National Park Service
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Natural Resource Stewardship and Science

Climate Station Maintenance 2013 Summary

Arctic Network

Natural Resource Data Series NPS/ARCN/NRDS—2014/730

ON THE COVER
Howard Pass weather station, Gates of the Arctic National Park and Preserve.
Photograph by: Ken Hill

Climate Station Maintenance 2013 Summary

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Natural Resource Data Series NPS/ARCN/NRDS—2014/730

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Abstract

The mission of the Arctic Network Inventory and Monitoring Program (ARCN) is to collect, compile and synthesize scientific information about the Arctic 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.

In an attempt to better understand climate variation as well as long-term changes in park ecosystems, sixteen climate stations have been installed in the five ARCN parks. The objective of the climate monitoring program is to monitor and record weather conditions at representative locations throughout ARCN 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. A critical element of the program is annual station maintenance. During the 2013 field season, one new I&M climate station was installed at Ella Creek, two stations were re-established (Midnight Mountain and Salmon River), and thirteen existing I&M stations were maintained. This report summarizes the 2013 field season and includes current sensor metadata.

Acknowledgments

A successful field season would not have been possible without support from staff in Fairbanks, Nome, Kotzebue , and Bettles . Additional support was provided by pilots (Curtis Cebulski, Kevin Pearson, Jared Cummings, Jeffrey Vehrs, Daniel Green) and aviation staff (Denali Dispatch, Dave Kreutzer, Dave Marshall).

List of Acronyms

Ah	Amp hour
AKDST	Alaska Daylight Savings Time
AKRO	Alaska Regional Office
OAS	Office of Aviation Services
ARCN	Arctic Network
AS350	A-star 350 Helicopter
AT-RH	Air Temperature- Relative Humidity
BELA	Bering Land Bridge National Preserve
C185	Cessna 185 airplane
C206	Cessna 206 airplane
CAKR	Cape Krusenstern National Monument
CS	Campbell Scientific
DCS	Data Collection System
DLP	Data Logger Program
FTS	Forest Technology Systems
GAAR	Gates of the Arctic National Park and Preserve
GOES	Geostationary Operational Environmental Satellite
GPS	Global Positioning System
I&M	Inventory and Monitoring
KOVA	Kobuk Valley National Park
LED	Light-Emitting Diode
NESDIS	National Environmental Satellite, Data, and Information Service
NIFC	National Interagency Fire Center
NOAT	Noatak National Park and Preserve
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
WEAR	Western Arctic National Parklands
WFMI	Wildland Fire Management Information
WRCC	Western Regional Climate Center
WS-WD	Wind Speed - Wind Direction
YUGA	Collective administrative unit for Yukon-Charley Rivers National Preserve and Gates of the Arctic National Park and Preserve

Climate Station Locations

For the 2013 field season, the Arctic Network (ARCN) continued its climate monitoring program by maintaining fifteen existing stations and installing one new station (Ella Creek) in the network (Figure 1, Table 1). These park units include, Gates of the Arctic National Park and Preserve (GAAR), Bering Land Bridge National Preserve (BELA), Cape Krusenstern National Monument (CAKR), Kobuk Valley National Park (KOVA), and Noatak National Preserve (NOAT. Maintenance includes downloading data, updating software and programming, replacing sensors, and troubleshooting problems. Maintenance is necessary in order to provide continuous, high-quality meteorological data. Midnight Mountain and Salmon River stations were re-established after temporary removal in 2012. Only air and soil temperatures are recorded at Midnight Mountain due to the stations vulnerability to icing. An electric fence was installed at the Salmon River, Mt. Noak, Devil Mountain, Chimney Lake, and Pamichtuk sites to protect the stations from bear activity.

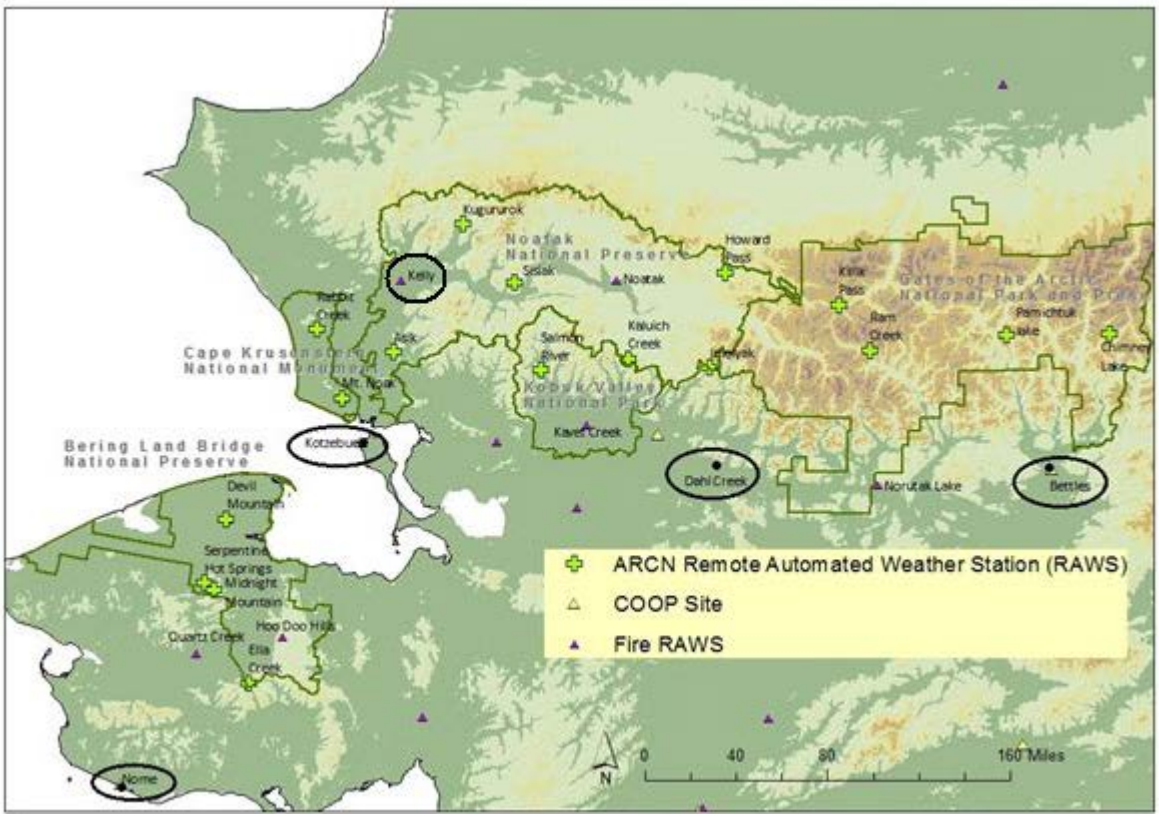

Figure 1. Locations of ARCN I&M RAWS and Fire RAWS and base locations.

Table 1. Locations of ARCN I&M RAWS installed and maintained in 2013 field season.

Station Name	Station Type	Latitude	Longitude	Elevation (ft)	Park	Work Summary
Chimney Lake	NPS I&M RAWS	67° 42.853’	150° 35.100’	3780	GAAR	Maintenance
Pamichtuk Lake	NPS I&M RAWS	67° 45.977’	152° 09.854’	3294	GAAR	Maintenance
Ram Creek	NPS I&M RAWS	67°37.458’	154° 20.678’	4110	GAAR	Maintenance
Killik Pass	NPS I&M RAWS	67° 59.007’	155° 00.782’	4355	GAAR	Maintenance
Howard Pass	NPS I&M RAWS	68° 09.361’	156° 53.749’	2062	NOAT	Maintenance
Imelyak	NPS I&M RAWS	67°32.689’	157° 04.646’	3620	NOAT	Maintenance
Kaluich	NPS I&M RAWS	67° 34.403’	158° 25.903’	2486	NOAT	Maintenance
Salmon River	NPS I&M RAWS	67° 27.594’	159° 50.475’	1262	NOAT	Replacement
Sisiak	NPS I&M RAWS	67° 59.702’	160° 23.739’	1823	NOAT	Maintenance
Asik	NPS I&M RAWS	67° 28.493’	162° 15.986’	1329	NOAT	Maintenance
Tahinichok	NPS I&M RAWS	67° 33.009’	163° 34.031’	966	CAKR	Maintenance
Mt. Noak	NPS I&M RAWS	67° 08.486’	162° 59.672’	809	CAKR	Maintenance
Devil Mountain	NPS I&M RAWS	66° 16.553’	164° 31.851’	285	BELA	Maintenance
Ella Creek	NPS I&M RAWS	65° 16.289’	163° 48.681’	2258	BELA	Installation
Midnight Mountain	NPS I&M RAWS	65° 49.220’	164° 32.565’	2267	BELA	Replacement
Serpentine HS	NPS I&M RAWS	65° 51.138’	164° 42.469’	518	BELA	Maintenance

Climate Station Installation and Maintenance Summaries

This next section describes the installation and maintenance details of sixteen climate stations in the Arctic Network organized by base locations.

Bettles Base

Stations maintained from Bettles include: Killik Pass (GAAR), Ram Creek (GAAR), Pamichtuk Lake (GAAR), and Chimney Lake (GAAR).

