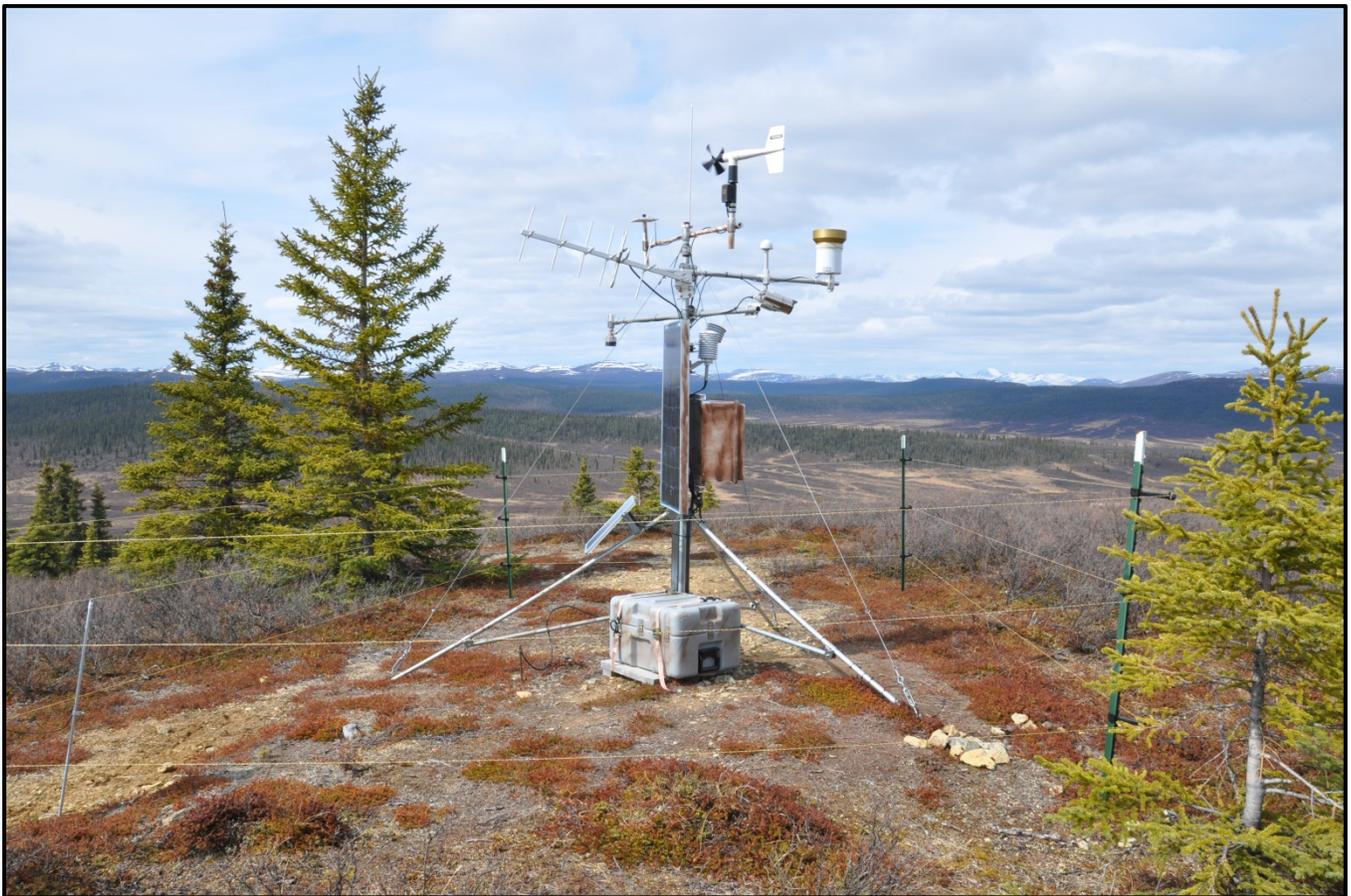




# Climate Station Maintenance 2014

## *Central Alaska Network*

Natural Resource Data Series NPS/CAKN/NRDS—2014/741



**ON THE COVER**

Upper Charley weather station, Yukon-Charley National Park and Preserve.  
Photograph by: Ken Hill

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# **Climate Station Maintenance in the Central Alaska Inventory and Monitoring Network**

*2014 Summary*

Natural Resource Data Series NPS/CAKN/NRDS—2014/741

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National Park Service  
Natural Resource Stewardship and Science  
Fort Collins, Colorado

The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado, publishes a range of reports that address natural resource topics. These reports are of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Data Series is intended for the timely release of basic data sets and data summaries. Care has been taken to assure accuracy of raw data values, but a thorough analysis and interpretation of the data has not been completed. Consequently, the initial analyses of data in this report are provisional and subject to change.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner. Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

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## **Abstract**

The mission of the Central Alaska Network Inventory and Monitoring Program (CAKN) is to collect, compile and synthesize scientific information about the central network of parks in order to manage park resources "unimpaired for the enjoyment of future generations". The Inventory and Monitoring (I&M) Program is a major component of the National Park Service's (NPS) strategy to improve park management through greater reliance on scientific information.

The objective of the climate monitoring 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 beyond park boundaries. Thirteen remote automated I&M weather stations (RAWS) have been installed in CAKN parks since 2003. There are additional weather and climate stations in the parks run by state and federal agencies with specific objectives and missions. It is in the best interest of the CAKN program to cooperate with these other entities on maintenance site visits. During the 2014 field season maintenance site visits were conducted at a total of eighteen sites, including thirteen I&M RAWS , four Snotel (snow telemetry) stations in coordination with Natural Resource Conservation Service (NRCS) staff, and one fire RAWS station. . This report summarizes all work for the 2014 field season and includes current sensor metadata.

## **Acknowledgments**

A successful field season would not have been possible without support from people in Fairbanks (Maggie Macluskie, Jim Lawler, Doris Lenahan, Trey Simmons), McCarthy (Stephens Harper), Gulkana (Mary Odden), and Eagle (Lou Flynn). Additional support was provided by pilots (Rick Swisher, Curtis Cebulski, Shannon Bowman, Kevin Franks, Andy Hermansky, Lynn Ellis) and aviation staff (Denali Dispatch, Scott Sample, Tara Whitesell, Susan Holly, Susanna Nancarrow, Colin Milone).

## List of Acronyms

Ah	Amp hour
AKDST	Alaska Daylight Savings Time
AKRO	Alaska Regional Office
AMD	Aviation Management Directorate
AS350	A-star 350 Helicopter
AT-RH	Air Temperature- Relative Humidity
C185	Cessna 185 airplane
C206	Cessna 206 airplane
CAKN	Central Alaska Network
CS	Campbell Scientific
DENA	Denali National Park and Preserve
DLP	Data Logger Program
FTS	Forest Technology Systems
GOES	Geostationary Operational Environmental Satellite
GPS	Global Positioning System
I&M	Inventory and Monitoring
LED	Light-Emitting Diode
NESDIS ID	National Environmental Satellite, Data, and Information Service Identifier
NIFC	National Interagency Fire Center
NRCS	Natural Resource Conservation Service
NPS	National Park Service
RAWS	Remote Automated Weather Station
RG-TB	Rain Gauge - Tipping Bucket
SD	Snow Depth
SDI	Serial Digital Interface
SR	Solar Radiation
ST	Soil Temperature
W	Watt
WFMI	Wildland Fire Management Information
WRCC	Western Regional Climate Center
WRST	Wrangell-St. Elias National Park and Preserve
WS-WD	Wind Speed - Wind Direction
YUCH	Yukon-Charley Rivers National Park and Preserve

# Climate Station Locations

For the 2014 field season, the Central Alaska Network (CAKN) continued its climate monitoring program by visiting stations in Denali National Park and Preserve (DENA), Yukon-Charley Rivers National Preserve (YUCH), and Wrangell – St. Elias National Park and Preserve (WRST) (Figure 1). Thirteen CAKN climate stations were maintained (Table 1) along with NPS support at four NRCS snow and soil sites, and one fire RAWS station. Annual maintenance includes downloading data, updating software and programming, replacing sensors, and troubleshooting problems. Maintenance is critical in order to provide continuous, high-quality meteorological data.

