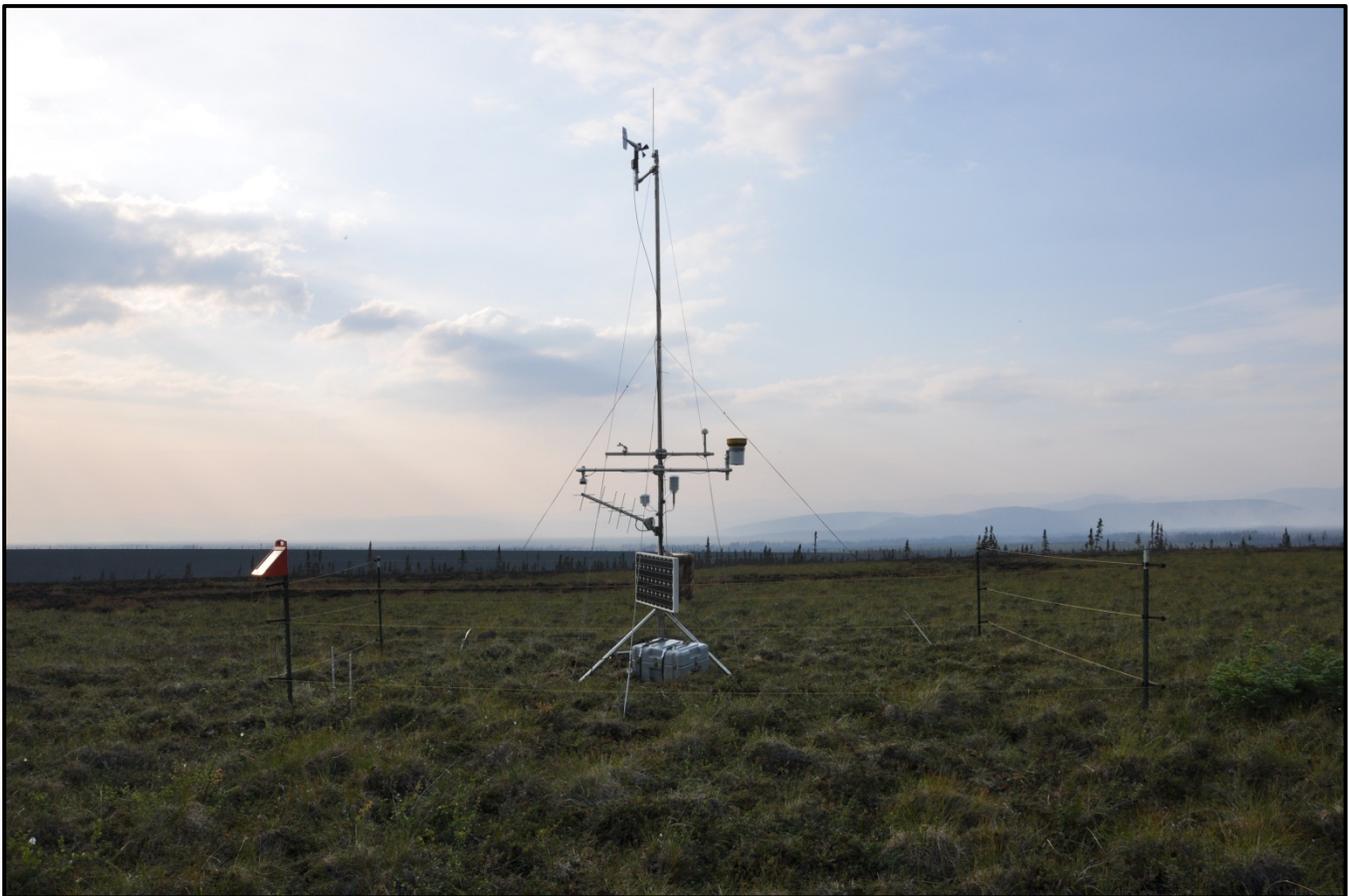




# Climate Station Maintenance 2013

## *Central Alaska Network*

Natural Resource Data Series NPS/CAKN/NRDS—2014/731



**ON THE COVER**

Wigand weather station, Denali National Park and Preserve.

Photograph by: Pam Sousanes

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

## *2013 Summary*

Natural Resource Data Series NPS/CAKN/NRDS—2014/731

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U.S. Department of the Interior  
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. Fourteen stations have been installed in CAKN parks since 2003. The objective of the climate monitoring program is to monitor and record weather conditions at representative locations throughout CAKN in order to identify long and short-term trends, provide reliable climate data to other researchers, and to participate in large scale climate monitoring and modeling efforts beyond park boundaries. During the 2013 field season, thirteen stations were visited for annual maintenance, and one station (Wigand) was re-established. This report summarizes all work for the 2013 field season and includes current sensor metadata.

## **Acknowledgments**

A successful field season would not have been possible without support from people in Fairbanks (Tara Whitesell, Stacia Backensto, Kumi Rattenbury, Jim Lawler, Doris Lenahan, Trey Simmons), McCarthy (Stevens Harper), Gulkana (Mary Odden), and Eagle (Lou Flynn). Additional support was provided by pilots (Eric Lorrington, Colin Milone, Kevin Pearson, Andy Hermansky, Tim Corrody, Lynn Ellis) and aviation staff (Denali Dispatch, Dave Kreutzer).