Logistics: NPS staff and approximately 350 pounds of gear and equipment were transported via NPS pilot and aircraft (Cessna 185; N6473) from Fairbanks on May 27. The Temsco Hughes 500 helicopter (NPS contracted ship by Eastern Area Fire program), pilot, and helicopter manager arrived the same day and were used to ferry the crew and gear from the Bettles base to the climate station sites. All staff stayed in the NPS/FWS bunkhouse at Bettles.

Chimney Lake

Date: May 27, 2013
Time of visit: 1300-1700
Personnel: Ken Hill, Ansel Sigenthaler (NPS Helicopter Manager), Kevin Pearson (pilot)
Mode of transport: Hughes 500 helicopter – Temsco (NPS Eastern Area Fire) – N337
Purpose of trip: Annual Maintenance
Weather: 50 F, 5 mph from NE, partly sunny

Sensors replaced:
AT-RH (replaced HMP155 with HMP45)
AT (added ThermX)
ST (added third sensor at -75 cm)
Electric Fence

Narrative:
Staff flew to Chimney Lake station (Figure 2) on May 27 from Bettles. The station was in good condition after having been visited by UAF researchers in April who were conducting snow surveys. All data were downloaded from the datalogger. All sensors were functioning upon arrival. The HMP155 AT-RH sensor was replaced due to failure of the same sensor at other sites. An HMP45 sensor was installed as the primary RH sensor. A ThermX AT sensor was installed as the primary AT sensor. A third AT sensor (109-L) continues to record air temperature data hourly. The ThermX and the 109-L sensors are housed in the same radiation shield. A fourth soil temperature sensor was installed at 75 cm depth (goal of 1.0 meter not achieved due to rocky soil). A new datalogger program (ARCN_HMP45_ThermX_T109_GAAR_2013) was sent to the datalogger. The height of the snow depth sensor was entered into the program via the CR1000 KD keypad. The RG-TB was tested. All values looked normal after the new program was sent. An electric fence was installed to protect the station from wildlife activity. The conduit for the power cable was secured to the enclosure with a large washer. Putty was added to the enclosure to protect the electronics from moisture. The desiccant packets were replaced in the enclosure. A 360° panorama of photos was taken including a photo of the inside of the enclosure. During the next visit the datalogger should be checked and updated with the latest operating system and program.

Figure 2. Chimney Lake I&M RAWS.

Pamichtuk
Date: May 28, 2013
Time of visit: 1000-1600
Personnel: Ken Hill, Ansel Sigenthaler (NPS Helicopter Manager), Kevin Pearson (pilot)
Mode of transport: Hughes 500 helicopter – Temsco (NPS Eastern Area Fire) – N337
Purpose of trip: Annual Maintenance
Weather: 50 F, partly sunny

Sensors replaced:
AT-RH (replaced HMP155 with HMP45)
AT (added ThermX)
WS-WD
SR
GPS Cable
CC5MPX Camera
Electric Fence

Narrative:
Staff flew from Bettles arriving at 1000 on May 28. The station looked okay upon arrival, but many sensors were not functioning properly. The station received wildlife damage the previous summer, and had been partly repaired by UAF researchers during their snow survey work in April 2013. The solar charge controller had been wired incorrectly and needed to be repaired to prevent overcharging of the batteries. All data were downloaded to update the WRCC archive. The power cable had been temporarily repaired by UAF, but was replaced with a new cable and conduit. The HMP155 AT-RH sensor was replaced with an HMP45 AT-RH sensor as the primary RH sensor. A ThermX AT sensor was added as the primary AT sensor. The 109-L backup AT sensor was repaired and spliced with electric tape. A more robust repair of the T109 cable may be beneficial during the next field visit. The WS-WD and SR sensors were replaced due to damage by wildlife. A new GPS cable was also installed. A CC5MPX time lapse camera

was installed and aimed N-NE. An electric fence was installed. The NE stake of the fence was incremented with strips of duct tape at 6”, 12”, 24”, and 36” to estimate snow depth after the photos are downloaded. The height of the snow depth sensor is 80.8 inches. A new program was sent to the datalogger (ARCN_HMP45_ThermX_T109_GAAR_2013.CR1). The desiccant packets were replaced in the enclosure. Photos were taken from the eight cardinal directions both towards and away from the station. During the next visit the datalogger should be checked and updated with the latest operating system and program.

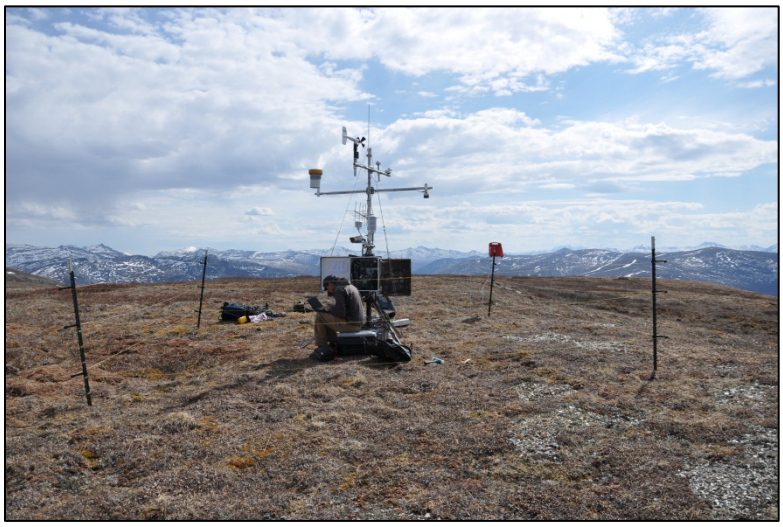

Figure 3. Pamichtuk I&M RAWS.

Ram Creek
Date: May 28, 2013
Time of visit: 1630-1800
Personnel: Ken Hill, Ansel Sigenthaler (NPS Helicopter Manager), Kevin Pearson (pilot)
Mode of transport: Hughes 500 helicopter – Temsco (NPS Eastern Area Fire) – N337
Purpose of trip: Annual Maintenance
Weather: 55 F, 10-15 mph from NE

Sensors replaced:
AT-RH (replaced HMP155 with HMP45)
AT (added ThermX)

Narrative:
After annual maintenance at Pamichtuk on May 28, staff visited Ram Creek (Figure 4). The station was in good condition. Data were downloaded from the logger to update the WRCC archive. The program was updated to ARCN_HMP45_ThermX_T109_GAAR2013.CR1 and the height of the snow sensor was adjusted in the program. The HMP155 AT-RH sensor was replaced with a HMP45 sensor. A ThermX AT sensor was added as the primary air temperature sensor and the T109 sensor was rewired as the backup AT sensor. The conduit for the power cable was secured with a large washer inside the enclosure. All bolts were tightened. Staff noted that wind speeds at the station (ridgetop) were 10-20 mph whereas adjacent areas to the north below the ridge were experiencing 0-5 mph wind speeds. Staff also noted one claw mark on the

battery box, but no other signs of damage. The desiccant packets were replaced in the enclosure. Photos were taken from the eight cardinal directions both towards and away from the station.

Figure 4. Ram Creek I&M RAWS.

Killik Pass
Date: May 29, 2013
Time of visit: 1000-1300
Personnel: Ken Hill, Ansel Sigenthaler (NPS Helicopter Manager), Kevin Pearson (pilot)
Mode of transport: Hughes 500 helicopter – Temsco (NPS Eastern Area Fire) – N337
Purpose of trip: Annual Maintenance
Weather: 45 F, light winds, clearing fog in valley

Sensors replaced:
AT-RH (HMP155 replaced with HMP45)
AT (ThermX added)

Narrative:
En route to the site, all visible valleys on the north side of the divide were covered by a fog layer. The pilot was able to reach the site safely by flying high along terrain features. Upon arrival the station location was a few hundred feet above the fog layer. Ground conditions near the site were damp with some standing water, indicating the snow melt had probably occurred within the last week. The station was in good condition with all sensors functioning properly (Figure 5). The HMP155 radiation shield was bent 45 degrees, but showed no signs of wildlife disturbance. The HMP155 AT-RH sensor was replaced with a HMP45 sensor. A ThermX sensor was added as the primary AT sensor and the T109 AT sensor was rewired for the new program (ARCN_HMP45_ThermX_T109_GAAR2013.CR1). The enclosure and back side of the solar panel have not been painted. The desiccant packets were replaced in the enclosure. Photos were taken from the eight cardinal directions both towards and away from the station.

