

**FINDING OF NO SIGNIFICANT IMPACT  
IMPROVE METEOROLOGICAL MONITORING IN ALPINE ENVIRONMENTS**

**North Cascades National Park Service Complex  
March 2008**

***Summary***

This Finding of No Significant Impact documents the decision of North Cascades National Park Service Complex to upgrade and expand its existing meteorological monitoring network. The National Park Service, in cooperation with Seattle City Light, Puget Sound Energy, and the Natural Resource Conservation Service, will 1) convert the existing snow course at Browntop Ridge and aerial marker at Easy Pass to SNOTEL (Snowpack Telemetry) stations; 2) install basic climate monitoring stations near Silver Glacier and Noisy Glacier; and 3) discontinue the use and remove equipment for the aerial marker at Jasper Pass.

***Purpose and Need***

The purpose of this proposed federal action is to gather better information on weather, climate, and precipitation patterns by expanding the existing meteorological monitoring network. It is needed to support the park complex's long-term ecological monitoring program and to improve understanding of watershed processes and glacier dynamics in response to global climate change.

***Selected Management Alternative***

Of the two management alternatives evaluated in the Environmental Assessment (EA), Alternative B, the Preferred Alternative will be implemented. The proposed actions under the Preferred Alternative, as detailed in the EA, remain unchanged (no substantive public or agency comments were received). The life cycle of the project is expected to be over 50 years. The project will be incorporated into the Long Term Ecological Monitoring program, and will be used for long term flood forecasting and management of hydroelectric projects. The three elements of Alternative B are described below.

***Browntop Ridge and Easy Pass SNOTEL Installation***

The NPS will replace existing snow survey sites with snow telemetry sites at Browntop Ridge and Easy Pass. These will be long-term monitoring stations located within federally designated wilderness. The advanced hydro-meteorological stations measure temperature, precipitation, solar radiation, snow depth, and snow water content. The stations consist of:

- An instrument shelter (4' x 4' x 16' tall)
- A 24-foot tall, three-foot diameter precipitation gauge
- Two towers (16' and 30')
- A leveled 20-foot diameter earthen pad for a 10-foot square steel snow pillow assembly
- A marker pole
- Three shallow underground fluid lines

The snow pillow assembly is composed of four stainless steel pillows that are approximately four by five feet and 2.5 inches thick. A leveled 20-foot diameter earthen pad will be created for the assembly using native soils and imported gravel and sand; some ground disturbance will occur. Each pillow holds 25 gallons of a 50/50 water and antifreeze solution. Soilcon Instrument Antifreeze is used, which is primarily ethanol and propylene glycol. The precipitation gauge will use 12 gallons of antifreeze that is changed, along with accumulated precipitation, annually each fall season. One tower supports a radio transmission antenna and solar panels while another supports a wind speed-measuring device. The three underground lines (buried six

inches below the surface) run from the instrument shelter to the snow pillow, the wind speed antenna tower, and the precipitation gauge. Towers will be powder-coated brown to lessen visibility. Each station's footprint will be approximately 60-75 feet in diameter.

Installation for the Easy Pass SNOTEL will occur in fall 2008 and for the Browntop Ridge SNOTEL in fall 2008 or 2009. The installation will be conducted by NRCS personnel. It will take six people approximately two days to install the SNOTEL station at each site (perhaps fewer people the second day). A park resource manager will be on site to direct the installation crew away from sensitive areas at the site and monitor excavations. Due to safety considerations with day length and the need to complete work in a short time frame, and to avoid having work crews camp overnight due to weather at that time of year; two additional flights/landings are planned.

For the Easy Pass installation, supplies and equipment will be trucked to a staging area/ landing zone near Baker Lake (USFS) then flown by helicopter to the site. An estimated 12 to 14 round trip flights from the landing zone near Baker Lake are required to complete the work. Eight to ten of those would be long line loads with cargo suspended below the aircraft; the helicopter will not land on those flights. The flight path will follow the Baker River to Easy Pass, approximately 15 miles. Estimated flight time from Baker Lake to Easy Pass is 12 to 15 minutes. The flight path is over the northern portion of Baker Lake, Baker River Trail, and Sulphide Campground.