## 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
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 2013 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). Twelve CAKN climate stations were maintained (Table 1) along with NPS support at four NRCS snow and soil sites. Annual maintenance includes downloading data, updating software and programming, replacing sensors, and troubleshooting problems. Maintenance is critical for in order to provide continuous, high-quality meteorological data. In addition to annual maintenance, the Wigand climate station in Denali National Park was reestablished on August 13, 2013.

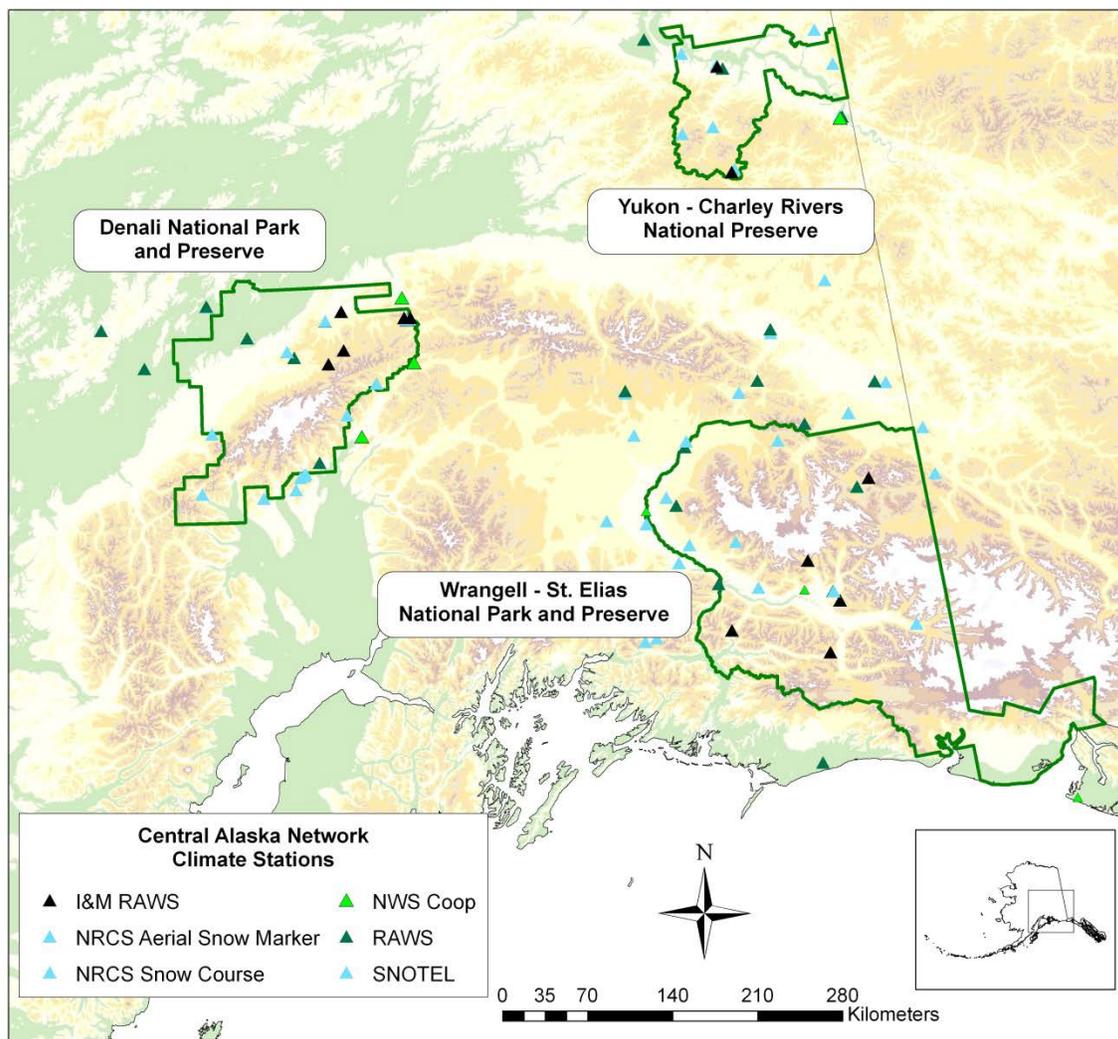


Figure 1. Map showing locations of CAKN climate stations.

**Table 1.** Locations of CAKN sites operated and maintained in 2013 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
Kantishna SNOTEL	63.540	-150.990	472	DENA
Tokositna SNOTEL	62.629	-150.775	259	DENA

## Climate Station Maintenance Summaries

This next section describes the maintenance details of sixteen stations in the Central Alaska Network organized by park.

### **Wrangell – St. Elias**

Stations maintained in WRST include Chititu, Chicken Creek, Gates Glacier, Chisana SNOTEL, May Creek SNOTEL, Tana Knob, and Tebay. CAKN staff used May Creek as a base for helicopter operations and stayed in NPS housing.