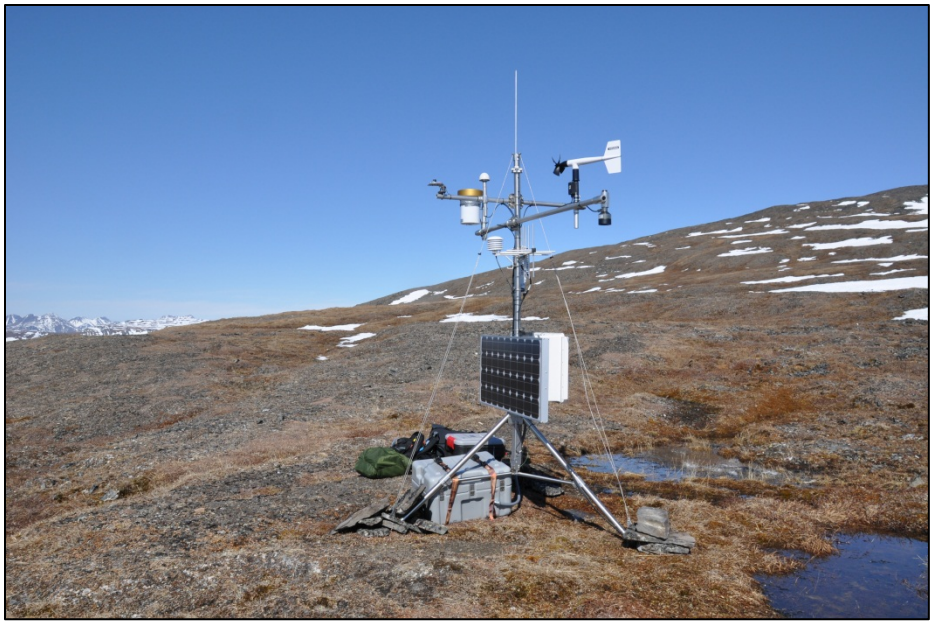

Figure 5. Killik Pass I&M RAWS.

Kotzebue / Kelly River Ranger Station Base

Stations maintained from Kelly River include: Asik (NOAT), Mt. Noak (CAKR), Tahinichok (CAKR), and Sisiak (NOAT).

Logistics: NPS climate staff (Ken Hill) flew commercially on Alaska Airlines to Kotzebue arriving early afternoon on 6/28/2013. Keys were obtained for the NPS warehouse with the assistance of Marci, Tara, and Kotzebue maintenance staff to retrieve climate equipment (antenna, electric fence) from the I&M cache. All components of the Kugururok station (to be installed 2014) except the mast (see Mt. Noak maintenance report below) are stored in the I&M cache as of 7/2/2013. A Cessna 206 charter was arranged with Golden Eagle Outfitters for transport from Kotzebue to Kelly River bar. Fire ecology staff (Jennifer Barnes, Jenn Northway) and support crew (3 Denali [DENA] staff) were already present at Kelly River ranger station with Temsco Western Area Fire helicopter 191. Because of high water levels, helicopter 191 transported Ken across the river channel to the cabin. Staff slept in tents and used the well maintained cabin for cooking.

Asik

Date: June 29, 2013
Time of visit: 1000-1300
Personnel: Ken Hill, Carol (DENA fire), Eric (pilot)
Mode of transport: Hughes 500 helicopter – Temsco (NPS Western Area Fire) – N191
Purpose of trip: Annual maintenance
Weather: Isolated showers, 50 F, east wind 10-20 mph

Sensors replaced:
AT-RH (HMP155 replaced by HMP45)

Narrative:
Ken and Carol arrived at station at 1000 in helicopter 191. The station looked great (Figure 6). Data were downloaded to the field laptop. A new program (NOAT_West_2013_HMP45_ThermX.CR1) and new operating system (OS 26) were uploaded to the datalogger. The HMP155 AT-RH sensor was replaced with a HMP45 AT-RH sensor. The new sensor was housed in the existing 12-plate radiation shield, but the insert was replaced to accommodate the HMP45's smaller diameter. The plan was to install a deeper (100 cm) soil sensor, but this was not possible in the rocky/sandy soils. The SR50a snow depth sensor height was adjusted in the program at 72 inches. All bolts and guy wires were tightened. The desiccant packets were replaced in the enclosure. Photos were taken from the eight cardinal directions both towards and away from the station. There was evidence (scat, hair) of caribou and wolf near the station, but there was no damage to any sensors or hardware.

Figure 6. Asik I&M RAWS

Mt. Noak
Date: June 29, 2013
Time of visit: 1300-1800
Personnel: Ken Hill, Carol (DENA fire), Eric (pilot)
Mode of transport: Hughes 500 helicopter – Temsco (NPS Western Area Fire) – N191
Purpose of trip: RAWS maintenance
Weather: Isolated showers, 55 F, east wind 5-10 mph

Sensors replaced:
AT-RH (HMP155 replaced by HMP45)
ST (50 cm)
ST (75 cm installed)
CC5MPX digital camera

Narrative:
Ken and Carol arrived at the Mt. Noak station and found major damage, presumably by rime ice (Figure 7). The mast was bent to the SE with the solar panel resting on the battery box. Amazingly, all sensors were functioning, the datalogger was powered, and the station was still transmitting data each hour. Wind, solar, and precipitation measurements were compromised by the damage, but air and soil temperature data will be reviewed. Ken called Pam Sousanes (climate program manager) in Fairbanks and they decided to reassemble the station. Helicopter 191 flew to Kotzebue to retrieve a spare mast (planned for Kugururok station installation) from Tara Whitesell. Ken and Carol stayed at Mt. Noak. All data were downloaded to the field laptop. The cross bars, enclosure, solar panel, and antenna were removed from the damaged mast. The mast was replaced and sensors realigned. A new program (NOAT_West_2013_HMP45_ThermX.CR1) and operating system (OS 26) were sent to the datalogger. The SR50a snow depth sensor was adjusted in the program at 77 inches. A few antenna tines were damaged and replaced. The 50 cm soil sensor was damaged and replaced in a new hole. A deeper soil temperature sensor was added with a goal of 100 cm, but it was only possible to reach 75 cm depth. A new CC5MPX camera was installed aimed to the NE. The desiccant was replaced in the enclosure. Photos were taken from the eight cardinal directions both towards and away from the station.

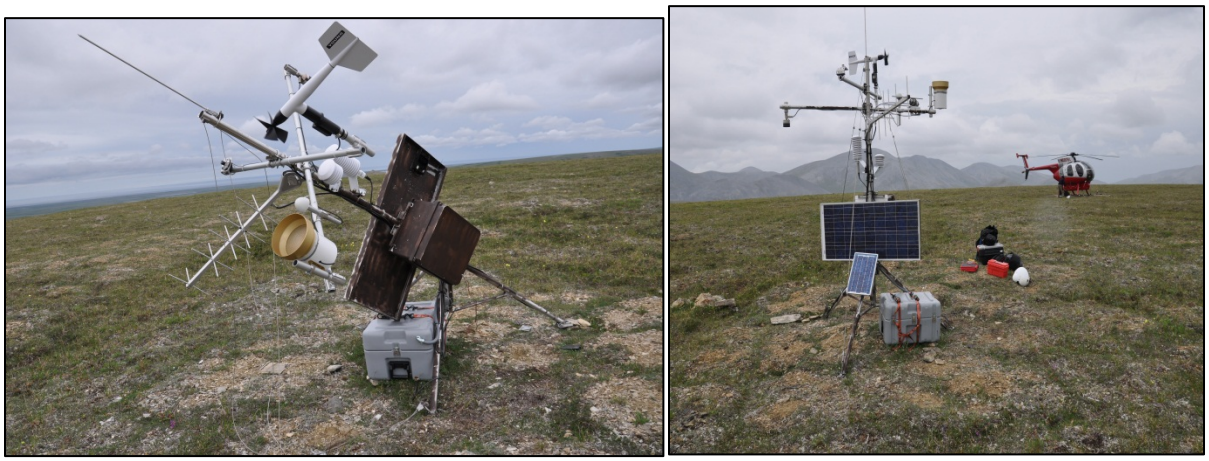

Figure 7. Mt. Noak I&M RAWS before (left) and after (right) repairs. Damage was caused by icing.

Tahinichok
Date: June 30, 2013
Time of visit: 1200-1600
Personnel: Ken Hill, Carol (DENA fire), Eric (pilot)
Mode of transport: Hughes 500 helicopter – Temsco (NPS Western Area Fire) – N191
Purpose of trip: Annual maintenance
Weather: scattered showers, 50 F, east wind 15-25 mph

Sensors replaced:
AT-RH (HMP155 replaced by HMP45)
SR
ST (10, 20, and 50 cm replaced)

ST (75 cm installed)
Antenna tines (all but 5 tines were corroded and/or broken off)
Electric Fence

Narrative:
Ken and Carol arrived at the station after a late start due to poor weather in the morning. There were some problems noted upon arrival at the site. The solar panel was twisted to the west. The long cross bar (snow depth and precipitation sensors) was out of level. All soil temperature sensors were ripped out of the ground and scattered on the tundra. This damage was likely caused by a bear, but there were no visible claw marks or hair at the station. All other sensors were functioning and the batteries were fully charged. Data were downloaded to the field laptop. A new program (NOAT_West_2013_HMP45_ThermX.CR1) and operating system (OS 26) were sent to the datalogger. The solar sensor was swapped. The HMP155 AT-RH sensor was replaced with an HMP45 sensor. The SD sensor height was adjusted in the program to 83 inches. All ST sensors were replaced and a new sensor was added as deep as possible (75 cm). An electric fence was installed to deter future damage by wildlife (Figure 8). Although the station was transmitting intermittently before the site visit, all but five antenna tines were broken off and/or corroded. All tines were replaced. This site is a good candidate for an antenna "hat" which can be purchased to protect the antenna from icing damage. The desiccant packets were replaced in the enclosure. Photos were taken from the eight cardinal directions both towards and away from the station. Ken called the GOES support staff to confirm successful transmissions before leaving the site.