For the Browntop Ridge installation, the supplies and equipment will be trucked to a staging area/ landing zone at Hozomeen Campground on Ross Lake before being flown by helicopter to the site. An estimated 12 to 14 round trip flights from Hozomeen will be required to complete the work. Eight to ten of those will be long line loads with cargo suspended below the aircraft; the helicopter will not land on those flights. The flight path will follow south along Ross Lake before heading west, following the Little Beaver Creek to the site. The flight of 14 miles will take an estimated 12 to 15 minutes of flight time between Hozomeen and Browntop Ridge. The flight path will fly over Hozomeen, Silver Creek, Little Beaver and Perry Creek Campgrounds, northern Ross Lake, and the Little Beaver Trail.

Calibration flights at Browntop Ridge will occur monthly from January through June for the first five years, and subsequent winter trips will then be reduced to two to three landings per year. Calibration visits at Easy Pass will be needed for three to five years; subsequent winter trips will then be reduced to an as-needed basis. Additionally, all SNOTELs will require an annual maintenance visit in the fall. After the initial calibration period, removal of remnant snow survey equipment, including aerial marker towers, will occur.

#### *Noisy and Silver Glacier Climate Stations*

The NPS will install climate stations near Silver and Noisy Glacier. These will be long-term monitoring stations located within federally designated wilderness. The climate stations provide near real-time meteorological data, including temperature, wind speed and direction, relative humidity, snow depth, and solar radiation. The stations consist of:

- A single 20-foot tower with supporting bracket
- One 80-watt solar panel
- Two 12" x 14" x 4" fiberglass weatherproof enclosures for data loggers and electronics
- Batteries
- A meteor-burst antenna

The single tower attached to a base plate will be anchored into bedrock by drilling four holes (1.5" diameter) and bolting and cementing the base plate to the bedrock. A support bracket for the tower, requiring three additional holes, will be bolted to a nearby bedrock block. The holes

will be drilled by NPS personnel using gas powered rock drills. Concrete will be mounded at the tower's base for ballast (approximately twelve 80-pound bags of concrete). Attached to the tower will be meteorological instrumentation, two fiberglass enclosures, a solar panel, and a meteor-burst communication antenna. The footprint of the station will consist of only the tower, which will be powder-coated brown to lessen visibility. All equipment will be coated with a hydrophobic Velox coating to prevent disruptive accumulation of hoar frost and icing of equipment.

Installation of the Noisy Glacier climate station will occur in fall 2008, and the Silver Glacier climate station will be installed in 2008 or 2009. The installation will be conducted by both NPS and NRCS personnel. The NPS will be responsible for drilling holes into the bedrock used for anchoring the tower; this will take two people approximately one day to complete at each site. The NRCS will install the tower, tower ballast, instrumentation, communications, and electronics; this will take two people approximately two days to complete at each site. A resource manager from the park will be on site to direct the installation crew away from sensitive areas. Work crews will not camp overnight at the installation sites; if needed, they will camp nearby at suitable unobtrusive locations not typically used by park visitors.

For the Noisy Glacier installation, the supplies and equipment will be trucked to a staging area/landing zone near Baker Lake (USFS) and then flown by helicopter to the site. An estimated ten round trip flights from the landing zone near Baker Lake will be required to complete the work. Eight of the flights will be long line loads with cargo suspended below the aircraft; the helicopter will not land on those flights. The flight path will follow Hidden Creek, a tributary of the Baker River, to Noisy Glacier, approximately 10 miles. Estimated flight time from Baker Lake to Noisy Glacier is 10 minutes. The flight path will include the northern portion of Baker Lake.

For the Silver Glacier installation, the supplies and equipment will be trucked to a staging area/landing zone at Hozomeen Campground on Ross Lake before being flown by helicopter to the site. An estimated ten round trip flights from the Hozomeen staging area/landing zone will be required to complete the work. Eight of the flights will be long line loads with cargo suspended below the aircraft; the helicopter will not land on those flights. The flight path will follow south along Ross Lake before heading west, following Silver Creek to the site. The 10-mile path will take an estimated 10 minutes of flight time between Hozomeen and Silver Glacier. The flight path will go over Hozomeen and Silver Creek Campgrounds and northern Ross Lake. At both climate stations, two to three winter calibration visits will be conducted for a maximum of five years. After this period, only one flight will be needed annually to maintain the site, and this visit will occur in conjunction with the fall glacier monitoring trip.