#### ***Chicken Creek***

Date: June 19, 2013

Time of visit: 1645-1900

Personnel: Ken Hill, Jessica Sherwood (NPS helicopter manager), Tim Coroddy (pilot)

Mode of transport: Hughes 500 helicopter – Temsco (NPS Eastern Area Fire) – N337

Purpose of trip: Maintenance

Weather: Partly cloudy

Sensors replaced:

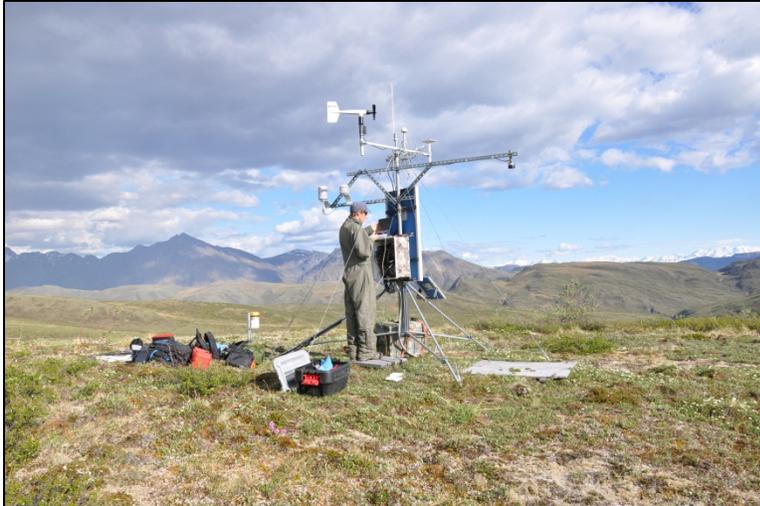
AT-RH (HMP45 6-wire replaced with HMP45 7-wire)

WS-WD

SD (SR50 replaced with SR50a)

Datalogger (CR10x replaced with CR1000)

Narrative: The station was accessed by helicopter from May Creek via Chitistone Pass. Upon arrival the station was in good condition. Data were downloaded from the CR10x datalogger to the field laptop and backed up on a USB memory stick. The CR10x datalogger was replaced with a CR1000 and all sensors were rewired. The AT-RH sensor head and cable head were replaced. A 7-wire switched power cable replaced the older 6-wire cable configuration. A new program (WRST\_2013\_HMP45\_7wire\_ThermX.CR1) was written in the field and sent to the datalogger to account for this change. The WS-WD sensor was replaced for routine calibration. The SD sensor was updated from the SR50 model to the SR50a model. The height of the snow depth sensor was configured in the new program and set at 86 inches. The precipitation bucket tested okay at 18:40. While stepping on the enclosure box, the fiberglass cracked. It was temporarily repaired with putty and weather tape, but the *enclosure should be replaced* during the next field visit. The station is also missing a printed wiring diagram and program to be left on site. 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 2.** Chicken Creek maintenance - June 19, 2013.

### ***Tebay***

Date: June 20, 2013

Time of visit: 0900-1200

Personnel: Ken Hill, Jessica Sherwood (NPS helicopter manager), Tim Coroddy (pilot)

Mode of transport: Hughes 500 helicopter – Temsco (NPS Eastern Area Fire) – N337

Purpose of trip: Annual Maintenance

Weather: Clear, 60° F, <5 mph

Sensors replaced:

Datalogger (CR10x replaced with CR1000)

AT-RH

SR

SD (SR50 replaced with SR50a)

Narrative: The station was accessed by helicopter from May Creek. The station looked good upon arrival. Data were downloaded from the CR10x datalogger to the field laptop and backed up on a USB memory stick. The CR10x datalogger was replaced with a CR1000 and all sensors were rewired. The SR Li200x pyranometer was swapped for scheduled calibration. The AT-RH HMP45 sensor was swapped for scheduled calibration. The CR10x datalogger was replaced with a CR1000. The SD sensor was updated from the SR50 model to the SR50a model. The height of the snow depth sensor was configured in the new program and set at 93.5 inches. A new program (WRST\_2013\_HMP45\_7wire\_ThermX.CR1) was sent to the datalogger. The electric fence had been affected by snow and was repaired. The extra 10 watt solar panel was removed from the station. The east leg of the *tripod is beginning to bend from snow load* and should be considered for replacement during the next field visit. The station is missing a printed wiring diagram and program to be left on site. 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 3.** Tebay maintenance June 20, 2013.

### ***Tana Knob***

Date: June 20, 2013

Time of visit: 1200-1500

Personnel: Ken Hill, Jessica Sherwood (NPS helicopter manager), Tim Coroddy (pilot)

Mode of transport: Hughes 500 helicopter – Temsco (NPS Eastern Area Fire) – N337

Purpose of trip: Annual Maintenance

Weather: 58 °F, partly cloudy 5-10 mph

Sensors replaced:

AT-RH

WS-WD

Datalogger (CR10x replaced with CR1000)

SD (SR50 replaced with SR50a)

Narrative: Access to Tana Knob was from Tebay via helicopter through the Bremner drainage. The station was in good condition upon arrival, but the electric fence was damaged. The fencing wire was scattered near the site and had apparently been visited by wildlife. The solar panel charging unit for the fence had been knocked off of the fence post and was damaged. There were some claw marks on the battery box of the station, but no other damage. The charging unit and polywire for the fence was replaced/repared. Data were downloaded from the CR10x datalogger to the field laptop and backed up on a USB memory stick. The CR10x datalogger was replaced with a CR1000 and all sensors were rewired. The AT-RH HMP45 sensor was swapped for scheduled calibration. The WS-WD sensor was replaced for routine calibration. The CR10x datalogger was replaced with a CR1000. The SD sensor was updated from the SR50 model to the SR50a model. The height of the snow depth sensor was configured in the new program and set at 103.5 inches. A new program (WRST\_2013\_HMP45\_7wire\_ThermX.CR1) was sent to the datalogger. The station is missing a printed wiring diagram and program to be left on site. 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. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure.