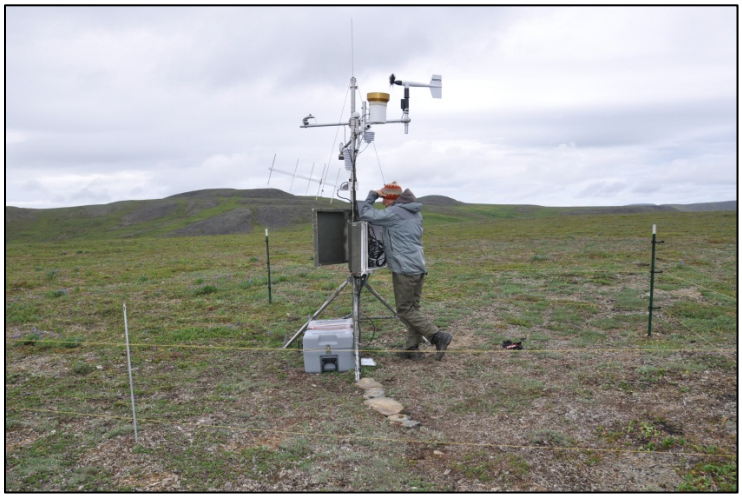

Figure 8. Tahinichok I&M RAWS.

Sisiak
Date: July 1, 2013
Time of visit: 1100-1400
Personnel: Ken Hill, Josh? (DENA fire), Eric (pilot)
Mode of transport: Hughes 500 helicopter – Temsco (NPS Western Area Fire) – N191
Purpose of trip: Annual maintenance
Weather: scattered showers, 50 F, east wind 15-20 mph

Sensors replaced:
AT-RH (HMP155 replaced by HMP45)
SR
ST (75 cm installed)

Narrative:
Staff arrived at site at 1100. All data were downloaded to the field laptop. A new program (NOAT_West_2013_HMP45_ThermX.CR1) and operating system (OS 26) were sent to the datalogger. The lower cross bar (snow depth and precipitation sensors) was approximately 5-10 degrees out of level. The brackets on the precipitation gage were damaged. They were repaired as well as possible with hose clamps and cable ties. The solar panel had been twisted approximately 30 degrees and there was hair on the solar panel. This damage may have been caused by a caribou or "friendly" bear. During the repair of the precipitation gage there were many extra tips (recorded measurements) which should be edited before sending data to update the WRCC archive. The SR sensor was swapped for calibration. The HMP155 AT-RH sensor was replaced with a HMP45 sensor. A new soil sensor was installed as deep as possible at 75 cm. The desiccant packets were replaced in the enclosure. Photos were taken from the eight cardinal directions both towards and away from the station (Figure 9).

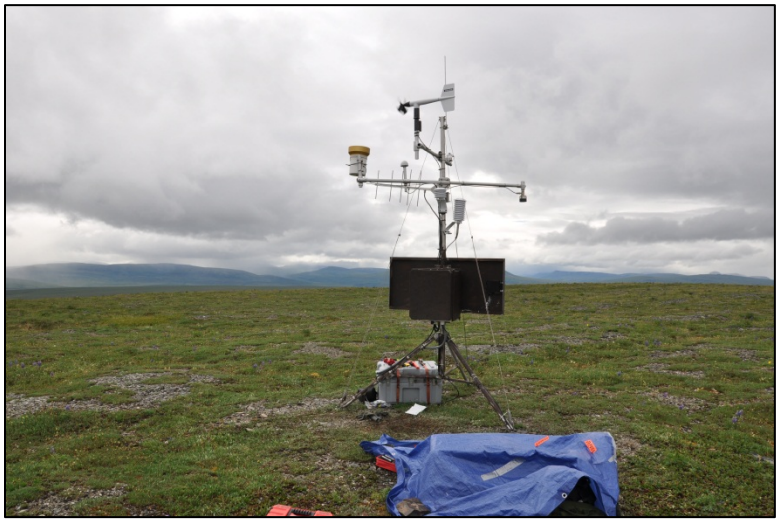

Figure 9. Sisiak I&M RAWS.

Dahl Creek Base

Stations installed and maintained from Dahl Creek include: Salmon River (KOVA), Howard Pass (NOAT), Imelyak (NOAT), Kaluich (NOAT).

Logistics: Staff reached Dahl Creek via a charter flight from Fairbanks to Dahl Creek. The Pollux Aviation Ltd., R-44 helicopter and pilot flew from Red Dog Mine to Dahl Creek. Pilot and staff stayed in the NPS bunkhouse at Dahl Creek.

Salmon River

Date: July 17, 2013
Time of visit: 1300-1800

Personnel: Ken Hill, Tara Whitesell, Shannon Glen (pilot)
Mode of transport: R-44 II helicopter – Pollux Aviation, Ltd. N59FD
Purpose of trip: Re-installation
Weather: 5-15 mph, 50 F, mostly cloudy, isolated showers

Sensors installed:
All sensors installed
AT sensors (HMP60 and T109)
Soil Temperature (10, 20, 50 cm)
CC5MPX camera
Electric fence

Narrative:
Two trips were necessary from Dahl Creek to Salmon River to ferry staff and gear. The first load contained the tripod, mast, and some sensors. Upon arrival at the site, we observed the battery box (and batteries) had been toppled down the adjacent hill, apparently by a bear. The other equipment (guy wires, tripod pegs, enclosure box, short cross arm, long cross arm, and the solar panel) that had been left after the disassembly of the station in 2012 was in good condition. The batteries and battery box were retrieved from the bottom of the hill. Amazingly, the batteries were in good condition and held a voltage of 12.5 volts. Staff began assembling the station while the pilot ferried the rest of the gear from Dahl Creek. An electric fence was installed to prevent wildlife problems. The grounding of the fence was not ideal, probably due to bed rock at the site. A CC5MPX camera was installed pointing N-NE. A new program (KOVA_2013_HMP60_T109.CR1) was sent to the datalogger which contained the latest operating system (OS 26). The desiccant packets were replaced in the enclosure. Photos were taken from the eight cardinal directions both towards and away from the station (Figure 10).

Figure 10. Salmon River I&M RAWS.

Howard Pass
Date: July 17-18, 2013
Time of visit: 2300-0100
Personnel: Ken Hill, Shannon Glen (pilot)

Mode of transport: R-44 II helicopter – Pollux Aviation, Ltd. N59FD
Purpose of trip: Annual maintenance
Weather: 48 F, 5-10 mph from south, midnight sun

Sensors replaced:
AT-RH (HMP155 damaged and replaced with HMP60)
SD
SR
Antenna tine (two tines replaced, striped model)

Narrative:
A good weather window prompted a long night of work. The Howard Pass station was accessed from Dahl Creek by R44 helicopter. Upon arrival at the station at 2300, we determined the station was in decent condition (Figure 11). The HMP155 AT-RH sensor had been damaged. It is unclear if this damage was from wind, or from wildlife. The sensor was replaced with an HMP60 AT-RH sensor. The SD sensor was not functioning properly and was replaced. The SR sensor was replaced for routine calibration. The lightning rod had been ripped from the top of the mast, and was reattached with zip ties. Two antenna tines had snapped and were replaced. A new program (NOAT_East_HMP60_ThermX.CR1) and operating system (OS26) were sent to the datalogger. All bolts and guy wires were tightened. The desiccant packets were replaced in the enclosure Photos were taken from the eight cardinal directions both towards and away from the station.

Figure 11. Howard Pass I&M RAWS.

Imelyak
Date: July 18, 2013
Time of visit: 1200-1400
Personnel: Ken Hill, Tara Whitesell, Shanon Glen (pilot)
Mode of transport: R-44 II helicopter – Pollux Aviation, Ltd. N59FD
Purpose of trip: Annual Maintenance
Weather: Breezy, 45 F, 5-10 mph, scattered showers

Sensors replaced:
AT-RH (HMP155 replaced with HMP60)
SR

Narrative:
The Imeylak site was accessed from Dahl Creek by R44 helicopter (Figure 12). Upon arrival, we determined the site was in good condition. Protective, weather proof conduit was added for the power cable. There was a very small amount of water in the battery box with a tiny bit of corrosion on the batteries. The area was dried and sealed. All data were downloaded from the datalogger. The HMP155 sensor was replaced with an HMP60 AT-RH sensor. The SR sensor was replaced for routine calibration. The SD sensor was not functioning properly. There was some green discoloration on the downward facing grate of the sensor. The desiccant in the sensor was replaced. Unfortunately, no extra SD sensors were available for replacing the faulty sensor because the spare sensor was used at Howard Pass. A new SD sensor should be installed during the next site visit. A new program (NOAT_East_HMP60_ThermX.CR1) and operating system (OS 26) were uploaded to the datalogger. All bolts were tightened at the station and rocks were added to the tripod feet to further anchor the station. The desiccant in the enclosure box was replaced. A full panorama of photos was taken looking both towards and away from the station. Rain showers began towards the end of the station visit.