#### *Jasper Pass Aerial Marker Decommission*

The Jasper Pass aerial marker is located within federally designated wilderness. Decommission of the aerial marker will include the removal of all associated equipment and discontinuation of monthly overflights during monitoring season. Decommission of this site will be possible only with the installation of the SNOTEL at Easy Pass. In order to correlate the Easy Pass SNOTEL with Jasper Pass, equipment and measurements will need to continue at Jasper Pass for five years. After this time, the remaining snow survey equipment will be removed and over-flights would cease. An estimated two to three flights will be needed to remove the snow survey equipment. Removal will occur during the fall. Helicopter operations will be based from Newhalem. The flight route would follow Goodell Creek to Jasper Pass.

All of the actions described above (and corresponding mitigation strategies) that will take place in designated wilderness are required for adequately protecting wilderness characteristics. The actions are necessary because meteorological data from higher altitudes is pre-requisite for

adequately understanding weather patterns so as to support essential park management, research, and operations, as well as begin to detect climate change trends. Due to variation in topography and weather, these “vital signs” data cannot be collected outside of wilderness.

All activities will utilize the minimum tools required to accomplish the objectives. The minimum tools outlined in the EA can be described as a combination of primitive tools and modern tools. Modern tools that will be used for the project include a helicopter, electric drill, gas-powered rock drill, and electric saw. The motorized hand tools that will be used are necessary in order to install the monitoring equipment. They will create a short term disturbance during construction; however, the long term benefits of having the stations and the data they provide outweigh the short term impact to wilderness.

The alternatives for upgrading and expanding the meteorological monitoring network involve a choice between use of foot travel versus use of helicopters and fixed-wing aircraft for installation, maintenance, and monitoring purposes. With the appropriate provisions, training and expertise, all sites could be accessed by foot. However, access by foot would present unacceptable risks to NPS personnel given the extreme terrain and remote locations of the sites, particularly in winter. In addition, most of the equipment at the sites would be too heavy to pack in on foot even under ideal weather conditions. In light of these constraints, use of aircraft would be the minimum tool/activity necessary for administrative action. Limits on aircraft include season and time of flights; other key mitigation measures for protecting wilderness values are addressed in the accompanying Matrix.

#### ***Other Alternatives Considered in the Environmental Assessment***

One other alternative was considered and evaluated: Alternative A. Continue Current Management. Under Alternative A, no additional climate stations would be established in North Cascades National Park Service Complex. The NPS, Seattle City Light, and Puget Sound Energy would continue to collect basic climatologic data through the current network using existing SNOTELs, snow-courses, aerial markers, and glacier mass balance data. Snow courses and aerial markers would continue to be used as they historically have been. Browntop Ridge, Easy Pass, and Jasper Pass would remain snow survey sites and continue to provide monthly snow depth and snow water equivalent measurements from January through June. There would continue to be no high-elevation weather stations in the 684,000-acre Complex.

Snow courses are generally visited by the NRCS six times during the winter for measurements, with an occasional fall maintenance visit (approximately every three to four years). Aerial markers require six low elevation over flights annually to take snow depth measurements. Due to their remoteness and for safety concerns, access to the sites is provided by helicopter (snow courses) or fixed-winged aircraft (aerial markers). For the purpose of this analysis, it is assumed the operation of the snow survey sites in this alternative would continue to require a total of six to seven wilderness landings and 12 low elevation over flights annually. The aerial marker towers at Easy Pass, Browntop Ridge, and Jasper Pass would remain. Maintenance of the Browntop Ridge snow course transect and helispot would continue.

#### ***Alternatives Considered but Dismissed***

Four other alternatives were considered but not further addressed in the EA because they did not fulfill the Purpose, Need and Objectives.

**1. Discontinue Use of the Sites.** Seattle City Light and Puget Sound Energy have depended on these sites for planning and operation of their respective hydroelectric projects for more the 47 years. Abandoning these sites would have a negative impact on their operations. In addition, the National Park Service would not be collecting climate data that is important to the

management of natural resources and to the understanding of climate change in North Cascades National Park Service Complex and the Stephen Mather Wilderness.