**Figure 4.** Tana Knob climate station.

***Chititu***

Date: June 20-21, 2013

Time of visit: 1700-1900 (6/21); 0900-1200 (6/22)

Personnel: Ken Hill, Jessica Sherwood (NPS helicopter manager), Tim Coroddy (pilot)

Mode of transport: Hughes 500 helicopter – Temsco (NPS Eastern Area Fire) – N337

Purpose of trip: Maintenance

Weather: partly cloudy, breezy

Sensors replaced:

AT-RH

SR

WS-WD

SD (SR50 replaced with SR50a)

AT (T109 replaced with ThermX)

TX312 Transmitter

GPS

GPS Cable

Antenna Coax Cable

Tripod

Narrative: Access to Chititu was from May Creek by helicopter. The station appeared in okay condition upon arrival, but was slightly out of level due to the tripod leg resting on the battery box. Also, the station was not transmitting. The pilot dropped Ken and Jessica at the site and returned to McCarthy to retrieve the replacement tripod. All data were downloaded from the CR1000 datalogger to the field laptop and backed up on a USB memory stick. The operating system of the CR1000 was updated from OS17 to OS26.

The station was tipped on its side to remove the mast. All sensors remained on the old mast and cross bars. The new tripod was inserted into the old mast with some difficulty. The technique worked, but led to lots of frustration for a team of two people. Maneuvering the fully intact mast

and leveling the tripod was difficult for a team of two. It would have been easier to set the new tripod in place, and insert the new mast into the new, upright, leveled tripod.

The AT-RH (HMP45), WS-WD, and SR sensors were replaced for routine calibration. The SD sensor was updated from the SR50 model to the SR50a model. The height of the snow depth sensor was configured in the new program and set at 96 inches. The T109 air temperature sensor was replaced with a ThermX sensor. A new program (WRST\_2013\_HMP45\_7wire\_ThermX.CR1) was sent to the datalogger.

During the tripod replacement, the GPS cable was damaged and therefore was replaced. After the tripod had been replaced and all sensors were connected, the station still had not retrieved a GPS fix. We left the station for the night and returned the next day, June 21, 2013. Upon arrival the transmitter had a good GPS fix as shown in the Sat Commander TX312 satellite transmitter software, however no transmissions had occurred on the new transmitter. Ken called the Campbell Scientific technicians for assistance and they provided some advice. The "RAL" command was executed in the Sat Commander terminal prompt to read out errors (see Sat Commander manual). The return prompt indicated that the transmissions had been aborted because the supply voltage was too low. The voltages on the transmitter, batteries, and power cable all read between 12-13 volts and Sat Commander indicated a voltage of 12.8 volts (see screen shots on field laptop). The batteries were inspected and a small amount of corrosion was removed. The fuse on the power cable harness was inspected and looked okay, but as a precaution was replaced. Lastly, the coax cable was replaced. Despite these efforts, the station still was unable to transmit. For the next field visit, a full set of replacement hardware should be tested in Fairbanks beforehand, and brought to the station visit. It's possible that the batteries should also be replaced. The only item that was not replaced was the antenna, and therefore that is the primary suspect piece of hardware.

The old tripod was removed from the site by fixing it to the helicopter skids as an external load. The bent pieces did not fit in the belly of the helicopter. The battery box had a small crack, likely due to the old tripod legs resting on it. The crack was temporarily repaired with putty and tape. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure.



**Figure 5.** Chititu station June 20, 2013.

### ***Gates Glacier***

Date: June 21, 2013

Time of visit: 1200-1600

Personnel: Ken Hill, Jessica Sherwood (NPS helicopter manager), Tim Coroddy and Kevin Pearson (pilots)

Mode of transport: Hughes 500 helicopter – Temsco (NPS Eastern Area Fire) – N337

Purpose of trip: Annual maintenance

Weather: Partly cloudy changing to rain showers

Sensors replaced:

AT-RH

SR

SD (SR50 replaced with SR50a)

Datalogger (CR10x replaced with CR1000)

Digital Camera (CC5MPX installed)

Tripod

Narrative: The station was in good condition upon arrival. Despite a bent tripod leg, the station was mostly level. Snow adjacent to the site suggested that the station became snow free within the previous few days. The micro topography of the site may enhance snow collection. The pilot had delivered the new tripod to the site on 6/20. Ken and Jessica worked at the Gates Glacier site while the pilots swapped places in Gulkana due to mandatory duty day restrictions.

All data were downloaded from the CR10x datalogger to the field laptop and backed up on a USB memory stick. The CR10x datalogger was replaced with a CR1000 and all sensors were rewired. The AT-RH and SR sensors were swapped for scheduled calibration. The CR10x datalogger was replaced with a CR1000. The SD sensor was updated from the SR50 model to the SR50a model and the height of the sensor was changed in the new program (WRST\_2013\_HMP45\_7wire\_ThermX.CR1). A CC5MPX digital camera was installed at the site facing NE towards the Gates Glacier icefall. The field of view includes vegetation in the foreground and snow fields in the background to the east. Five photos will be stored daily.

The station was tipped on its side to remove the mast and replace the damaged tripod. All sensors remained on the old mast and cross bars. The new tripod was inserted into the old mast with some difficulty. The technique worked, but led to lots of frustration for a team of two people. Maneuvering the fully intact mast and leveling the tripod was difficult for a team of two. It would have been easier to set the new tripod in place, and insert the new mast into the new, upright, leveled tripod. The old tripod was left at the site because it did not fit in the belly of the helicopter. It should be disassembled and removed during the next field visit.