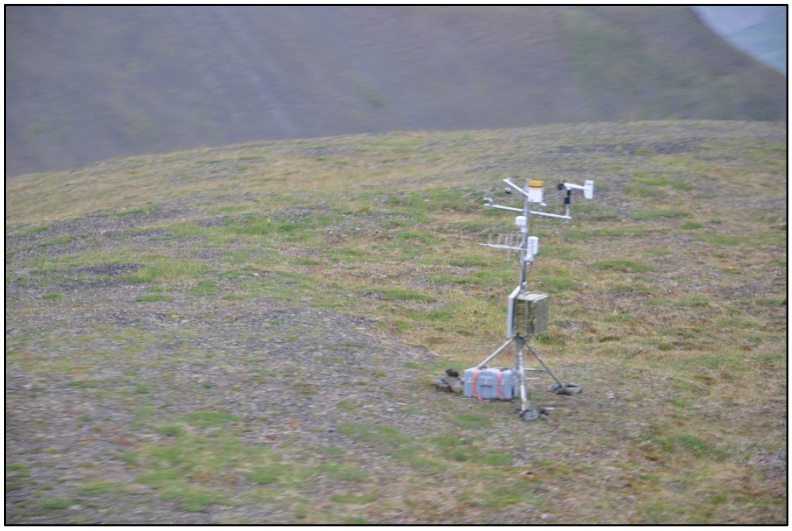

Figure 12. Imelyak I&M RAWS.

Kaluich
Date: July 18, 2013
Time of visit: 1530-1700
Personnel: Ken Hill, Tara Whitesell, Shannon Glen (pilot)
Mode of transport: R-44 II helicopter – Pollux Aviation, Ltd.N59FD
Purpose of trip: Annual Maintenance
Weather: 55 F, 5-10 mph, partly cloudy

Sensors replaced:
AT-RH (HMP155 replaced with HMP60)

Narrative:
The Kaluich site was accessed directly from the Imelyak site by R44 helicopter. Upon arrival it was determined that the station was in good condition. All data were downloaded from the datalogger. A new program (NOAT_East_HMP60_ThermX.CR1) and operating system (OS 26) were uploaded to the datalogger. The height of the SD sensor (80.6 inches) was updated in the new program. The HMP155 AT-RH sensor was replaced with an HMP60 sensor. All bolts were tightened on the station. Photos were taken from the eight cardinal directions both towards and away from the station (Figure 13). The desiccant in the enclosure was replaced. The satellite transmission of data was confirmed by calling staff in Fairbanks before leaving the site.

Figure 13. Kaluich I&M RAWS.

Nome Base

Stations installed and maintained from Nome include: Midnight Mountain (BELA), Devil Mountain (BELA), Ella Creek (BELA), and Serpentine (BELA).

Logistics: NPS staff flew via commercial airline to Nome and based out of Nome and Quartz Creek for the station maintenance. All equipment was checked on Alaska Airlines. A Bering Air R-44 helicopter was used to reach the site locations from Quartz Creek. Staff stayed at the NPS bunkhouse in Nome and used a park vehicle to transport people and gear to Quartz Creek.

Midnight Mountain

Date: August 6, 2013
Time of visit: 1400
Personnel: Ken Hill, Pam Sousanes, Jeffrey Vehrs (Bering Air Pilot)
Mode of transport: R44 from Bering Air 38W
Purpose of trip: Annual maintenance
Weather: 51 F, 10-15 mph, in and out of cloud layer, many caribou

Sensors installed:
AT (3 ThermX sensors)

ST (3 ThermX sensors)

Narrative:
NPS staff drove the Kougarok Road from Nome the morning of August 6 and met the Bering Air R44 helicopter at Quartz Creek at 1245. Staff arrived at Midnight Mountain site at 1400. The site had been taken down in 2012, but some hardware remained. Because of heavy riming in winter months, only air and soil temperature sensors were installed at this site. Three ThermX sensors were installed (two within one radiation shield) to measure air temperature. Three ThermX sensors were installed at 10 cm, 20 cm, and 50 cm depths to measure soil temperature. Data are recorded on a CR1000 datalogger. The enclosure is mounted to a short mast / tripod (Figure 14). The NPS batteries at the station were dead (6 volts) and so staff used an old battery from the nearby repeater site (~ 10 volts). A solar panel was connected to the batteries along with a charging regulator. A weather proof conduit was used to house the battery cable. The NPS batteries were removed from the site. The desiccant packets were replaced in the enclosure. The repeater battery should be replaced with a new battery during the next field visit.

Figure 14. Midnight Mountain station. Measurements include air temperature (three replicate sensors) and soil temperature at 10, 20, and 50 cm.

Devil Mountain
Date: August 6, 2013
Time of visit: 1530
Personnel: Ken Hill, Pam Sousanes, Jeffrey Vehrs (Bering Air Pilot)
Mode of transport: R44 from Bering Air 38W
Purpose of trip: Annual Maintenance
Weather: 55 F, light winds, high overcast.

Sensors replaced:
SD
RG-TB
AT-RH
SR

ST (20 cm)
Coax cable
Antenna tines
Electric Fence
Narrative:
After maintenance at Midnight Mountain, staff traveled to Devil Mountain. The station had some damage from bear activity (Figure 15). The coax cable for the antenna had been ripped out from the enclosure. The tipping bucket and AT-RH sensor were also damaged. Many antenna tines were also missing, either from wildlife or ice damage. The 20 cm soil temperature sensor was repaired by splicing. The SR and AT-RH sensors were replaced for calibration. All data were downloaded to the field laptop. A new program (BELA_2013_HMP45_ThermX.CR1) and operating system (OS 26) were sent to the datalogger. The bent cross arm was replaced and the station was re-leveled. All guy wires and bolts were tightened. An electric fence was installed to prevent future wildlife damage. The desiccant packets were replaced in the enclosure. Photos were taken from the eight cardinal directions both towards and away from the station.

Figure 15. Devil Mountain I&M RAWS before (left) and after (right) annual maintenance. Damage was caused by bear(s).

Ella Creek
Date: August 7, 2013
Time of visit: 930
Personnel: Ken Hill, Pam Sousanes, Jeffrey Vehrs (Bering Air Pilot)
Mode of transport: R44 from Bering Air 38W
Purpose of trip: Annual maintenance
Weather: 45 F, 10 mph, Cloudy.

Sensors replaced:
AT-RH (HMP45)
TB-RG

SD
Antenna (installed)

Narrative:
Ella Creek was accessed by helicopter from Quartz Creek. The station was in good condition upon arrival. An antenna was installed. Data are now transmitted hourly via GOES satellite. The tines on the antenna have stripes/dots (not numbers) to designate their position. The AT-RH sensor head (HMP45) was replaced for routine maintenance. The RG-TB was missing (presumably lost during a high wind event) and replaced. The SD sensor was not functioning and was therefore replaced. There is no lightning rod at this station and it should be added during the next field visit. All data were downloaded to the field laptop. A new program (BELA_2013_HMP45_ThermX.CR1) and operating system (OS 26) were uploaded to the datalogger. All bolts were tightened at the station and a successful satellite transmission was verified. The desiccant packets were replaced in the enclosure. Photos were taken from the eight cardinal directions both towards and away from the station (Figure 16).

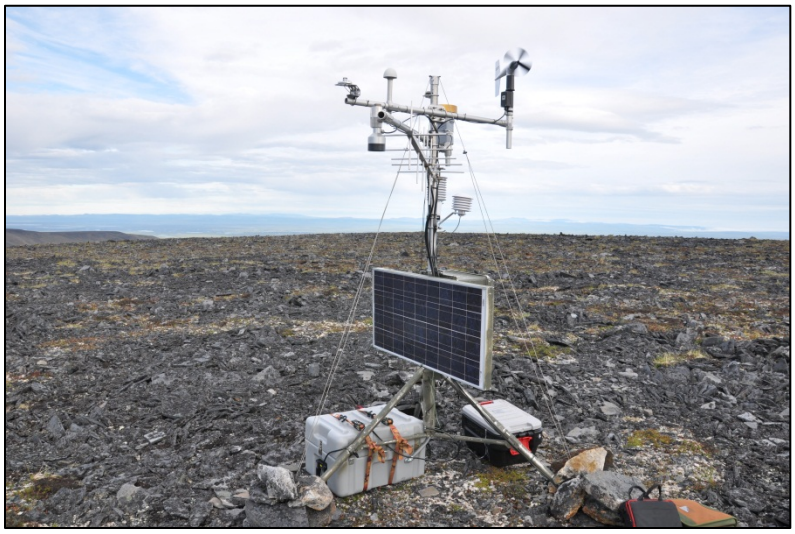

Figure 16. Ella Creek I&M RAWS.