**2. Relocate to another Site outside Wilderness.** There are no alternative sites at high elevations in the vicinity that are outside of designated wilderness. Consistent long-term data from the same sites are critical to several programs including ecological monitoring and runoff forecasting.

**3. Prohibit Helicopter use for Calibration and Maintenance.** There are no established trails to any of these sites; all overland travel would have to be done by foot, through rugged, steep terrain, requiring two to three days of travel to reach each site. The size and weight of the equipment and gear used during the fall maintenance visit are in excess of 500 pounds, further complicating logistics and travel. The use of overland travel during the initial five year calibration visits would have the same difficulties as the fall maintenance visit, with the additional danger of traveling on and through very dangerous terrain prone to avalanches.

**4. Partial Implementation of the Preferred Alternative.** Partial implementation would not satisfy the needs for the climate monitoring network. The needs of the network are for well-distributed stations, which provide near-real time data that are located at a variety of elevations. These sites were chosen because of their elevation, their unique locations that allow for a well distributed climate network and the quantity of historical data from previous snow surveys. The elimination of either of the glacier climate stations would remove the high alpine monitoring aspect of the network. The elimination of either SNOTEL would return these sub-alpine sites to seasonal monitoring of limited parameters.

#### ***Environmentally Preferred Alternative***

Alternative B, the selected management alternative, is the environmentally preferred alternative. Climate change could have a tremendous impact to the natural systems of the region. Although there are foreseeable impacts caused by Alternative B, these impacts are outweighed by the short-term and long-term benefits of having a more complete understanding of the Complex's climate, micro-climates, and the resource impacts due to climate change. Data derived from these stations would assist resource managers in their decision making. Alternative A does not meet the climate monitoring needs of the park resource managers. In addition, Alternative B would ultimately result in fewer helicopter flights within wilderness than Alternative A. Assisting the region's hydro-electric projects will aid in the efficient use of water resources thereby lowering dependence on other sources of electricity.

#### ***Mitigation Measures***

The following mitigation measures will be followed during project implementation. These actions were developed to lessen the potential for adverse effects of the proposed action.

#### **Station Design**

All infrastructure components chosen for this project will be the least intrusive models available in terms of size, color, and overall design. Infrastructure installation will minimize ground disturbance, excavation, and helicopter flights. If less intrusive methods not identified in this document become feasible, they would be preferred to more intrusive methods. Stations would be decommissioned or improved as equipment or the site becomes obsolete.

*Responsible Party: Geologist.*

#### **Helicopter Use and Flight Paths**

Timing, frequency, and flight paths for helicopter activity will be conducted to minimize impacts to resources and visitor use. Helicopter flights will be restricted to weekdays after Labor Day

and before the Fourth of July, which are periods of less visitor use. During installation and maintenance, flight paths will occur at higher elevations, lessening disturbance to any visitors and wildlife. When reasonable, flight paths will be routed to avoid trails, campsites, and areas of higher visitor use. Annual maintenance flights to the Silver and Noisy Glacier stations would occur in conjunction with the spring glacier mass balance flights, thereby lessening the number of landings. After the initial five-year calibration period, the conversion of snow courses and aerial markers at Browntop Ridge and Easy Pass would decrease flights to one to four annually per site. The decommission of the Jasper Pass aerial marker is intended, in part, as a mitigation action, reducing annual overflights from six to zero. During installation of the sites, a press release would inform visitors of the planned helicopter operations sites to further minimize potential impact.

*Responsible Party: Geologist and Wilderness District Ranger.*

#### Reducing Visible Intrusions

All tower heights will be the minimum height necessary to achieve the desired needs. The instrument shelter and precipitation gauge at the SNOTEL sites and the towers at all the sites will be painted brown in an effort to camouflage them from view. The Easy Pass SNOTEL would be positioned on the south side of the ridge, shielding its view from Copper Ridge and Copper Lookout. The Browtop Ridge SNOTEL towers and instrument shelter will be sited on the south-facing side of large vegetation to shield them from views on popular climbing routes to the north. An NPS resource manager will be on-site during construction to direct the installation crew away from sensitive areas at the site and to shield the equipment from view.