A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure. During the next field visit, the tripod level should be checked. Printed copies of the current wiring diagram and program should be left at the site.



**Figure 6.** Gates Glacier station June 21, 2013.

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

Date: June 19, 2013

Personnel: Dan Kenney (NRCS), Lynn Ellis (NPS Pilot)

Mode of transport: NPS plane and pilot

Purpose of trip: Annual maintenance

Weather: Windy

Sensors replaced: as needed by NRCS

Narrative: Dan Kenney from the Natural Resources Conservation Service attempted to complete the annual maintenance at May Creek and Chisana Snotel sites on June 18. Due to high winds, they could not land and May Creek and had to land at Copper Center. They returned on June 19 for annual maintenance at both sites. 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.

## Denali National Park and Preserve

This next station includes all of the stations that were maintained in DENA in 2013. The sites include: Toklat, Eielson Visitor Center, Stampede, Dunkle Hills, Ruth Glacier, Wigand (installed), Tokositna Valley SNOTEL and Kantishna SNOTEL.

### *Wigand*

Date: August 13, 2013

Time of visit: 0930-16:30

Personnel: Ken Hill, Pam Sousanes, Jessica Sherwood (helicopter manager), Eric Lorring (pilot)

Mode of transport: Hughes 500 helicopter – Temsco (NPS Western Area Fire) – N-58191

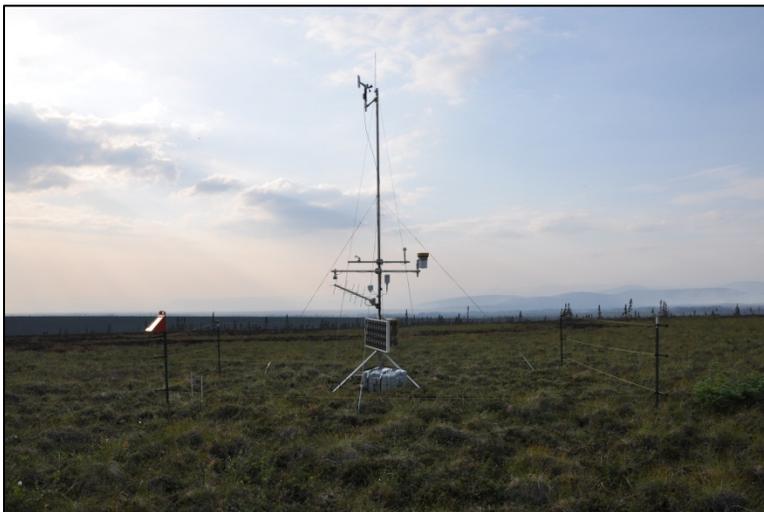
Purpose of trip: Installation

Weather: Partly cloudy, active fire near site

Sensors replaced:

All sensors installed.

Narrative: The site was accessed by helicopter from DENA park headquarters. The original station was part of a three year project and was removed upon project completion in 2007. It was determined that data from this area was useful for permafrost studies, fire weather indices, and climate purposes. An EA was completed for a permanent installation and the site was reinstalled in 2013. The location of the new station is near the old site in an unburned “island” of green vegetation. Jessica Sherwood escorted climate staff to monitor nearby fire behavior and assist in the station installation. The tripod was installed with a 20’ mast, with a WS-WD sensor (05103) at the 20’ height. The 20’ wind data makes the data suitable for inclusion in the fire danger rating system. Other sensors installed include AT-RH (HMP45C), AT (ThermX), SR (Li200x), SD (SR50a, sensor height=78 inches), RG-TB (TE525), and ST (10, 20, 50 cm depths). The station logs data on a CR1000 datalogger and transmits data via a TX312 transmitter. Six guy wires were used to anchor the station, approximately 60 degrees apart. An electric fence was installed to protect the station from wildlife. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure.



**Figure 7.** Wigand I&M RAWS August 13, 2013.

### ***Dunkle Hills***

Date: August 14, 2013

Time of visit: 1000-1230

Personnel: Ken Hill, Pam Sousanes, Eric Lorring (pilot)

Mode of transport: Hughes 500 helicopter – Temsco (NPS Western Area Fire) – N-58191

Purpose of trip: Annual Maintenance

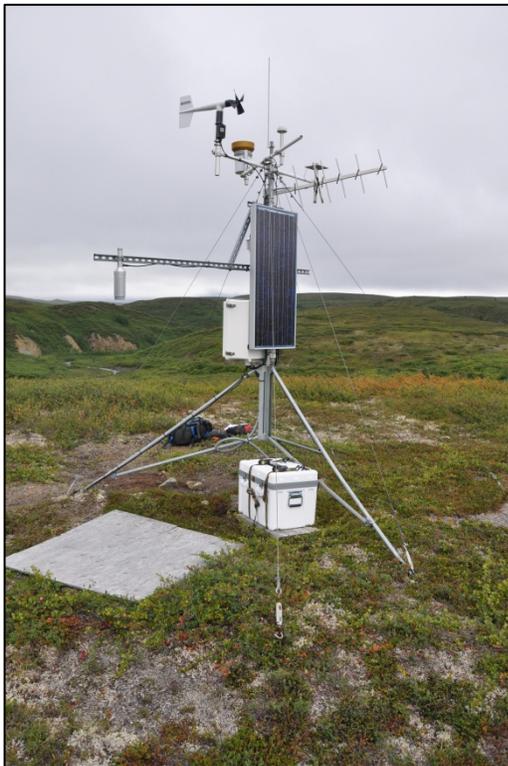
Weather: 47°F, overcast with patchy fog. 5-10 mph.