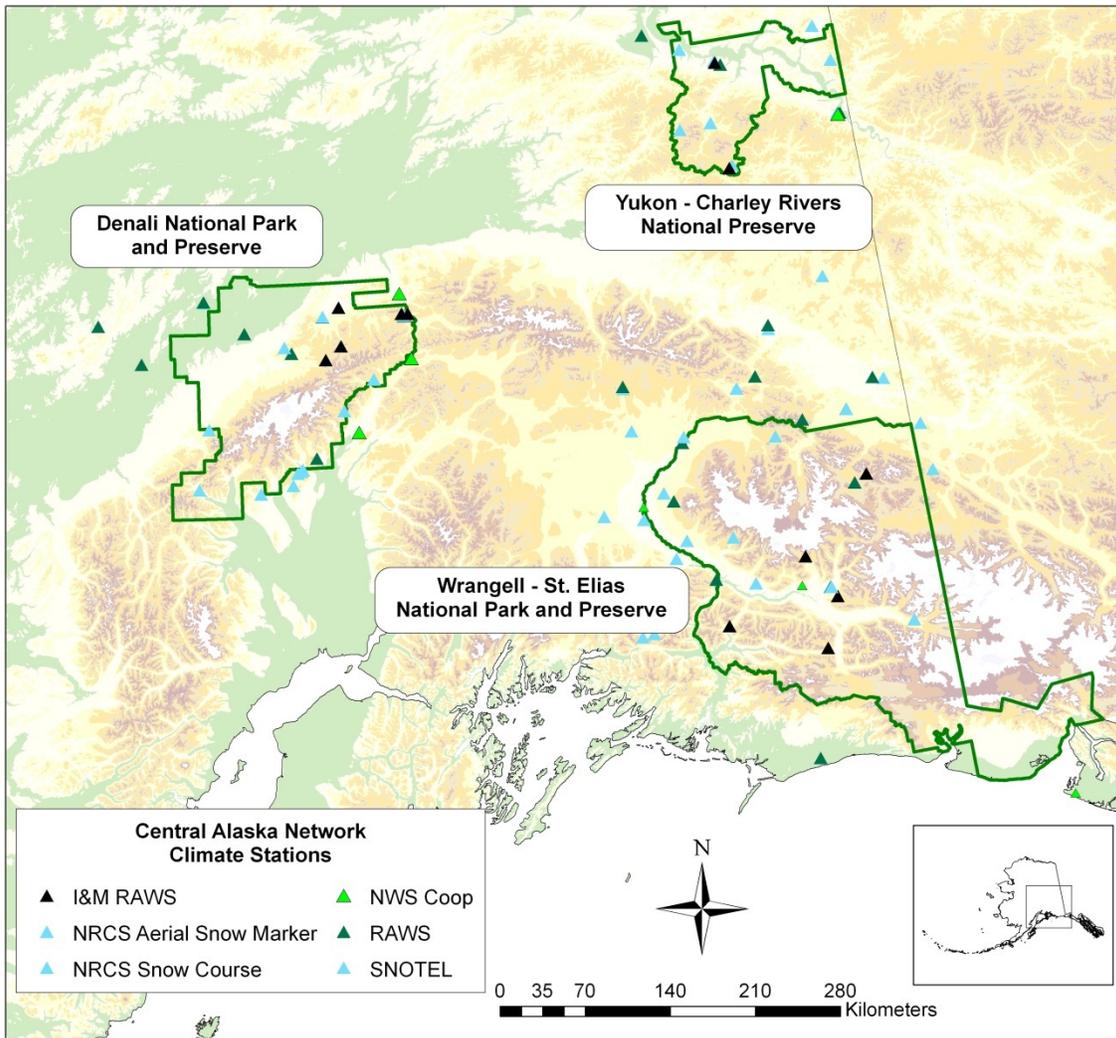


Figure 1. Map showing locations of CAKN climate stations.

**Table 1.** Locations of CAKN sites operated and maintained in 2014 field season.

<b>Station Name</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Elevation (m)</b>	<b>Park</b>
Chititu	61.274	-142.621	1385	WRST
Chicken Creek	62.124	-141.847	1597	WRST
Tana Knob	60.908	-142.901	1140	WRST
Gates Glacier	61.603	-143.013	1237	WRST
Tebay	61.181	-144.342	573	WRST
Chisana SNOTEL	62.072	-142.065	1012	WRST
May Creek SNOTEL	61.348	-142.694	503	WRST
Upper Charley	64.517	-143.202	1114	YUCH
Coal Creek	65.314	-143.132	292	YUCH
Toklat	63.524	-150.043	890	DENA
Eielson Visitor Center	63.431	-150.309	1202	DENA
Wigand	63.814	-150.109	1716	DENA
Ruth Glacier	62.710	-150.540	1006	DENA
Stampede	63.747	-150.328	549	DENA
Dunkle Hills	63.268	-149.539	808	DENA
McKinley River fire RAWS	63.649	-151.642	259	DENA
Kantishna SNOTEL	63.540	-150.990	472	DENA
Tokositna SNOTEL	62.629	-150.775	259	DENA

## Climate Station Maintenance Summaries

This section describes the maintenance details of eighteen climate stations in the Central Alaska Network organized by park. See Appendix A for detailed logistics for each of the parks and Appendix B for detailed information on station metadata.

### Denali National Park and Preserve

This section includes all of the stations that were maintained in DENA in 2014. The sites include: Dunkle Hills, Eielson Visitor Center, McKinley River fire RAWS, Ruth Glacier, Stampede, Toklat, Wigand, Tokositna Snotel, and Kantishna Snotel.

#### Dunkle Hills

Date: August 12, 2014

Time of visit: 0830-1130

Personnel: Pam Sousanes, Shannon Bowman (pilot)

Mode of transport: A-star helicopter – Temsco (NPS Western Area Fire) – N-6015S

Purpose of trip: Annual Maintenance

Weather: 50°F

Sensors replaced:

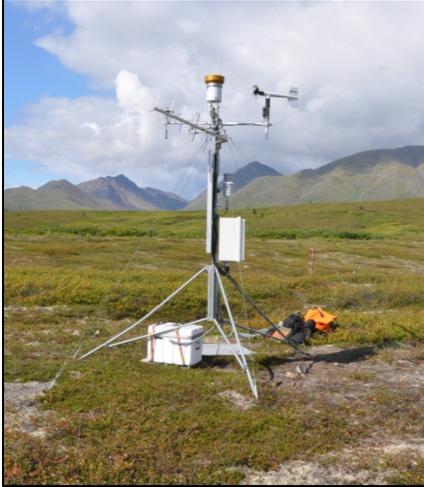
AT-RH

WS-WD

SD (SR50 replaced with SR50a)

Datalogger (CR10x replaced with CR1000)

Narrative: The site was accessed by helicopter from DENA park headquarters. The site was in good condition upon arrival. The CR10x was replaced with a CR1000 datalogger. The CR1000 datalogger was configured with the *Dunkle2014.CRI* program with a snow depth sensor height of 109 inches. The AT-RH (HMP45) and WS-WD sensors were replaced for routine calibration. The SR50 snow depth sensor was replaced with the SR50a model. Extra unistrut at the station was removed and the WS-WD and SR sensors were realigned clockwise 90° so the SR was oriented to the south. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure.