Serpentine Hot Springs
Date: August 7, 2013
Time of visit: 1100
Personnel: Ken Hill, Pam Sousanes, Jeffrey Vehrs (Bering Air Pilot)
Mode of transport: R44 from Bering Air 38W
Purpose of trip: Annual maintenance
Weather: 60F, 5-10 mph from N-NE, mostly sunny

Sensors replaced:
SR
CC5MPX installed

Narrative:

After maintenance at Ella Creek, staff traveled to Serpentine (Figure 17). The site was in good condition and all sensors were working. The SR sensor was replaced for routine maintenance. The HMP155 sensor was not replaced. A recently calibrated AT-RH should be installed during the next site visit. A CC5MPX digital camera was installed facing NW. Mastic and electric tape were added to the HMP155 and the camera plugs to weatherproof the sensors. All data were downloaded to the field laptop. A new program was sent to the datalogger which records the AT-RH from the HMP155 sensor and transmits air temperature values logged by the ThermX sensor. An updated operating system (OS 26) was also sent to the datalogger. The desiccant packets were replaced in the enclosure. Photos were taken from the eight cardinal directions both towards and away from the station.

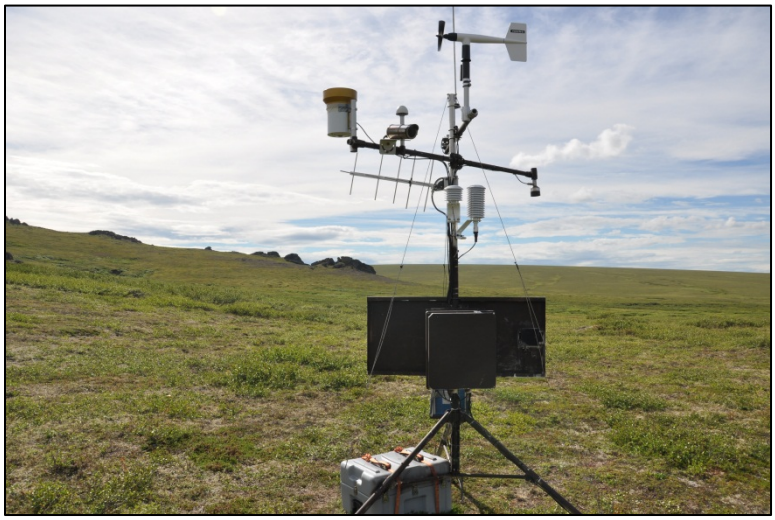

Figure 17. Serpentine I&M RAWS.

Appendix A: Logistics Summary 2013

Bettles Logistics May 27- 30

Ken traveled to Bettles on 5/27 with NPS pilot Curtis Cebulski in NPS aircraft C185 N6473 with about 350 pounds of cargo. The Eastern Area Fire Helicopter (Hughes 500 MD N58337) contracted from Temsco flew from Fairbanks with Ansel Sigenthaler (helicopter manager, NPS) and Kevin Pearson (pilot). Staff stayed in the NPS/USFWS bunk house after checking in with maintenance staff at the NPS office in Bettles. A NPS OHV vehicle was used as needed to ferry gear from the bunkhouse to the air strip. Killik Pass, Ram Creek, Pamichtuk Lake, and Chimney Lake stations were maintained from the Bettles base. Ken returned to Fairbanks on a scheduled Wright Air flight.

Kotzebue / Kelly River Logistics June 28 – July 2

Ken traveled to Kotzebue on an Alaska Airlines commercial flight arriving in Kotzebue at 1330 on 6/28. The NPS expeditor picked Ken up from the airport and helped him retrieve equipment from the warehouse in Kotzebue. There were some difficulties finding a key to open the I&M cache in the warehouse, so this should be arranged in advance. Ken visited local staff in Kotzebue before departing. Ken flew to Kelly Bar with Golden Eagle Outfitters in a Cessna 206. Two NPS fire ecology staff and three DENA fire staff were already working from the Kelly River ranger station with the Hughes 500 MD NPS Western Area Fire Helicopter (N58191) contracted from Temsco. Ken was transported from Kelly Bar to the ranger station 1 mile upstream by helicopter because the depth of the river channel was too deep to cross. Fuel barrels were staged at Kelly Bar. All staff slept in tents and cooked in the ranger cabin. Asik, Mt. Noak, Tahinichok, and Sisiak stations were maintained from the Kelly River base. Ken had planned to install the Kugururok station, but the mast for this station was used to repair Mt. Noak. All equipment for the Kugururok install is in the I&M cache in the warehouse **except** the mast. Jared from Golden Eagle Outfitters picked up NPS staff from the Kelly Bar on two flights from Kotzebue on 7/2. He took an additional one or two flights to removal the empty fuel barrels. NPS staff returned to Fairbanks on a BLM Alaska Fire Service aircraft (PC-12) which the vegetation crew had utilized to travel from Fairbanks to Kotzebue.

Dahl Creek Logistics July 16-20

Ken had scheduled a charter flight from Fairbanks to Dahl Creek on 7/15, but was delayed because the pilot was not appropriately carded. Aviation staff were able to reschedule the flight with Wright Air on 7/16 on a Navajo plane piloted by Daniel. Ken and Tara arrived at Dahl Creek at 1230 on 7/16. Pollux R-44 helicopter N59FD arrived moments later piloted by Shannon Glen. Due to low ceilings on his flight from Red Dog to Dahl Creek, Shannon recommended staying grounded before trying to reach any high elevation stations. Shannon did set up a small fuel cache near Jade Creek because the distances from Dahl Creek to Howard Pass and Salmon River are near the limitations of the aircraft. Poor weather the morning of 7/17 delayed departure until 1300. Salmon River was re-installed on 7/17 and Howard Pass was visited for annual maintenance late that night. Imelyak and Kaluich were maintained on 7/18. Ken and Tara had scheduled to depart Dahl Creek by charter on 7/19, but poor weather in Fairbanks prevented a pick-up. Poor weather continued on 7/20. Ken and Tara caught a ride with staff from Bornite mine from Dahl Creek to Kobuk, and took a scheduled flight with Bering Air from Kobuk to

Kotzebue. Ken continued on an Alaska Airlines flight from Kotzebue to Fairbanks the night of 7/20. Tara stopped in Nome for previously scheduled ARCN work.

Nome Logistics August 5-8

Pam and Ken traveled to Nome on a scheduled Alaska Airline flights from Fairbanks on 8/5. Local staff picked Pam and Ken up from the airport. Pam and Ken reserved beds at the NPS bunkhouse and checked in with local staff. All cargo was checked on the Alaska Airlines flight. While in Nome, Pam and Ken met with local staff. A vehicle was reserved to transport gear up the Kougarok Road to Quartz Creek where a Bering Air helicopter met Pam and Ken for transport to Devil Mountain, Serpentine, Midnight Mountain, and Ella Creek. After returning from site maintenance, Pam and Ken drove back from Quartz Creek to Nome before departing on an Alaska Airlines flight to Fairbanks the following day.

Appendix B: ARCN I&M RAWS Components by Station (as of 2013)

Table 2. Metadata for Asik I&M RAWS.

Station Name	Item	Model	Start Date
Asik	Antenna	25316 YAGI	7/13/2012
Asik	AT	ThermX	7/13/2012
Asik	AT-RH	HMP45	6/29/2013
Asik	Battery	100 AH (x2)	7/13/2012
Asik	Cross arm	CM204	7/13/2012
Asik	Cross arm	CM206	7/13/2012
Asik	Datalogger	CR1000	7/13/2012
Asik	DLP	NOAT_West_2013_HMP45_ThermX	7/13/2012
Asik	GPS	17992 GPS	7/13/2012
Asik	RG-TB	TE525	7/13/2012
Asik	SD	SR50a	7/13/2012
Asik	Solar Panel	75 W	7/13/2012
Asik	SR	Li200x	7/13/2012
Asik	ST	107	7/13/2012
Asik	ST	107	7/13/2012
Asik	ST	107	7/13/2012
Asik	Tripod	CM106	7/13/2012
Asik	TX312	NESDIS ID 3961A40E	7/13/2012
Asik	WS/WD	5103	7/13/2012

Table 3. Metadata for Chimney Lake I&M RAWS.

Station Name	Item	Model	Start Date
Chimney Lake	Antenna	25316 YAGI	8/7/2012
Chimney Lake	AT	T-109	8/7/2012
Chimney Lake	AT	ThermX	5/27/2013
Chimney Lake	AT-RH	HMP45	5/27/2013
Chimney Lake	Battery	100 AH (x2)	8/7/2012
Chimney Lake	Cross arm	CM204	8/7/2012
Chimney Lake	Cross arm	CM206	8/7/2012
Chimney Lake	Datalogger	CR1000	8/7/2012
Chimney Lake	Datlogger	ARCN_HMP45_ThermX_T109	5/27/2013
Chimney Lake	GPS	17992 GPS	8/7/2012
Chimney Lake	RG-TB	TE525	8/7/2012
Chimney Lake	SD	SR50a	8/7/2012
Chimney Lake	Solar Panel	75 W	8/7/2012
Chimney Lake	SR	Li200x	8/7/2012
Chimney Lake	ST	107	8/7/2012
Chimney Lake	ST	107	8/7/2012
Chimney Lake	ST	107	8/7/2012
Chimney Lake	ST	107	5/27/2013
Chimney Lake	Tripod	CM106	8/7/2012
Chimney Lake	TX312	NESDIS ID 3961F472	8/7/2012
Chimney Lake	WS/WD	5103	8/7/2012

Table 4. Metadata for Devil Mountain I&M RAWS.

