standard of 10 meters to 3 meters, typical of many tripod mounts. Climate stations deployed for CAKN are also 3 meter tripods.

Stations can be painted to blend in with surroundings, though unlike snowshoe hares one color scheme must suffice all year. The usual choice is the greenish colors of vegetative camouflage. Thermometer housings must remain as white as possible under all circumstances.
Project managers will provide to the parks a monitoring and maintenance schedule so that parks know when and how often sites will be accessed.
Check any Wilderness Act Section 4(c) uses approved in this alternative:

- ☐ mechanical transport
- X☐ motorized equipment
- ☐ motor vehicles
- ☐ motorboats
- X☐ landing of aircraft
- ☐ temporary road
- X☐ structure or installation

Record and report any authorizations of Wilderness Act Section 4(c) uses according to agency procedures.

Approvals	Signature	Name	Position	Date
Prepared by:	Adrienne Lindholm, Dan Stevenson, Judy Alderson			
Recommended:				
Recommended:				
Approved:				