**Figure 2.** Dunkle Hills station August 22, 2014.

### **Eielson Visitor Center**

Date: May 28, 2014

Time of visit: 1400-1530

Personnel: Ken Hill, Pam Sousanes

Mode of transport: DENA Park Road

Purpose of trip: Annual Maintenance

Weather: Mostly sunny, 48°F

Sensors Replaced:

AT-RH

WS-WD

Datalogger (CR10x replaced by CR1000)

SD (SR50 replaced by SR50a)

Narrative: The site was accessed from the DENA park road by NPS vehicle. All data were downloaded from the CR10x datalogger to the field laptop and backed up on a USB memory stick. The AT-RH and WS-WD sensors were replaced for routine calibration. The CR10x datalogger was replaced with a CR1000 datalogger. The CR1000 was configured with a program (Eielson2014.CRI). The SR50 snow depth sensor was replaced with a SR50a snow depth sensor. All bolts were tightened on the station. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure. All bolts and guy wires were tightened.

The inner section of the 4" National Weather Service (NWS) rain gage was cracked and removed. A new interpretive sign was placed on the enclosure door. If desired, a long 1" cross arm and nurrail could replace the unistrut assembly next year. A plastic envelope needs to be added to the inside of the enclosure door to store the wiring diagram and datalogger program.



**Figure 3.** Eielson visitor center station May 28, 2014.

**Kantishna Snotel**

Date: September 25, 2014

Time of visit: 1100-1230

Personnel: Dan Kenney (NRCS), Ken Hill, Curtis Cebulski (NPS pilot)

Mode of transport: Cessna 206 from Fairbanks in NPS fleet aircraft N-473YC

Purpose of trip: Maintenance

Weather: Sunny, patchy fog

Sensors replaced: as needed by Snotel Network

Narrative: Ken flew with Curtis from Fairbanks and met Dan at the Healy airstrip the morning of September 25. Ken, Dan, and Curtis arrived at Kantishna around 1100. Gear was transported to the Snotel station in backpacks. The precipitation gauge was flushed and 10 gallons of fresh antifreeze liquid added for the winter. The sensors were tested and the site was working great on departure.



**Figure 4.** Kantishna Snotel (photo from 2012).

#### **McKinley River Fire RAWS**

Date: May 29, 2014

Time of visit: 0930-1330

Personnel: Ken Hill, Pam Sousanes, Shannon Bowman (pilot)

Mode of transport: A-star helicopter – Temsco (NPS Western Area Fire) – N-6015S

Purpose of trip: Maintenance/Repair

Weather: Sunny, calm

Sensors replaced:

AT-RH

SR

GPS Cable

Battery

Narrative: An NPS A-star helicopter from DENA park headquarters was used to access the site. The site had received some bear damage and was not transmitting. The AT-RH and SR sensors were replaced for routine maintenance. The GPS cable was replaced. The battery was dead and was replaced. The electric fence was repaired. Data was downloaded from the site.

Transmissions were confirmed by calling the NPS radio shop in Anchorage. All bolts and guy wires were tightened.



Figure 2. McKinley River RAWS May 29, 2014.

### **Ruth Glacier**

Date: June 24, 2014

Time of visit: 1230-1430

Personnel: Ken Hill, Pam Sousanes

Mode of transport: A-star helicopter

Purpose of trip: Annual Maintenance

Weather: Sunny, light breeze,

Sensors replaced:

AT-RH

WS-WD

SR

Datalogger (CR10x replaced with CR1000)

SD (SR50 replaced with SR50a)

ST2 (20 cm soil temperature was not working)

ST3 (added 50 cm soil temperature)

Narrative: An NPS A-star helicopter from Talkeetna was used to access the site. The site looked good upon arrival, but it was not transmitting. The AT-RH, WS-WD, and SR sensors were replaced for routine maintenance. The cable on the old wind sensor was damaged and had been spliced multiple times. The CR10x datalogger was replaced with a CR1000. The CR1000 program (*Ruth2014.CRI*) was configured with a snow depth sensor height of 69 inches. The SR50 snow depth sensor was replaced with a SR50a sensor. The ST2 (20 cm depth) soil temperature sensor was not working so it was replaced. A ST3 (50 cm depth) soil temperature sensor was added to the site. The electric fence looked decent and was maintained as needed. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure. All bolts and guy wires were tightened.



**Figure 5.** Ruth Glacier station June 24, 2014.

### **Stampede**

Date: September 16, 2014

Time of visit: 1000-1200

Personnel: Ken Hill, Curtis Cebulski (NPS pilot)

Mode of transport: Fixed wing Cessna-206 (N-473YC)

Purpose of trip: Annual Maintenance

Weather: Mostly sunny, calm, 45° F, patchy fog

Sensors replaced:

AT-RH

SD (SR50 replaced with SR50a)

Datalogger (CR10x replaced with CR1000)

Narrative: NPS fleet plane (Cessna-206) and pilot (Curtis Cebulski) were used to access the station. The site was in good condition upon arrival. All data were downloaded from the CR10x datalogger to the field laptop and backed up on a USB memory stick. The AT-RH sensor was replaced for routine calibration. The CR10x datalogger was replaced with a CR1000 datalogger. The CR1000 was configured with a program (*Stampede2014.CRI*) and snow depth sensor height of 83.5 inches. The SR50 snow depth sensor was replaced with a SR50a snow depth sensor. The tipping bucket tested okay, but the cable is stretched to maximum capacity. Consider replacing/splicing. All bolts were tightened on the station. Loppers were used to remove some brush near the site. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure.



**Figure 6.** Stampede station September 16, 2014.

### **Toklat**

Date: May 28, 2014

Time of visit: 1600-1830

Personnel: Ken Hill, Pam Sousanes

Mode of transport: DENA Park Road

Purpose of trip: Annual Maintenance

Weather: Mostly sunny, 50°F, 15-20 mph

Sensors Replaced:

AT-RH

WS-WD

Datalogger (CR10x replaced with CR1000)

Transmitter (HDR replaced with TX312)

Narrative: The site was accessed from the DENA park road by NPS vehicle. All data were downloaded from the CR10x datalogger to the field laptop and backed up on a USB memory stick. The AT-RH and WS-WD sensors were replaced for routine calibration. The CR10x datalogger was replaced with a CR1000 datalogger. The CR1000 was configured with a new program (*Toklat2014.CRI*). The HDR transmitter was replaced with a TX312, including a new GPS antenna/cable and mounting hardware. The SR50 snow depth sensor was replaced with a SR50a snow depth sensor. All bolts were tightened on the station. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure.