Sensors replaced:

AT-RH

SR

Narrative: The site was accessed by helicopter from DENA park headquarters. 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 (HMP45) and SR sensors were replaced for routine calibration. The WS-WD sensor was realigned. The sensor was off 10-15° to the east. The battery box was strapped to the tripod. All ST sensors were removed and replaced. The new sensors were installed at 10, 20, and 50 cm. A 360° panorama of photos was taken of the station along with a photo of inside the enclosure box before departure.



**Figure 8.** Dunkle Hills I&M RAWS August 24, 2013.

### ***Stampede***

Date: August 14, 2013

Time of visit: 1400-1600

Personnel: Ken Hill, Pam Sousanes, Colin Milone (NPS pilot)

Mode of transport: Fixed wing Found (09M)  
Purpose of trip: Annual Maintenance  
Weather: Partly cloudy, calm, 55° F  
Sensors replaced:  
AT-RH  
SR

Narrative: The NPS plane (Found 09M) and pilot (Colin Milone) 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 and SR sensors were replaced for routine calibration. All bolts were tightened on the station. Some brush was removed at the site, but next year loppers should be used to remove more vegetation 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 9.** Stampede I&M RAWS August 14, 2013.

***Toklat***

Date: August 15, 2013  
Time of visit: 1330 to 1430  
Personnel: Ken Hill, Pam Sousanes, Mark and Rocky (NOAA CRN), Rick Thoman (NWS)  
Mode of transport: DENA Park Road  
Purpose of trip: Annual Maintenance  
Weather: Mostly cloudy, 55°F  
Sensors Replaced:  
AT-RH

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 sensor was replaced for routine calibration. 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. Staff from NOAA Climate Reference Network and Rick Thoman (NWS) was present at the site visit, on the way to the Wonder Lake site review.



**Figure 10.** Toklat I&M climate station August 15, 2013.

### ***Eielson Visitor Center***

Date: August 15, 2013

Time of visit: 1500 to 1630

Personnel: Ken Hill, Pam Sousanes, Mark and Rocky (NOAA CRN), Rick Thoman (NWS)

Mode of transport: DENA Park Road

Purpose of trip: Annual Maintenance

Weather: Mostly cloudy, 53°F

Sensors Replaced:

AT-RH

SR

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 SR sensors were replaced for routine calibration. 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 4" NWS gage was moved to the top of the post. Previously, it was mounted lower down in the shadow of the post. Staff from NOAA Climate Reference Network and Rick Thoman (NWS) was present at the site visit, on the way to the Wonder Lake site review. Next year a new interpretive sign should be added to the outside of the enclosure.



**Figure 11.** Eielson I&M climate station August 15, 2013.

***Ruth Glacier***

Date: June 18, 2013

Time of visit:

Personnel: Trey Simmons (CAKN Streams), Andy Hermansky (pilot)

Mode of transport: A-star helicopter

Purpose of trip: Annual Maintenance

Weather: Sunny, light breeze,

Sensors replaced:

GPS Antenna

Coax Cable

Battery Cable

Coax Cable

Narrative: An NPS A-star helicopter from Talkeetna was used to access the site. The site was not transmitting so Trey attempted to troubleshoot for obvious problems: He assessed the damage, downloaded data, swapped the GPS antenna and antenna cable, cycled the power to the satellite transmitter, and repaired cables by splicing. Unfortunately, the station was still not transmitting after the visit. Trey and Andy Hermansky (pilot) also installed an electric fence around the site.



**Figure 12.** Ruth Glacier climate station.

***Tokositna Snotel***

Date: June 18, 2013

Time of visit:

Personnel: Daniel Fisher (NRCS Anchorage)

Mode of transport: A-star helicopter

Purpose of trip: Annual Maintenance

Weather:

Narrative: Daniel Fisher 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 13.** Tokositna Snotel site (photos from 2012).

### ***Kantishna Snotel***

Date: August 16, 2013

Time of visit: 09:30-11:30

Personnel: Dan Kenney (NRCS), Ken Hill, Pam Sousanes, Mark and Rocky (NOAA CRN), Rick Thoman (NWS)

Mode of transport: Denali Park Road (Ken), NPS Park Plane (Dan Kenney)

Purpose of trip: Maintenance

Weather: Partly cloudy, calm

Sensors replaced: as needed by Snotel Network

Narrative: Pam, Ken, Mark, Rocky, and Rick drove in on the park road on August 15, and met Dan at the airstrip upon his arrival with Colin Milone in the NPS park plane the morning of August 16. Gear was transported to the Snotel station using the government vehicle. Dan completed annual maintenance at the site including recharging the precipitation gage and inspecting the tower. Other staff assisted as needed and removed vegetation (and blueberries) from the snow course and below the SD sensor.