*Responsible Party: Geologist.*

#### Reducing Audible Intrusions

All power tools would adhere to the North Cascades Wilderness Management Plan (1989) by using a modified muffler that reduces decibel levels below 4. Work time would be restricted to weekdays during daylight hours (not later than 7:00pm). Flights will be restricted to weekdays after Labor Day and before the Fourth of July.

*Responsible Party: Geologist.*

#### Protecting Whitebark Pine Trees

Whitebark pines trees will not be cut for any reason (e.g., to provide maximum sun exposure to solar panels, to position equipment, etc).

*Responsible Party: Geologist.*

#### Controlling Non-native Plants at Project Areas

Installation of the SNOTELs may provide vectors for the introduction of non-native plants through equipment, sand or fill material, boots, and /or helicopter skids. Involved parties will make an effort to clean equipment (including helicopter), clothing, and personal gear of all weed seeds. A monitoring program for the project areas would be conducted for five years post-construction by NPS personnel and would occur in conjunction with the annual maintenance visit by the NRCS in the fall. No additional flights or landings to the site would be required to implement the monitoring.

*Responsible Party: Geologist, Botanist.*

#### Antifreeze Leakage at SNOTELs

A stainless steel snow pillow assembly will be used instead of the older style Hypolon rubber snow pillows. No leaks of stainless steel snow pillows have been reported. Although there have been a few instances of leaks of the older style Hypolon rubber snow pillows, there have been no reports of impact to wildlife or vegetation. In addition, the stainless steel pillow requires less antifreeze to operate. For antifreeze, a propylene glycol and ethanol mix is used (the ethanol is

needed to thin the propylene glycol to a specific gravity of 0.98, which prevents the separation of the rain water and anti-freeze). It is anticipated that in the future that load cell technology will eliminate the need for antifreeze-filled snow pillows.

*Responsible Party: Geologist.*

***Why the Selected Action will not have a Significant Effect on the Environment***

The NPS has determined that the selected alternative can be implemented with no significant adverse impacts on wilderness character, vegetation and soils, wildlife and special status species, recreation and visitor use, cultural resources, and socioeconomics. The following criteria were used to determine the significance of each impact:

*1) Impacts that may have both beneficial and adverse aspects and which on balance may be beneficial, but that may still have significant adverse impacts that require analysis in an EIS.*

No major adverse impacts were identified that would require analysis in an EIS. The selected management alternative will have impacts that range from minor to moderate for wilderness character, vegetation and soils, wildlife, and recreation and visitor use. There will be no impact to cultural resources since none were found during site surveys. There will be beneficial impacts to socioeconomics.

*2) Effects on public health and safety.*

The selected alternative will provide more accurate data on current snowpack depths, therefore eventually improving the accuracy of flood forecasting. This would indirectly benefit residents and businesses whose property may be threatened by flooding. The primary benefit would be to provide more accurate warnings so that residents and business owners could make more informed choices as to how to secure their property and/or evacuate during a flood.

*3) Unique characteristics of the area (proximity to historic or cultural resources, wild and scenic rivers, ecologically critical areas, wetlands or floodplains, and so forth).*

All of the climate stations are located within the Stephen Mather Wilderness. The actions were deemed the minimum requirement for administrative of the area as wilderness because meteorological data from higher altitudes is needed to enhance understanding of weather and climate patterns, and due to the wide variation in weather and climate, this data cannot be collected outside of wilderness.

The Silver Glacier climate station will be located within the Silver Lake Research Natural Area. Research Natural Areas were established to provide examples of undisturbed ecosystems for scientific research.

*4) Degree to which impacts are likely to be highly controversial or are highly uncertain or involve unique or unknown risks.*

Potential impacts that could result from the selected alternative are not likely to be highly controversial, uncertain, or involve unique or unknown risks. During the 30-day review period, four individuals commented on this project. None of the comment letters identified any substantive issues nor any issue not fully considered in preparing the EA.

*5) Whether the action may establish a precedent for future actions with significant effects, or represents a decision in principle about a future consideration.*

The selected alternative neither establishes a precedent for future actions with significant effects, nor represents a decision in principle about a future consideration.