**Figure 7.** Toklat station May 28, 2014.

### **Tokositna Snotel**

Date: June 24, 2014

Time of visit: 1230-1530

Personnel: Dan Kenney and Tony DiMarco (NRCS Anchorage)

Mode of transport: A-star helicopter

Purpose of trip: Annual Maintenance

Weather: Mostly cloudy

Narrative: Dan Kenny and Tony DiMarco from the Natural Resources Conservation Service did the annual maintenance on the Tokositna Snotel site. The precipitation gauge was flushed and 10 gallons of fresh antifreeze liquid was added for the winter. The electric fence was repaired. The sensors were tested and the site was working great on departure.



**Figure 8.** Tokositna Snotel station June 24, 2014.

## Wigand

Date: May 29, 2014

Time of visit: 1200-1400

Personnel: Ken Hill, Pam Sousanes, Shannon Bowman (pilot)

Mode of transport: A-star helicopter – Temsco (NPS Western Area Fire) – N-6015S

Purpose of trip: Maintenance

Weather: Mostly cloudy, breezy, 60 F

Sensors replaced:

AT-RH

Narrative: The site was accessed by helicopter from DENA park headquarters. The station looked good upon arrival. Data were downloaded from the CR1000 datalogger to the field laptop and backed up on a USB memory stick. The AT-RH HMP45 sensor head was replaced for routine calibration. The CR1000 program was updated (*Wigand2014.CRI*). The electric fence had been affected by snow and was repaired. The enclosure desiccant packets were replaced. All bolts and guy wires were tightened. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure.

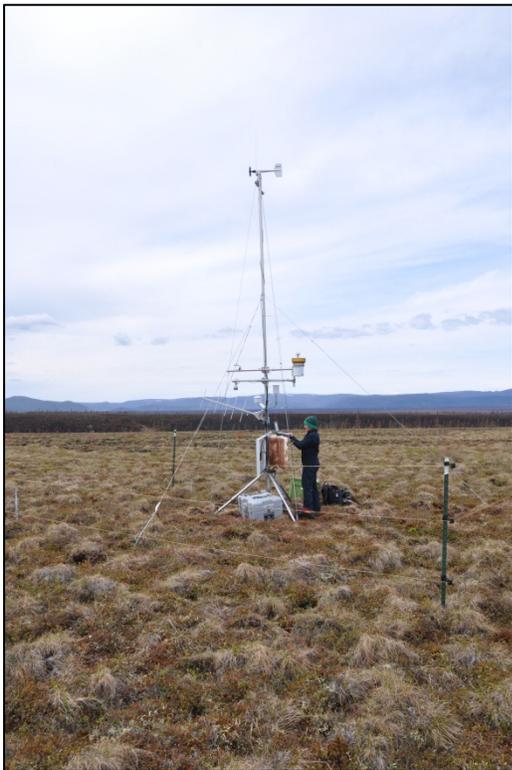


Figure 9. Wigand station May 29, 2014.

## Wrangell – St. Elias

Stations maintained in WRST include Chicken Creek, Chititu, Gates Glacier, Tana Knob, Tebay, Chisana Snotel, and May Creek Snotel. CAKN staff used McCarthy as a base for helicopter operations and stayed at the McCarthy B&B.

### **Chicken Creek**

Date: July 3, 2014

Time of visit: 1000-1200

Personnel: Ken Hill, Pam Sousanes, Kevin Franks (pilot)

Mode of transport: A-star helicopter – Temsco (NPS Eastern Area Fire) – N57954

Purpose of trip: Maintenance

Weather: Cloudy

Sensors replaced:

AT-RH (HMP45 6-wire)

SR

Enclosure box

Narrative: The station was accessed by helicopter from McCarthy via Skolai Creek-Frederika Glacier-Chisana Glacier. Upon arrival the station was in good condition. Data were downloaded from the CR1000 datalogger to the field laptop and backed up on a USB memory stick. The CR1000 program was updated (*Chicken2014.CRI*). The AT-RH sensor head and SR sensor were replaced for routine calibration. The height of the SR50a snow depth sensor was configured in the new program and set at 86 inches. The enclosure box was replaced due to a crack in the fiberglass. The new enclosure has one large hole and six small holes for cables entering the enclosure. The enclosure desiccant packets were replaced. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure.



**Figure 10.** Chicken Creek station July 3, 2014.

### **Chititu**

Date: July 2, 2014

Time of visit: 1500-1630

Personnel: Ken Hill, Pam Sousanes, Kevin Franks (pilot)

Mode of transport: A-star helicopter – Temsco (NPS Eastern Area Fire) – N57954

Purpose of trip: Maintenance

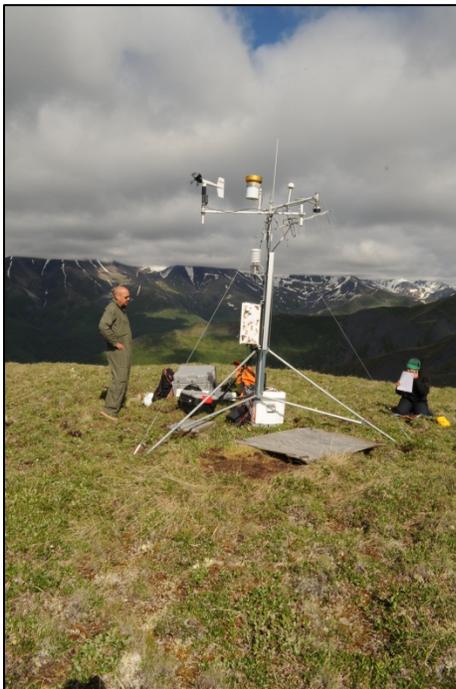
Weather: partly cloudy, 50 F, 5-10 mph

Sensors replaced:

AT-RH

TX312 Power Cable Interface

Narrative: Access to Chititu was from Tebay by helicopter. The station appeared in good condition upon arrival, but was not transmitting. All data were downloaded from the CR1000 datalogger to the field laptop and backed up on a USB memory stick. The AT-RH (HMP45), sensor was replaced for routine calibration. The CR1000 program was updated to *Chititu2014.CRI* and sent to the datalogger with a snow depth sensor height of 96 inches. The wooden platform was moved under the snow depth sensor. The cause of the transmission problem was determined by examining the power cable interface on the TX312 transmitter. The green interface was the incorrect type with three inputs (12V, G, Data) instead of two (12V, G). The interface was replaced and transmissions were confirmed by calling NESDIS. The battery box has a small crack, likely due to the old tripod legs resting on it. The temporary repair from 2013 with putty and tape was holding up well. Guy wires were tightened. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure.



**Figure 11.** Chititu station July 2, 2014.

### **Gates Glacier**

Date: July 2, 2014

Time of visit: 1730-1930

Personnel: Ken Hill, Pam Sousanes, Kevin Franks (pilot)

Mode of transport: A-star helicopter – Temsco (NPS Eastern Area Fire) – N57954

Purpose of trip: Annual maintenance

Weather: Sunny

Sensors replaced:

AT-RH

Narrative: The station was in good condition upon arrival. All data were downloaded from the CR1000 datalogger to the field laptop and backed up on a USB memory stick. The CR1000 program was updated (*GatesGl2014.CRI*) with a snow depth sensor height of 96 inches. The AT-RH (HMP45 7-wire) sensor was out of the radiation shield upon arrival. The sensor was replaced for routine calibration. Photos from the CC5MPX digital camera were downloaded to the field laptop. The camera failed to turn back on in the spring and therefore photos are missing starting the end of November 2013. New firmware (version 1.22) was installed on the camera from the field laptop. The image capture settings were changed to take five photos each day at 1000, 1100, 1200, 1300, and 1400. The tripod was re-leveled by adjusting the south leg. All sensors were checked for level. Ratchet straps were added to secure the battery box to the tripod legs. The old tripod had been stored at the site since 2013 and was removed by helicopter. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure.