**Figure 14.** Kantishna Snotel (photo from 2012).

### **Yukon-Charley Rivers**

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

#### ***Upper Charley***

Date: July 23, 2013

Time of visit: 1200-1600

Personnel: Ken Hill, Pam Sousanes, Eric Lorrington (pilot)

Mode of transport: Hughes 500 from Coal Creek – Temsco (NPS Western Area Fire) – N-58191

Purpose of trip: Maintenance

Weather: 56 F, mostly cloudy, 5-10 mph from West

Sensors replaced:

AT-RH

SR

Camera (CC5MPX installed)

Electric Fence installed

ST (replaced and spliced soil probes)

Narrative: NPS staff flew to Coal Creek Camp (CCC) and met N-58191 helicopter to access the Upper Charley station. The station was in good condition upon arrival, except all soil temperature sensors were damaged. All data were downloaded from the CR1000 datalogger to the field laptop and backed up on a USB memory stick. The CR1000 datalogger was updated with the latest operating system. The AT-RH and SR sensors were replaced for routine calibration. A 6' cross arm was added for mounting the SD, RG-TB, and GPS. The unistrut sensor mounting system was removed. The desiccant in the SR50a sensor was replaced and the snow sensor was remounted on the 6' cross arm. The cross arm with the WS-WD and SR sensors was oriented N-S. The AT-RH and ThermX sensors were moved above the solar panel. A new camera (CC5MPX) was installed facing north. An electric fence was installed to help protect the station from bear damage. 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 15.** Upper Charley I&M RAWS July 23, 2013

### ***Coal Creek***

Date: July 24, 2013

Time of visit: 0830-1000

Personnel: Ken Hill, Pam Sousanes

Mode of transport: Cessna 206 from Fairbanks – Arctic Air Alaska N275F Pilot - Bob Eubanks

Purpose of trip: Maintenance at station and snow course

Weather: Mostly cloudy, 55F, calm  
Sensors replaced:  
AT-RH  
SD (SR50 replaced with SR50a)  
Datalogger (CR10x replaced with CR1000)

Narrative: The station 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 CR10x was replaced with a CR1000 datalogger loaded with the newest operating system. A new program was loaded on the datalogger (YUCH\_2013\_HMP45\_7wire\_constant\_ThermX.CR1). The AT-RH sensor was replaced for routine calibration. The SD sensor was updated to the SR50a model and installed at a height of 72 inches. 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.



**Figure 16.** Coal Creek I&M RAWS July 24, 2013.

## **Appendix A: Logistics Summary 2013**

### **DENA Logistics**

Tokositna Snotel and Ruth Glacier - June 18, 2013 Trey Simmons (CAKN aquatic ecologist) based out of Talkeetna for climate, snow, and streams work on the south side of Denali.. Daniel Fisher and Andy Fisher from NRCS arrived from Anchorage and met Trey and Andy Hermansky (the helicopter pilot) at the NPS helibase. Three passengers and the field gear fit easily in the Temsco A-Star helicopter on contract for mountain operations at Denali. Daniel and Andy Fisher were dropped off at the Tokositna Snotel. Trey went to the Ruth Glacier site to work on the station and then surveyed several streams in the area. Both crews were shuttled back to Talkeetna at the end of the day.

Wigand Creek and Dunkle Hills – August 14, 2013: Ken Hill and Pam Sousanes drove from Fairbanks to Denali in a government vehicle. Helicopter 191 (Eastern Area Fire Helicopter contract) was used to access Wigand (8/13) and Dunkle Hills (8/14).

Stampede: NPS aircraft N-709M was used to access the Stampede airstrip for annual maintenance.

Toklat and Eielson Visitor Center - August 15, 2013: Ken Hill, Pam Sousanes, Mark and Rocky (NOAA CRN staff), and Rick Thoman (NWS Fairbanks) drove the park road in a government vehicle. Maintenance at Toklat and Eielson was completed on 8/15. A site review for a potential CRN site at Wonder Lake was also completed on 8/15. Staff stayed at government housing at Friday Creek on 8/15 and returned to park headquarters on 8/16.

### **WRST Logistics**

June 18-22, 2012: Ken Hill drove a government vehicle from Fairbanks to McCarthy. The plan was for helicopter 337 to meet Ken in McCarthy for transport May Creek, but the helicopter was delayed due to high winds. With help from Stevens Harper and NPS staff in Copper Center, Ken arranged to stay in NPS housing in McCarthy on 6/18. On 6/19, helicopter 337 transported Ken and most climate gear to May Creek, where Ken, Jessica (helicopter manager) and Tim (pilot) stayed on 6/19-6/20. As the first people to utilize May Creek for the season, it took some time and luck to get the camp up and running. Keys for the house were obtained from Mary Odden. A separate key is also needed to access the water house, generator house, etc. It's also important to determine the location of the keys for the ATV before arriving in May Creek. Fuel was obtained from the NPS tank at the McCarthy air strip. The five climate stations in WRST were accessed from May Creek: Chicken Creek, Chititu, Gates Glacier, Tana Knob, and Tebay. On 6/21, helicopter 337 dropped Ken in McCarthy before returning to May Creek to retrieve excess gear and shut down the camp. Ken departed McCarthy at 1900 on 6/21 and camped at the Gilahina River before returning to Fairbanks 6/22.

The Snotel sites at May Creek and Chisana were accessed from Gulakana with Lynn Ellis the park pilot.

### **YUCH Logistics**

July 23, 2013: Pam Sousanes and Ken Hill flew in and out of Coal Creek with Arctic Air Alaska (N-275F; pilot Bob Eubanks) on July 23, 2013. The NPS Eastern Area Fire Helicopter (N-

58191; pilot Eric Lorrington) met Pam and Ken at Coal Creek on 7/23 and flew to Upper Charley for annual maintenance. Staff stayed at Coal Creek NPS housing on 7/23 and completed maintenance at Coal Creek RAWS and snow course on 7/24. Ken and Pam returned directly to Fairbanks in N-58191 on 7/24. Also on 7/24, Curtis Cebulski shuttled gear and staff from the vegetation crew from Coal Creek to Fairbanks. Curtis was able to take excess climate gear with him on one of these flights. Fuel was available at the NPS tank at Coal Creek. Lodging was at the NPS cabins at Coal Creek Camp arranged by staff in Eagle.