Station Name	Item	Model	Start Date
Devil Mountain	Antenna	25316 YAGI	8/23/2012
Devil Mountain	AT	ThermX	8/18/2011
Devil Mountain	AT-RH	HMP45	8/6/2013
Devil Mountain	Battery	100 AH (x2)	8/18/2011
Devil Mountain	Cross arm	CM204	8/18/2011
Devil Mountain	Cross arm	CM206	8/6/2013
Devil Mountain	Datalogger	CR1000	8/18/2011
Devil Mountain	DLP	BELA_2013_HMP45_ThermX	8/6/2013
Devil Mountain	Enclosure	ENC 16/18	8/18/2011
Devil Mountain	GPS	17992 GPS	8/18/2011
Devil Mountain	RG-TB	TE525	8/18/2011
Devil Mountain	SD	SR50a	8/6/2013
Devil Mountain	Solar Panel	75 W	8/18/2011
Devil Mountain	SR	Li200x	8/18/2011
Devil Mountain	ST	107	8/18/2011
Devil Mountain	ST	107	8/18/2011
Devil Mountain	ST	107	8/18/2011
Devil Mountain	Tripod	CM106	8/18/2011
Devil Mountain	TX312	NESDIS ID 3961221A	8/18/2011
Devil Mountain	WS/WD	5103	8/23/2012

Table 5. Metadata for Ella Creek I&M RAWS.

Station Name	Item	Model	Start Date
Ella Creek	Antenna	25316 YAGI	8/7/2013
Ella Creek	AT	ThermX	9/18/2012
Ella Creek	AT-RH	HMP45	8/7/2013
Ella Creek	Battery	100 AH (x2)	9/18/2012
Ella Creek	Cross arm	CM204	9/18/2012
Ella Creek	Cross arm	CM206	9/18/2012
Ella Creek	Datalogger	CR1000	9/18/2012
Ella Creek	DLP	BELA_2013_HMP45_ThermX	8/7/2013
Ella Creek	Enclosure	ENC 16/18	9/18/2012
Ella Creek	GPS	17992 GPS	9/18/2012
Ella Creek	RG-TB	TE525	8/7/2013
Ella Creek	SD	SR50a	8/7/2013
Ella Creek	Solar Panel	75 W	9/18/2012
Ella Creek	SR	Li200x	9/18/2012
Ella Creek	ST	107	9/18/2012
Ella Creek	ST	107	9/18/2012
Ella Creek	ST	107	9/18/2012
Ella Creek	Tripod	CM106	9/18/2012
Ella Creek	TX312	396182E2	8/7/2013
Ella Creek	WS/WD	5103	9/18/2012

Table 6. Metadata for Howard Pass I&M RAWS.

Station Name	Item	Model	Start Date
Howard Pass	Antenna	25316 YAGI	7/7/2011
Howard Pass	AT	ThermX	7/7/2011
Howard Pass	AT-RH	HMP60	7/17/2013
Howard Pass	Battery	100 AH (x2)	7/7/2011
Howard Pass	Cross arm	CM204	7/7/2011
Howard Pass	Cross arm	CM206	7/7/2011
Howard Pass	Datalogger	CR1000	7/7/2011
Howard Pass	DLP	NOAT_East_HMP60_ThermX	7/17/2013
Howard Pass	Enclosure	ENC 16/18	7/7/2011
Howard Pass	GPS	17992 GPS	7/7/2011
Howard Pass	RG-TB	TE525	7/7/2011
Howard Pass	SD	SR50a	7/17/2013
Howard Pass	Solar Panel	75 W	7/7/2011
Howard Pass	SR	Li200x	7/17/2013
Howard Pass	ST	107	7/7/2011
Howard Pass	ST	107	7/7/2011
Howard Pass	ST	107	7/7/2011
Howard Pass	Tripod	CM106	7/7/2011
Howard Pass	TX312	NESDIS ID 39617266	7/7/2011
Howard Pass	WS/WD	5103	7/7/2011

Table 7. Metadata for Imelyak I&M RAWS.

Station Name	Item	Model	Start Date
Imelyak	Antenna	25316 YAGI	7/6/2011
Imelyak	AT	ThermX	7/6/2011
Imelyak	AT-RH	HMP60	7/6/2011
Imelyak	Battery	100 AH (x2)	7/6/2011
Imelyak	Cross arm	CM204	7/6/2011
Imelyak	Cross arm	CM206	7/6/2011
Imelyak	Datalogger	CR1000	7/20/2012
Imelyak	DLP	NOAT_East_HMP60_ThermX	7/18/2013
Imelyak	Enclosure	ENC 16/18	7/6/2011
Imelyak	GPS	17992 GPS	7/6/2011
Imelyak	RG-TB	TE525	7/6/2011
Imelyak	SD	SR50a	7/6/2011
Imelyak	Solar Panel	75 W	7/6/2011
Imelyak	SR	Li200x	7/18/2013
Imelyak	ST	107	7/6/2011
Imelyak	ST	107	7/6/2011
Imelyak	ST	107	7/6/2011
Imelyak	Tripod	CM106	7/6/2011
Imelyak	TX312	NESDIS ID 3961316C	7/20/2012
Imelyak	WS/WD	5103	7/20/2012

Table 8. Metadata for Kaluich I&M RAWS.

Station Name	Item	Model	Start Date
Kaluich	Antenna	25316 YAGI	7/20/2012
Kaluich	AT	ThermX	7/20/2012
Kaluich	AT-RH	HMP60	7/18/2013
Kaluich	Battery	100 AH (x2)	7/20/2012
Kaluich	Cross arm	CM204	7/20/2012
Kaluich	Cross arm	CM206	7/20/2012
Kaluich	Datalogger	CR1000	7/20/2012
Kaluich	DLP	NOAT_East_HMP60_ThermX	7/18/2013
Kaluich	Enclosure	ENC 16/18	7/20/2012
Kaluich	GPS	17992 GPS	7/20/2012
Kaluich	RG-TB	TE525	7/20/2012
Kaluich	SD	SR50a	7/20/2012
Kaluich	Solar Panel	75 W	7/20/2012
Kaluich	SR	Li200x	7/20/2012
Kaluich	ST	107	7/20/2012
Kaluich	ST	107	7/20/2012
Kaluich	ST	107	7/20/2012
Kaluich	Tripod	CM106	7/20/2012
Kaluich	TX312	NESDIS ID 39617266	7/20/2012
Kaluich	WS/WD	5103	7/20/2012

Table 9. Metadata for Killik Pass I&M RAWS.

Station Name	Item	Model	Start Date
Killik Pass	Antenna	25316 YAGI	8/8/2012
Killik Pass	AT	T109	8/8/2012
Killik Pass	AT	ThermX	5/29/2013
Killik Pass	AT-RH	HMP45	5/29/2013
Killik Pass	Battery	100 AH (x2)	8/8/2012
Killik Pass	Cross arm	CM204	8/8/2012
Killik Pass	Cross arm	CM206	8/8/2012
Killik Pass	Datalogger	CR1000	8/8/2012
Killik Pass	DLP	ARCN_HMP45_ThermX_T109	5/29/2013
Killik Pass	Enclosure	ENC 16/18	8/8/2012
Killik Pass	GPS	17992 GPS	8/8/2012
Killik Pass	RG-TB	TE525	8/8/2012
Killik Pass	SD	SR50a	8/8/2012
Killik Pass	Solar Panel	75 W	8/8/2012
Killik Pass	SR	Li200x	8/8/2012
Killik Pass	ST	107	8/8/2012
Killik Pass	ST	107	8/8/2012
Killik Pass	ST	107	8/8/2012
Killik Pass	Tripod	CM106	8/8/2012
Killik Pass	TX312	NESDIS ID 3961C1E8	8/8/2012
Killik Pass	WS/WD	5103	8/8/2012

Table 10. Metadata for Midnight Mountain I&M RAWS.

Station Name	Item	Model	Start Date
Midnight Mountain	AT	ThermX	8/6/2013
Midnight Mountain	AT	ThermX	8/6/2013
Midnight Mountain	AT	ThermX	8/6/2013
Midnight Mountain	Battery	12 V	8/6/2013
Midnight Mountain	Datalogger	CR1000	8/6/2013
Midnight Mountain	DLP	Midnight_2013_ThermX_6	8/6/2013
Midnight Mountain	Enclosure	ENC 16/18	7/8/2011
Midnight Mountain	Solar Panel	75 W	7/8/2011
Midnight Mountain	ST	ThermX	8/6/2013
Midnight Mountain	ST	ThermX	8/6/2013
Midnight Mountain	ST	ThermX	8/6/2013
Midnight Mountain	Tripod	CM106	7/8/2011

Table 11. Metadata for Mt. Noak I&M RAWS.