**Figure 12.** Gates Glacier station July 2, 2014.

### **May Creek and Chisana Snotel**

Date: July 14, 2014

Personnel: Daniel Fisher (NRCS), Lynn Ellis (NPS Pilot)

Mode of transport: NPS plane and pilot from Gulkana

Purpose of trip: Annual maintenance

Sensors replaced: as needed by NRCS

Narrative: Daniel Fisher from the Natural Resources Conservation Service completed the annual maintenance at May Creek and Chisana Snotel sites on July 14. The precipitation gauges were flushed and 10 gallons of fresh antifreeze liquid added for the winter. The electric fences were repaired. The sensors were tested and the sites were working great on departure.

### **Tana Knob**

Date: July 2, 2014

Time of visit: 1300-1430

Personnel: Ken Hill, Pam Sousanes, Kevin Franks (pilot)

Mode of transport: A-star helicopter – Temsco (NPS Eastern Area Fire) – N57954

Purpose of trip: Annual Maintenance

Weather: 51 °F, partly cloudy, light winds

Sensors replaced:

AT-RH

SR

Datalogger (suspect CR1000 replaced with new CR1000)

Narrative: Access to Tana Knob was from McCarthy via helicopter. The station appeared to be in good condition upon arrival, but data were not being transmitted. After connecting to the CR1000, the software indicated that no program was present. Therefore, no data were stored on the datalogger. The cause of the program loss remains unknown. The corrupted CR1000 program was removed and replaced with a new CR1000. The *Tana2014.CRI* program was loaded into the new datalogger with a snow depth sensor height of 103.5 inches. The sensors and hardware were in good condition. The AT-RH HMP45 (7-wire) sensor head and SR sensors were replaced for routine calibration. The electric fence was repaired after being damaged by snow loading. The enclosure desiccant packets were replaced. The pipe reducing apparatus for the top of the mast needs to be replaced for proper installation of the lightning rod. As a temporary fix, the rod was fastened to the mast with tape and cable ties in 2013 and remains sturdy. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure.



**Figure 13.** Tana Knob station July 2, 2014.

### **Tebay**

Date: July 3, 2014

Time of visit: 1400-1700

Personnel: Ken Hill, Pam Sousanes, Kevin Franks (pilot)

Mode of transport: A-star helicopter – Temsco (NPS Eastern Area Fire) – N57954

Purpose of trip: Annual Maintenance  
Weather: Partly cloudy, warm, 70° F, <5 mph  
Sensors replaced:  
AT-RH  
Tripod

Narrative: The station was accessed by helicopter from McCarthy. The station looked good upon arrival. Data were downloaded from the CR1000 datalogger to the field laptop and backed up on a USB memory stick. The AT-RH HMP45 (7-wire) sensor head was replaced for routine calibration. The tripod was replaced because the legs had been damaged by snow loading. The new tripod was placed in the same location after temporarily removing both crossbars. The new tripod and all sensors were leveled. The solar radiation sensor leveling stand was replaced. The CR1000 program was updated (*Tebay2014.CRI*). The height of the snow depth sensor was configured in the new program and set at 105.5 inches. The electric fence had been affected by snow and was repaired. The mounting interface on the fence charger was damaged and so the charger was placed on the ground inside the fence. The enclosure desiccant packets were replaced. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure.

Note: The aerial snow marker near the station should be repainted during the next field visit.



**Figure 14.** Tebay station July 3, 2014.

## **Yukon-Charley Rivers**

This next section includes maintenance done on sites in YUCH, which includes the Upper Charley and Coal Creek stations.

### **Coal Creek**

Date: May 22, 2014

Time of visit: 1600-1800

Personnel: Ken Hill, Pam Sousanes

Mode of transport: Cessna 206 from Fairbanks – NPS Fleet N473YC\Pilot – Curtis Cebulski

Purpose of trip: Maintenance at station and snow course

Weather: Mostly cloudy, 48°F, light wind

Sensors replaced:

AT-RH

SR

WS-WD

Narrative: The station was in good condition upon arrival. All data were downloaded from the CR1000 datalogger to the field laptop and backed up on a USB memory stick. The CR1000 program was updated (*CoalCreek2014.CRI*) and the snow depth sensor height set at 72 inches. The AT-RH, WS-WD, and SR sensors were replaced for routine calibration. The 10 watt solar panel was removed. All bolts and guy wires were tightened on the station. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure.

After maintenance at the weather station, the snow course near Coal Creek Camp was visited. All vegetation was cleared from the snow course in preparation for winter snow surveys. In July, three of the snow markers had been inadvertently knocked over during construction of a new water line for the camp. Nick Thompson, a YUCH ranger, replaced the markers and brushed the site again in September 2014.



**Figure 15.** Coal Creek station July 22, 2014.

### ***Upper Charley***

Date: May 23, 2014

Time of visit: 1000-1230

Personnel: Ken Hill, Pam Sousanes, Rick Swisher (pilot)

Mode of transport: R44 Helicopter from Coal Creek – Quicksilver – N-944AK

Purpose of trip: Maintenance

Weather: 40°F, mostly cloudy, 5-10 mph from West

Sensors replaced:

AT-RH

WS-WD

GPS and Cable

Narrative: Access to Upper Charley was by helicopter from Coal Creek Camp. The station was in good condition upon arrival, except it was not transmitting. All data were downloaded from the CR1000 datalogger to the field laptop and backed up on a USB memory stick. The AT-RH

and WS-WD sensors were replaced for routine calibration. The GPS cable was replaced. It appeared that a caribou had run through the electric fence (polywire from the fence was strung out to the south) and knocked the charger off the fence post. The electric fence was repaired and the charger was remounted to the fence post with bailing wire and cable ties. A new fence charger could be added to the station during the next field visit. The new GPS and cable solved the transmission problems. A successful transmission was confirmed by calling NESDIS. Photos were downloaded from the CC5MPX camera. The camera did not power back on properly in the spring. No photos were obtained after mid-November. During the next visit the camera firmware should be updated and the power settings adjusted. All bolts and guy wires were tightened on the station. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure.



**Figure 16.** Upper Charley station May 23, 2014

## **Appendix A: Logistics Summary 2014**

### **DENA Logistics**

June 24, 2014: Tokositna Snotel and Ruth Glacier: Pam Sousanes and Ken Hill met Dan Kenney and Tony DiMarco (NRCS Palmer) along with Trey Simmons (CAKN aquatic ecologist) in Talkeetna. Sites were accessed with the DENA rescue A-star helicopter N-3AE under pilot Andy Hermansky. The helicopter dropped NRCS staff at the Tokositna Snotel before dropping Pam and Ken at the Ruth Glacier site. The helicopter returned to Talkeetna to deliver Trey to his stream sites. Two return trips were necessary to shuttle all staff back to Talkeetna. Three to four passengers and the field gear fit easily in the Temsco A-Star helicopter on contract for mountain operations at Denali.