*6) Whether the action is related to other actions that may have individual insignificant impacts but cumulatively significant effects.*

The impacts of the selected alternative on wilderness character, vegetation and soils, wildlife, recreation and visitor use, cultural resources, and socioeconomics were identified in the EA. Cumulative impacts to each resource were also identified and none will have cumulatively significant effects. The cumulative activities analyzed in the EA include installations in wilderness, including the narrowband radio conversion project; helicopter use in wilderness for search and rescue, fire management, backcountry trails projects, law enforcement, and on-going research; creation of social trails which leads to trampling of vegetation and development of bare ground; helicopter disturbance to wildlife; and impacts of climate change on wildlife.

*7) Degree to which the action may adversely affect historic properties in or eligible for listing in the National Register of Historic Places, or other significant scientific, archeological, or cultural resources.*

Surveys at each of the proposed sites found no cultural resources.

*8) Degree to which an action may adversely affect an endangered or threatened species or its habitat.*

The NPS determined that the selected alternative will have no effect on the marbled murrelet, northern spotted owl, and bull trout and that it may affect, but is not likely to adversely affect, the gray wolf, Canada lynx, and grizzly bear. The US Fish and Wildlife Service concurred with the NPS' determinations. Mitigation measures outlined in this document will help to minimize potential impacts to any of these species.

*9) Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.*

The selected alternative does not violate any federal, state, or local law, or requirements imposed for protection of the environment.

### **Public Review and Agency Consultation**

Public scoping took place from May 24 – June 24, 2007. Three responses were received during this period. Comments included concern about the number of new flights that would be necessary, that the expansion and upgrades would degrade park resources, and the need for the EA to disclose the possible effects of operation of the units to wildlife. All three letters noted the importance of having meteorological monitoring stations within the park complex.

The EA was released for a 30-day public review period on September 18, 2007. Copies of the document were sent to about 140 agencies, organizations, public libraries, media, and individuals. A media release announcing the document's availability locally and on the internet



occurred at the same time. As a result of the public review, four comments were received. All four of the respondents supported the purpose and need for the project. One of the respondents encouraged the park to minimize the use of machines in wilderness and to make sure all stations have the smallest footprint and profiles possible.

*US Fish and Wildlife Service (USFWS)*

A letter to initiate informal consultation was sent to USFWS on October 24, 2007. The NPS requested concurrence with its findings on impacts to federally listed species. The NPS determined that the actions proposed under the selected management alternative would have no effect on the marbled murrelet, northern spotted owl, and bull trout; and the actions may affect, but are not likely to adversely affect the gray wolf, Canada lynx, and grizzly bear. The USFWS concurred with the NPS' findings in a letter received December 17, 2007.

*Other Agencies*

The National Park Service consulted with staff from Seattle City Light, Puget Sound Energy, and the Natural Resource Conservation Service regarding network and station needs and design, and installation planning during this planning process.

***Non-impairment of Park Resources and Values***

The environmental assessment found that Alternative B, the selected management alternative, will have no major adverse impacts to any resource or value whose conservation is 1) necessary to fulfill the specific purposes identified in the park's enabling legislation; 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or 3) identified as a goal in the park's General Management Plan or other relevant planning documents. The impacts resulting from implementation of the selected alternative will not impair park resources or values and will not violate the Organic Act of 1916.

***Determination***

Based on the environmental impact analysis contained in the Environmental Assessment; the mitigation measures designed to avoid, reduce, or eliminate potential impacts; and the favorable nature of public review and agency coordination, the National Park Service has determined that the selected alternative does not constitute a major federal action that would significantly affect the quality of the human environment. The selected alternative is not without precedent, nor is it similar to an action which normally requires an environmental impact statement. No connected actions with potential significant impacts were identified. Therefore, in accordance with the National Environmental Policy Act of 1969 and regulations of the Council on Environmental Quality, an Environmental Impact Statement will not be prepared.

**RECOMMENDED**

/s/ Palmer L. Jenkins	3/5/08
Superintendent, North Cascades National Park Service Complex	Date

**APPROVED**

/s/ George J. Turnbull for Jonathan B. Jarvis	3/18/08
Regional Director, Pacific West Region	Date