Station Name	Item	Model	Start Date
Mt. Noak	Antenna	25316 YAGI	7/11/2011
Mt. Noak	AT	ThermX	7/11/2011
Mt. Noak	AT-RH	HMP45	6/29/2013
Mt. Noak	Battery	100 AH (x2)	7/11/2011
Mt. Noak	Camera	CC5MPX	6/29/2013
Mt. Noak	Cross arm	CM204	7/11/2011
Mt. Noak	Cross arm	CM206	7/11/2011
Mt. Noak	Datalogger	CR1000	7/11/2011
Mt. Noak	DLP	NOAT_West_2013_HMP45_ThermX	6/29/2013
Mt. Noak	Enclosure	ENC 16/18	7/11/2011
Mt. Noak	GPS	17992 GPS	7/11/2011
Mt. Noak	RG-TB	TE525	7/11/2011
Mt. Noak	SD	SR50a	7/14/2012
Mt. Noak	SD	SR50a	6/29/2013
Mt. Noak	Solar Panel	75 W	7/11/2011
Mt. Noak	SR	Li200x	7/11/2011
Mt. Noak	ST	107	7/11/2011
Mt. Noak	ST	107	7/11/2011
Mt. Noak	ST	107	6/29/2013
Mt. Noak	ST	107	6/29/2013
Mt. Noak	Tripod	CM106	7/11/2011
Mt. Noak	TX312	NESDIS ID 39616110	7/11/2011
Mt. Noak	WS/WD	5103	7/11/2011

Table 12. Metadata for Pamichtuk I&M RAWS.

Station Name	Item	Model	Start Date
Pamichtuk	Antenna	25316 YAGI	8/6/2012
Pamichtuk	AT	T109	8/6/2012
Pamichtuk	AT	ThermX	5/29/2013
Pamichtuk	AT-RH	HMP45	5/28/2013
Pamichtuk	Battery	100 AH (x2)	8/6/2012
Pamichtuk	Camera	CC5MPX	5/28/2013
Pamichtuk	Cross arm	CM204	8/6/2012
Pamichtuk	Cross arm	CM206	8/6/2012
Pamichtuk	Datalogger	CR1000	8/6/2012
Pamichtuk	DLP	ARCN_HMP45_ThermX_T109	5/28/2013
Pamichtuk	Enclosure	ENC 16/18	8/6/2012
Pamichtuk	GPS	17992 GPS	8/6/2012
Pamichtuk	RG-TB	TE525	8/6/2012
Pamichtuk	SD	SR50a	8/6/2012
Pamichtuk	Solar Panel	75 W	8/6/2012
Pamichtuk	SR	Li200x	5/28/2013
Pamichtuk	ST	107	8/6/2012
Pamichtuk	ST	107	8/6/2012
Pamichtuk	ST	107	8/6/2012
Pamichtuk	Tripod	CM106	8/6/2012
Pamichtuk	TX312	NESDIS ID 3961E704	8/6/2012
Pamichtuk	WS/WD	5103	5/28/2013

Table 13. Metadata for Ram Creek I&M RAWS.

Station Name	Item	Model	Start Date
Ram Creek	Antenna	25316 YAGI	8/7/2012
Ram Creek	AT	T109	8/7/2012
Ram Creek	AT	ThermX	5/28/2013
Ram Creek	AT-RH	HMP45	5/28/2013
Ram Creek	Battery	100 AH (x2)	8/7/2012
Ram Creek	Cross arm	CM204	8/7/2012
Ram Creek	Cross arm	CM206	8/7/2012
Ram Creek	Datalogger	CR1000	8/7/2012
Ram Creek	DLP	ARCN_HMP45_ThermX_T109	5/28/2013
Ram Creek	Enclosure	ENC 16/18	8/7/2012
Ram Creek	GPS	17992 GPS	8/7/2012
Ram Creek	RG-TB	TE525	8/7/2012
Ram Creek	SD	SR50a	8/7/2012
Ram Creek	Solar Panel	75 W	8/7/2012
Ram Creek	SR	Li200x	8/7/2012
Ram Creek	ST	107	8/7/2012
Ram Creek	ST	107	8/7/2012
Ram Creek	ST	107	8/7/2012
Ram Creek	Tripod	CM106	8/7/2012
Ram Creek	TX312	NESDIS ID 3961D29E	8/7/2012
Ram Creek	WS/WD	5103	8/7/2012

Table 14. Metadata for Salmon River I&M RAWS.

Station Name	Item	Model	Start Date
Salmon River	Antenna	25316 YAGI	7/17/2013
Salmon River	AT	T109	7/17/2013
Salmon River	AT-RH	HMP60	7/17/2013
Salmon River	Battery	100 AH (x2)	7/8/2011
Salmon River	Cross arm	CM204	7/8/2011
Salmon River	Cross arm	CM206	7/8/2011
Salmon River	Datalogger	CR1000	7/17/2013
Salmon River	DLP	KOVA_2013_HMP60_T109	7/17/2013
Salmon River	Enclosure	ENC 16/18	7/8/2011
Salmon River	GPS	17992 GPS	7/17/2013
Salmon River	RG-TB	TE525	7/17/2013
Salmon River	SD	SR50a	7/17/2013
Salmon River	SR	Li200x	7/17/2013
Salmon River	ST	107	7/17/2013
Salmon River	ST	107	7/17/2013
Salmon River	ST	107	7/17/2013
Salmon River	Tripod	CM106	7/17/2013
Salmon River	TX312	NESDIS ID 3960F688	7/17/2013
Salmon River	WS/WD	5103	7/17/2013

Table 15. Metadata for Serpentine I&M RAWS.

Station Name	Item	Model	Start Date
Serpentine	Antenna	25316 YAGI	8/18/2011
Serpentine	AT	ThermX	8/18/2011
Serpentine	AT-RH	HMP155	8/18/2011
Serpentine	Battery	100 AH (x2)	8/18/2011
Serpentine	Camera	CC5MPX	8/7/2013
Serpentine	Cross arm	CM204	8/18/2011
Serpentine	Cross arm	CM206	8/18/2011
Serpentine	Datalogger	CR1000	8/18/2011
Serpentine	DLP	HMP155_ThermX	8/7/2013
Serpentine	Enclosure	ENC 16/18	8/18/2011
Serpentine	GPS	17992 GPS	8/18/2011
Serpentine	RG-TB	TE525	8/18/2011
Serpentine	SD	SR50a	8/18/2011
Serpentine	Solar Panel	75 W	8/18/2011
Serpentine	SR	Li200x	8/7/2013
Serpentine	ST	107	8/18/2011
Serpentine	ST	107	8/18/2011
Serpentine	ST	107	8/18/2011
Serpentine	Tripod	CM106	8/18/2011
Serpentine	TX312	NESDIS ID 3961C1E8	8/18/2011
Serpentine	WS/WD	5103	8/18/2011

Table 16. Metadata for Sisiak I&M RAWS.

Station Name	Item	Model	Start Date
Sisiak	Antenna	25316 YAGI	7/13/2011
Sisiak	AT	ThermX	7/13/2011
Sisiak	AT-RH	HMP45	7/1/2013
Sisiak	Battery	100 AH (x2)	7/13/2011
Sisiak	Cross arm	CM204	7/13/2011
Sisiak	Cross arm	CM206	7/13/2011
Sisiak	Datalogger	CR1000	7/13/2011
Sisiak	DLP	NOAT_West_2013_HMP45_ThermX	7/1/2013
Sisiak	Enclosure	ENC 16/18	7/13/2011
Sisiak	GPS	17992 GPS	7/13/2011
Sisiak	RG-TB	TE525	7/13/2011
Sisiak	SD	SR50a	7/13/2011
Sisiak	Solar Panel	75 W	7/13/2011
Sisiak	SR	Li200x	7/1/2013
Sisiak	ST	107	7/13/2011
Sisiak	ST	107	7/13/2011
Sisiak	ST	107	7/13/2011
Sisiak	ST	107	7/1/2013
Sisiak	Tripod	CM106	7/13/2011
Sisiak	TX312	NESDIS ID 3961548A	7/13/2011
Sisiak	WS/WD	5103	7/13/2011

Table 17. Metadata for Tahinichok I&M RAWS.

Station Name	Item	Model	Start Date
Tahinichok	Antenna	25316 YAGI	7/10/2011
Tahinichok	AT	ThermX	7/10/2011
Tahinichok	AT-RH	HMP45	6/30/2013
Tahinichok	Battery	100 AH (x2)	7/10/2011
Tahinichok	Cross arm	CM204	7/10/2011
Tahinichok	Cross arm	CM206	7/10/2011
Tahinichok	Datalogger	CR1000	7/10/2011
Tahinichok	DLP	NOAT_West_2013_HMP45_ThermX	6/30/2013
Tahinichok	Enclosure	ENC 16/18	7/10/2011
Tahinichok	GPS	17992 GPS	7/10/2011
Tahinichok	RG-TB	TE525	7/10/2011
Tahinichok	SD	SR50a	7/10/2011
Tahinichok	Solar Panel	75 W	7/10/2011
Tahinichok	SR	Li200x	6/30/2013
Tahinichok	ST	107	7/10/2011
Tahinichok	ST	107	7/10/2011
Tahinichok	ST	107	7/10/2011
Tahinichok	ST	107	6/30/2013
Tahinichok	Tripod	CM106	7/10/2011
Tahinichok	TX312	NESDIS ID 3961548A	7/10/2011
Tahinichok	WS/WD	5103	7/10/2011

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