May 28, 2014: Toklat and Eielson Visitor Center –Ken Hill and Pam Sousanes drove the park road in a government vehicle. Maintenance at Toklat and Eielson was completed on 5/28. Ken and Pam camped at the Sanctuary River campground.

May 29, 2014: Wigand Creek, McKinley River RAWS, and Dunkle Hills –Ken Hill and Pam Sousanes accessed Wigand and McKinley River with pilot Shannon Bowman and A-star helicopter N-6015S (Temsco Western Area Fire Helicopter contract). Dunkle Hills was accessed with the same helicopter and pilot on 8/22/2014.

September 16, 2014: Stampede - NPS aircraft N-473YC was used to access the Stampede airstrip for annual maintenance. Ken Hill flew with NPS pilot Curtis Cebulski from Fairbanks.

September 25, 2014: Kantishna – NPS aircraft N-473YC was used to access the Kantishna airstrip. Ken flew with NPS pilot Curtis Cebulski and met Dan Kenney (NRCS Palmer) in Healy. Ken and Dan accessed the Snotel site by walking from the airstrip.

### **WRST Logistics**

June 30 – July 3, 2014: Pam Sousanes (GOV) and Ken Hill (POV) drove separately and met in McCarthy on June 30. The A-star helicopter N57954 with pilot Kevin Franks and helicopter manager Brianna Proctor were delayed due to weather and did not arrive in McCarthy until midday on 7/2. Fuel was purchased at the Fireweed airstrip on the west side of the Kennicott River (contact: Lori Rowland). The helicopter was also staged at the Fireweed airstrip. Chicken Creek, Chititu, Gates Glacier, Tana Knob, and Tebay were accessed by helicopter 7/2-7/3. The helicopter was shared with Trey Simmons (CAKN aquatic ecologist). All staff stayed at the McCarthy B&B (contact: John Adams).

July 14, 2014: The Snotel sites at May Creek and Chisana were accessed from Gulkana with NPS pilot Lynn Ellis. Daniel Fisher (NRCS Palmer) completed the maintenance at the Snotel sites.

### **YUCH Logistics**

May 23-24, 2014: Pam Sousanes and Ken Hill flew to Coal Creek with NPS fleet aircraft (Cessna 206, pilot Curtis Cebulski) on May 23, 2014. Maintenance at the Coal Creek station and snow course was completed on 5/23. On 5/24, an R44 helicopter (Quicksilver Air, pilot Rick Swisher) arrived at Coal Creek. Pam and Ken flew to the Upper Charley site via helicopter to

complete the maintenance. Ken and Pam returned to Fairbanks in the helicopter on 5/24 and their gear was shuttled by Curtis on previously scheduled NPS fixed wing flights. Fuel was available at the NPS tank at Coal Creek. All staff stayed at park housing in Coal Creek.

## Appendix B: ARCN I&M Station Specifications

**Table 2.** Sensor Specifications.

<b>Measurements</b>	<b>Model/Manufacturer/Item#</b>	<b>Purchased from:</b>
Air Temperature 1/Relative Humidity	HMP-45C Temperature and Relative Humidity Probe	Campbell Scientific
Air Temperature 2	Resistance Temperature Detector (RTD) Thermistor. Custom build.	Therm-X
Wind Speed and direction	RM Young 05103	Campbell Scientific
Precipitation (summer rainfall)	Texas Electronics TE525WS Rain Gage	Campbell Scientific
Solar Radiation (incoming)	LI-COR LI200X	Campbell Scientific
Snow Depth	SR50A sonic ranging sensor	Campbell Scientific
Soil Temperature	107 Temperature Probe (3)	Campbell Scientific

**Table 3.** Datalogger Specifications.

<b>Datalogger</b>	<b>Purchased from:</b>
CR1000-XT Measurement and Control System	Campbell Scientific

**Table 4.** Satellite Communication Specifications

<b>Satellite Communication</b>	<b>Model/Item #</b>	<b>Purchased From:</b>
GOES Satellite transmitter	TX312/TX320 High Data rate GOES Transmitter	Campbell Scientific
GPS Antenna	GPS Antenna 3.3 V 17992	Campbell Scientific
GPS Cable	Antenna Cable 18017	Campbell Scientific
GOES Antenna	GOES 11 dBi YAGI RHCP Antenna 25316	Campbell Scientific
Coaxial Cable	Antenna Cable RG8 COAXNTN	Campbell Scientific

**Table 5.** Power Specifications

<b>Power</b>	<b>Model</b>	<b>Purchased form:</b>
Batteries	Concorde Sun Extender PV 1040 T 12 Volt 100 Amp hour (2)	ABS Alaskan
Solar Panel	60-75 watt	Varies depending on prices
Battery Box	Pelican Hardigg Single Lid Case	AllCases
Charging Regulator	CH100 12V Charging Regulator	Campbell Scientific

**Table 6.** Hardware Specifications

<b>Station Hardware - Item</b>	<b>Type/Model</b>	<b>Purchased from:</b>
--------------------------------	-------------------	------------------------

Tripod	CM110 10 ft. stainless-steel tripod w/grounding kit	Campbell Scientific
Guy Kit	Guy Kit for Tripod 19239	Campbell Scientific
Crossarm – 4 ft.	CM204 Sensor crossarm with mounting hardware – 4ft	Campbell Scientific
Crossarm – 6 ft.	CM206 Sensor crossarm with mounting hardware – 6ft	Campbell Scientific
Enclosure with (2) 1.5” diameter holes and mounting hardware for tripod	Weather Resistant 16” x 18” enclosure ENC 16/18 – DC - MM	Campbell Scientific

**Table 7.** Electric Fence Specifications

<b>Electric Fence Parts</b>	<b>Type/Model</b>	<b>Purchased from:</b>
Metal fence posts	6 ft. T-Posts	Various local vendors
T-Post Insulators	5-inch extender insulators	
Poly wire	200 ft. Polywire	Various local vendors
Solar fence charger	10 mile low impedance fence charger – various models	Various local vendors

## Appendix C: ARCN I&M Components by Station

### Chicken Creek

Station Name	Item	Model	Start Date
Chicken Creek	Antenna	25316 YAGI	8/21/2004
Chicken Creek	AT	ThermX	8/21/2004
Chicken Creek	AT-RH	HMP45	7/3/2014
Chicken Creek	Battery	100 AH (x2)	8/21/2004
Chicken Creek	Crossarm	3/4"	8/21/2004
Chicken Creek	Datalogger	CR1000	6/19/2013
Chicken Creek	DLP	Chicken2014	7/3/2014
Chicken Creek	Enclosure	ENC 16/18	8/21/2004
Chicken Creek	GPS	17992 GPS	7/3/2014
Chicken Creek	RG-TB	TE525	8/21/2004
Chicken Creek	SD	SR50a	6/19/2013
Chicken Creek	Solar Panel	75 W	8/21/2004
Chicken Creek	SR	Li200x	7/3/2014
Chicken Creek	ST1	107	7/2/2010
Chicken Creek	ST2	107	7/2/2010
Chicken Creek	ST3	107	7/2/2010
Chicken Creek	Tripod	CM106	8/21/2004
Chicken Creek	TX312	NESDIS ID 39603396	5/25/2006
Chicken Creek	WSWD	5103	6/19/2013