## Appendix B: CAKN RAWS Station Metadata

### 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	6/19/2013
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	WRST_2013_HMP45-7wire_ThermX.CR1	6/19/2013
Chicken Creek	Enclosure	ENC 16/18	8/21/2004
Chicken Creek	GPS	17992 GPS	8/21/2004
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	6/28/2012
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	6/21/2013
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	WRST_2013_HMP45-7wire_ThermX.CR1	6/21/2013
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	WS/WD	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	7/24/2013
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	YUCH_2013_HMP45_7-wire_constant_ThermX	7/24/2013
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	9/8/2012
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	WS/WD	5103	9/9/2011

## 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	8/14/2013
Dunkle Hills	Battery	100 AH (x2)	8/1/2002
Dunkle Hills	Battery	100 AH (x2)	2/5/2004
Dunkle Hills	3/4"	CM204	8/1/2002
Dunkle Hills	3/4"	CM206	8/1/2002
Dunkle Hills	Datalogger	CR10x	8/1/2002
Dunkle Hills	DLP	2005_V3	8/1/2002
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	SR50	8/1/2002
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	WS/WD	5103	9/19/2011

## Eielson Visitor Center

<b>Station Name</b>	<b>Item</b>	<b>Model</b>	<b>Start Date</b>
Eielson	Antenna	25316 YAGI	6/4/2005
Eielson	AT	ThermX	6/4/2005
Eielson	AT-RH	HMP45	8/15/2013
Eielson	Battery	100 AH (x2)	6/4/2005
Eielson	Crossarm	3/4"	6/4/2005
Eielson	Datalogger	CR10x	6/4/2005
Eielson	DLP	2005_V3	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	SR50	6/4/2005
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	WS/WD	5103	5/18/2011

## 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	6/21/2013
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	
Gates Glacier	Datalogger	CR1000	6/21/2013
Gates Glacier	DLP	WRST_2013_HMP45-7wire_ThermX.CR1	6/21/2013
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	4/29/2003
Ruth Glacier	AT	ThermX	4/29/2003
Ruth Glacier	AT-RH	HMP45	6/7/2011
Ruth Glacier	Battery	100 AH (x2)	4/29/2003
Ruth Glacier	Battery Cable	Power Cable	6/13/2012
Ruth Glacier	Charging Regulator	CH-100	6/13/2012
Ruth Glacier	Datalogger	CR1000	4/29/2003
Ruth Glacier	DLP	2005_V3	4/29/2003
Ruth Glacier	Enclosure	ENC 16/18	4/29/2003
Ruth Glacier	GPS	17992 GPS	4/29/2003
Ruth Glacier	RG-TB	TE525	4/29/2003
Ruth Glacier	SD	SR50a	4/29/2003
Ruth Glacier	Solar Panel	75 W	4/29/2003
Ruth Glacier	SR	Li200x	6/13/2012
Ruth Glacier	ST1	107	4/29/2003
Ruth Glacier	ST2	107	4/29/2003
Ruth Glacier	ST3	107	4/29/2003
Ruth Glacier	Tripod	FTS RAWS Lunar Lander	4/29/2003
Ruth Glacier	TX312	NESDIS ID 396063EA	6/13/2012
Ruth Glacier	TX312 Cable	Coaxial Cable	6/13/2012
Ruth Glacier	WS/WD	5103	9/13/2011

## 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	8/14/2013
Stampede	Battery	100 AH (x2)	2003
Stampede	Crossarm	3/4"	8/1/2002
Stampede	Datalogger	CR10x	9/1/2002
Stampede	DLP	2005_V3	8/1/2002
Stampede	Enclosure	ENC 16/18	5/18/2011
Stampede	GPS	17992 GPS	8/1/2002
Stampede	RG-TB	TE525	8/1/2002
Stampede	SD	SR50	8/1/2002
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	WS/WD	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	6/20/2013
Tana Knob	Battery	100 AH (x2)	7/5/2005
Tana Knob	Crossarm	CM204	
Tana Knob	Crossarm	CM206	
Tana Knob	Datalogger	CR1000	6/20/2013
Tana Knob	DLP	WRST_2013_HMP45-7wire_ThermX.CR1	6/20/2013
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	6/27/2012
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	WS/WD	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	6/20/2013
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	WRST_2013_HMP45-7wire_ThermX.CR1	6/20/2013
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	7/8/2005
Tebay	TX312	NESDIS ID 3960936E	9/17/2008
Tebay	WS/WD	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	8/15/2013
Toklat	Battery	100 AH (x2)	6/16/2005
Toklat	Crossarm	3/4"	6/16/2005
Toklat	Datalogger	CR10x	6/16/2005
Toklat	DLP	2005_V3	6/16/2005
Toklat	Enclosure	ENC 16/18	6/16/2005
Toklat	GPS	17992 GPS	6/16/2005
Toklat	RG-TB	TE525	6/16/2005
Toklat	SD	SR50	6/16/2005
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	9/17/2009
Toklat	WS/WD	5103	9/13/2011

## 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	7/23/2013
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	YUCH_2013_HMP45_7-wire_constant_ThermX	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	
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	9/11/2011



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 953/126944, October 2014

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



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