## Chititu

Station Name	Item	Model	Start Date
Chititu	Antenna	25316 YAGI	8/20/2004
Chititu	AT	ThermX	6/21/2013
Chititu	AT-RH	HMP45	7/2/2014
Chititu	Battery	100 AH (x2)	8/20/2004
Chititu	Crossarm	3/4"	8/20/2004
Chititu	Crossarm	3/4"	8/20/2004
Chititu	Datalogger	CR1000	6/26/2012
Chititu	DLP	Chititu2014	7/2/2014
Chititu	Enclosure	ENC 16/18	8/20/2004
Chititu	GPS	17992 GPS	6/21/2013
Chititu	RG-TB	TE525	8/20/2004
Chititu	SD	SR50a	6/21/2013
Chititu	Solar Panel	75 W	8/20/2004
Chititu	SR	Li200x	6/21/2013
Chititu	ST1	107	8/20/2004
Chititu	ST2	107	8/20/2004
Chititu	ST3	107	6/25/2011
Chititu	Tripod	CM106	8/20/2004
Chititu	TX312	NESDIS ID 396020E0	6/21/2013
Chititu	WSWD	5103	6/21/2013

## Coal Creek

Station Name	Item	Model	Start Date
Coal Creek	Antenna	25316 YAGI	9/16/2004
Coal Creek	AT	ThermX	
Coal Creek	AT-RH	HMP45	5/22/2014
Coal Creek	Battery	100 AH (x2)	9/16/2004
Coal Creek	Crossarm	3/4"	9/16/2004
Coal Creek	Crossarm	3/4"	9/16/2004
Coal Creek	Datalogger	CR1000	7/24/2013
Coal Creek	DLP	CoalCreek2014	5/22/2014
Coal Creek	Enclosure	ENC 16/18	9/16/2004
Coal Creek	GPS	17992 GPS	9/8/2012
Coal Creek	RG-TB	TE525	9/16/2004
Coal Creek	SD	SR50a	7/24/2013
Coal Creek	Solar Panel	75 W	9/16/2004
Coal Creek	SR	Li200x	5/22/2014
Coal Creek	ST1	107	9/16/2004
Coal Creek	ST2	107	9/16/2004
Coal Creek	ST3	107	9/16/2004
Coal Creek	Tripod	CM106	9/16/2004
Coal Creek	TX312	NESDIS ID 39605670	9/8/2012
Coal Creek	WSWD	5103	5/22/2014

## Dunkle Hills

Station Name	Item	Model	Start Date
Dunkle Hills	Antenna	25316 YAGI	8/1/2002
Dunkle Hills	AT	ThermX	8/1/2002
Dunkle Hills	AT-RH	HMP-45	8/22/2014
Dunkle Hills	Battery	100 AH (x2)	8/1/2002
Dunkle Hills	3/4"	CM204	8/1/2002
Dunkle Hills	3/4"	CM206	8/1/2002
Dunkle Hills	Datalogger	CR1000	8/22/2014
Dunkle Hills	DLP	Dunkle2014	8/22/2014
Dunkle Hills	Enclosure	ENC 16/18	9/19/2011
Dunkle Hills	GPS	17992 GPS	8/1/2002
Dunkle Hills	RG-TB	TE525	8/1/2002
Dunkle Hills	SD	SR50a	8/22/2014
Dunkle Hills	Solar Panel	75 W	8/1/2002
Dunkle Hills	SR	Li200x	8/14/2013
Dunkle Hills	ST1	107	8/14/2013
Dunkle Hills	ST2	107	8/14/2013
Dunkle Hills	ST3	107	8/14/2013
Dunkle Hills	Tripod	CM106	8/1/2002
Dunkle Hills	TX312	NESDIS ID 3960B582	9/17/2009
Dunkle Hills	WSWD	5103	8/22/2014

## Eielson Visitor Center

Station Name	Item	Model	Start Date
Eielson	Antenna	25316 YAGI	6/4/2005
Eielson	AT	ThermX	6/4/2005
Eielson	AT-RH	HMP45	5/28/2014
Eielson	Battery	100 AH (x2)	6/4/2005
Eielson	Crossarm	3/4"	6/4/2005
Eielson	Datalogger	CR1000	5/28/2014
Eielson	DLP	Eielson2014	6/4/2005
Eielson	Enclosure	ENC 16/18	6/4/2005
Eielson	GPS	17992 GPS	6/4/2005
Eielson	RG-TB	TE525	6/4/2005
Eielson	SD	SR50a	5/28/2014
Eielson	Solar Panel	75 W	6/4/2005
Eielson	SR	Li200x	8/15/2013
Eielson	Tripod	CM106	6/4/2005
Eielson	TX312	NESDIS ID 39604506	9/17/2009
Eielson	WSWD	5103	5/28/2014

## Gates Glacier

Station Name	Item	Model	Start Date
Gates Glacier	Antenna	25316 YAGI	7/6/2005
Gates Glacier	AT	ThermX	7/6/2005
Gates Glacier	AT-RH	HMP45	7/3/2014
Gates Glacier	Battery	100 AH (x2)	7/6/2005
Gates Glacier	Camera	CC5MPX	6/21/2013
Gates Glacier	Crossarm	3/4"	7/6/2005
Gates Glacier	Crossarm	CM206	7/6/2005
Gates Glacier	Datalogger	CR1000	6/21/2013
Gates Glacier	DLP	GatesGI2014	7/3/2014
Gates Glacier	Enclosure	ENC 16/18	7/6/2005
Gates Glacier	GPS	17992 GPS	7/6/2005
Gates Glacier	RG-TB	TE525	7/6/2005
Gates Glacier	SD	SR50	6/21/2013
Gates Glacier	Solar Panel	75 W	7/6/2005
Gates Glacier	SR	Li200x	6/21/2013
Gates Glacier	ST1	107	7/6/2005
Gates Glacier	ST2	107	7/6/2005
Gates Glacier	ST3	107	7/6/2005
Gates Glacier	Tripod	CM106	6/21/2013
Gates Glacier	TX312	NESDIS ID 39608018	6/30/2010
Gates Glacier	WS/WD	5103	6/28/2012

## Ruth Glacier

Station Name	Item	Model	Start Date
Ruth Glacier	Antenna	25316 YAGI	9/6/2008
Ruth Glacier	AT	ThermX	9/6/2008
Ruth Glacier	AT-RH	HMP45	6/24/2014
Ruth Glacier	Battery	100 AH (x2)	9/6/2008
Ruth Glacier	Battery Cable	Power Cable	6/13/2012
Ruth Glacier	Charging Regulator	CH-100	6/13/2012
Ruth Glacier	Datalogger	CR1000	6/24/2014
Ruth Glacier	DLP	Ruth2014	6/24/2014
Ruth Glacier	Enclosure	ENC 16/18	9/6/2008
Ruth Glacier	GPS	17992 GPS	9/6/2008
Ruth Glacier	RG-TB	TE525	9/6/2008
Ruth Glacier	SD	SR50a	6/24/2014
Ruth Glacier	Solar Panel	75 W	9/6/2008
Ruth Glacier	SR	Li200x	6/24/2014
Ruth Glacier	ST1	107	9/6/2008
Ruth Glacier	ST2	107	9/6/2008
Ruth Glacier	ST3	107	6/24/2014
Ruth Glacier	Tripod	FTS RAWS Lunar Lander	9/6/2008
Ruth Glacier	TX312	NESDIS ID 396063EA	6/13/2012
Ruth Glacier	TX312 Cable	Coaxial Cable	6/13/2012
Ruth Glacier	WSWD	5103	6/24/2014

## Stampede

Station Name	Item	Model	Start Date
Stampede	Antenna	25316 YAGI	8/1/2002
Stampede	AT	ThermX	8/1/2002
Stampede	AT-RH	HMP-45	9/16/2014
Stampede	Battery	100 AH (x2)	2003
Stampede	Crossarm	3/4"	8/1/2002
Stampede	Datalogger	CR1000	9/16/2014
Stampede	DLP	Stampede2014	9/16/2014
Stampede	Enclosure	ENC 16/18	5/18/2011
Stampede	GPS	17992 GPS	8/1/2002
Stampede	RG-TB	TE525	8/1/2002
Stampede	SD	SR50a	9/16/2014
Stampede	Solar Panel	75 W	8/1/2002
Stampede	SR	Li200x	8/14/2013
Stampede	ST1	107	8/1/2002
Stampede	ST2	107	8/1/2002
Stampede	ST3	107	8/1/2002
Stampede	Tripod	CM106	9/1/2002
Stampede	TX312	NESDIS ID 3960A6F4	9/17/2009
Stampede	WSWD	5103	9/13/2012

## Tana Knob

Station Name	Item	Model	Start Date
Tana Knob	Antenna	25316 YAGI	7/5/2005
Tana Knob	AT	ThermX	7/5/2005
Tana Knob	AT-RH	HMP45	7/2/2014
Tana Knob	Battery	100 AH (x2)	7/5/2005
Tana Knob	Crossarm	CM204	7/5/2005
Tana Knob	Crossarm	CM206	7/5/2005
Tana Knob	Datalogger	CR1000	7/2/2014
Tana Knob	DLP	Tana2014	7/2/2014
Tana Knob	Enclosure	ENC 16/18	7/5/2005
Tana Knob	GPS	17992 GPS	7/5/2005
Tana Knob	RG-TB	TE525	7/5/2005
Tana Knob	SD	SR50	6/20/2013
Tana Knob	Solar Panel	75 W	7/5/2005
Tana Knob	SR	Li200x	7/2/2014
Tana Knob	ST1	107	7/5/2005
Tana Knob	ST2	107	7/5/2005
Tana Knob	ST3	107	7/5/2005
Tana Knob	Tripod	CM106	6/27/2012
Tana Knob	TX312	NESDIS ID 3960709C	7/1/2010
Tana Knob	WSWD	5103	6/20/2013

## Tebay

Station Name	Item	Model	Start Date
Tebay	Antenna	25316 YAGI	7/8/2005
Tebay	AT	ThermX	7/8/2005
Tebay	AT-RH	HMP45	7/3/2014
Tebay	Battery	100 AH (x2)	7/8/2005
Tebay	Crossarm	CM204	7/8/2005
Tebay	Crossarm	CM206	7/8/2005
Tebay	Datalogger	CR1000	6/20/2013
Tebay	DLP	Tebay2014	7/3/2014
Tebay	Enclosure	ENC 16/18	7/8/2005
Tebay	GPS	17992 GPS	7/8/2005
Tebay	RG-TB	TE525	7/8/2005
Tebay	SD	SR50a	6/20/2013
Tebay	Solar Panel	75 W	7/8/2005
Tebay	SR	Li200x	6/20/2013
Tebay	ST1	107	6/30/2010
Tebay	ST2	107	6/30/2010
Tebay	ST3	107	6/30/2010
Tebay	Tripod	CM106	7/3/2014
Tebay	TX312	NESDIS ID 3960936E	9/17/2008
Tebay	WSWD	5103	6/28/2012

## Toklat

Station Name	Item	Model	Start Date
Toklat	Antenna	25316 YAGI	6/16/2005
Toklat	AT	ThermX	6/16/2005
Toklat	AT-RH	HMP45	5/28/2014
Toklat	Battery	100 AH (x2)	6/16/2005
Toklat	Crossarm	3/4"	6/16/2005
Toklat	Datalogger	CR1000	5/28/2014
Toklat	DLP	Toklat2014	5/28/2014
Toklat	Enclosure	ENC 16/18	6/16/2005
Toklat	GPS	17992 GPS	5/28/2014
Toklat	RG-TB	TE525	6/16/2005
Toklat	SD	SR50a	5/28/2014
Toklat	Solar Panel	75 W	6/16/2005
Toklat	SR	Li200x	8/19/2012
Toklat	ST1	107	6/16/2005
Toklat	ST2	107	6/16/2005
Toklat	ST3	107	6/16/2005
Toklat	Tripod	CM106	6/16/2005
Toklat	TX312	NESDIS ID 396063EA	5/28/2014
Toklat	WSWD	5103	5/28/2014

## Upper Charley

Station Name	Item	Model	Start Date
Upper Charley	Antenna	25316 YAGI	8/3/2005
Upper Charley	AT	ThermX	8/3/2005
Upper Charley	AT-RH	HMP45	5/23/2014
Upper Charley	Battery	100 AH (x2)	8/3/2005
Upper Charley	Camera	CC5MPX	7/23/2013
Upper Charley	Crossarm	3/4"	8/3/2005
Upper Charley	Crossarm	CM206	8/3/2005
Upper Charley	Datalogger	CR1000	8/3/2005
Upper Charley	DLP	UpperCharley2014	7/23/2013
Upper Charley	Enclosure	ENC 16/18	8/3/2005
Upper Charley	GPS	17992 GPS	9/8/2012
Upper Charley	RG-TB	TE525	8/3/2005
Upper Charley	SD	SR50a	9/7/2012
Upper Charley	Solar Panel	75 W	8/3/2005
Upper Charley	SR	Li200x	7/23/2013
Upper Charley	ST1	107	7/23/2013
Upper Charley	ST2	107	7/23/2013
Upper Charley	ST3	107	7/23/2013
Upper Charley	Tripod	CM206	8/3/2005
Upper Charley	TX312	NESDIS ID 3960D064	9/8/2012
Upper Charley	WS/WD	5103	5/23/2014

## Wigand

Station Name	Item	Model	Start Date
Wigand	Antenna	25316 YAGI	8/3/2005
Wigand	AT	ThermX	8/13/2013
Wigand	AT-RH	HMP45	8/13/2013
Wigand	Battery	100 AH (x2)	8/13/2013
Wigand	Camera	CC5MPX	7/23/2013
Wigand	Crossarm	3/4"	8/13/2013
Wigand	Crossarm	CM206	8/13/2013
Wigand	Datalogger	CR1000	8/13/2013
Wigand	DLP	UpperCharley2014	5/23/2014
Wigand	Enclosure	ENC 16/18	8/13/2013
Wigand	GPS	17992 GPS	8/13/2013
Wigand	RG-TB	TE525	8/13/2013
Wigand	SD	SR50a	8/13/2013
Wigand	Solar Panel	75 W	8/13/2013
Wigand	SR	Li200x	8/13/2013
Wigand	ST	107	8/13/2013
Wigand	ST	107	8/13/2013
Wigand	ST	107	8/13/2013
Wigand	Tripod	CM206	8/13/2013
Wigand	TX312	NESDIS ID 3960D064	8/13/2013
Wigand	WS/WD	5103	8/13/2013

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 953/127451, December 2014

**National Park Service**  
**U.S. Department of the Interior**



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