



# Climate Station Maintenance 2012 Summary

## *Arctic Network*

Natural Resource Data Series NPS/ARCN/NRDS—2013/460



**ON THE COVER**

Killik Pass weather station, Gates of the Arctic National Park and Preserve.  
Photograph by: Ken Hill

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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.

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. In an attempt to better understand climate variation as well as long-term changes in park ecosystems, nineteen stations were visited in ARCN parks during the 2012 field season. Seven new I&M stations were installed, seven existing I&M stations were maintained, three NPS Remote Automated Weather Stations (RAWS) were maintained, and two I&M stations were temporarily removed due to excessive damage. This report summarizes all work for the 2012 field season and includes current sensor metadata.

## **Acknowledgments**

A successful field season would not have been possible without support from staff in Fairbanks (Tara Whitesell, Stacia Backensto, Kumi Rattenbury, Jim Lawler, Doris Lenahan, Jeff Rasic), Nome (Jeanette Pomrenke, Janet Klein, Ken Adkisson), Kotzebue (Evan Watson, Frank Hayes), and Bettles (DaleLynn Gardner). Additional support was provided by pilots (Chris Ramsey, Russell Rowe, Andy Hermansky, Dave Fagre, Curtis Cebulski) and aviation staff (Denali Dispatch, Alicia Tanrath, Dave Marshall, Brad Shults).

## 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
	National Environmental Satellite, Data, and Information Service
NESDIS ID	Identifier
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
W	Watt
WEAR	Western Arctic National Parklands
WFMI	Wildland Fire Management Information
WRCC	Western Regional Climate Center
WS-WD	Wind Speed - Wind Direction
	Collective administrative unit for Yukon-Charley Rivers National Preserve and Gates of the Arctic National Park and Preserve
YUGA	

# Climate Station Locations

For the 2012 field season, the Arctic Network (ARCN) continued its climate monitoring program by maintaining existing stations and installing new stations throughout the network (Figure 1). Seven new Inventory and Monitoring (I&M) Remote Automated Weather Stations (RAWS) were installed and seven additional I&M RAWS were maintained in the five NPS units that comprise ARCN (Table 1; see also Sousanes and Hill 2013). These park units include, Gates of the Arctic National Park and Preserve (GAAR), which is administered from Fairbanks, Alaska; and Bering Land Bridge National Preserve (BELA), Cape Krusenstern National Monument (CAKR), Kobuk Valley National Park (KOVA), and Noatak National Preserve (NOAT), which are administered collectively as the Western Arctic National Parklands (WEAR) from offices in Kotzebue and Nome, Alaska. Maintenance support for three National Park Service (NPS) Fire RAWS was also completed. 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. Due to excessive damage at Midnight Mountain (icing) and Salmon River (bear damage), these stations were temporarily removed.

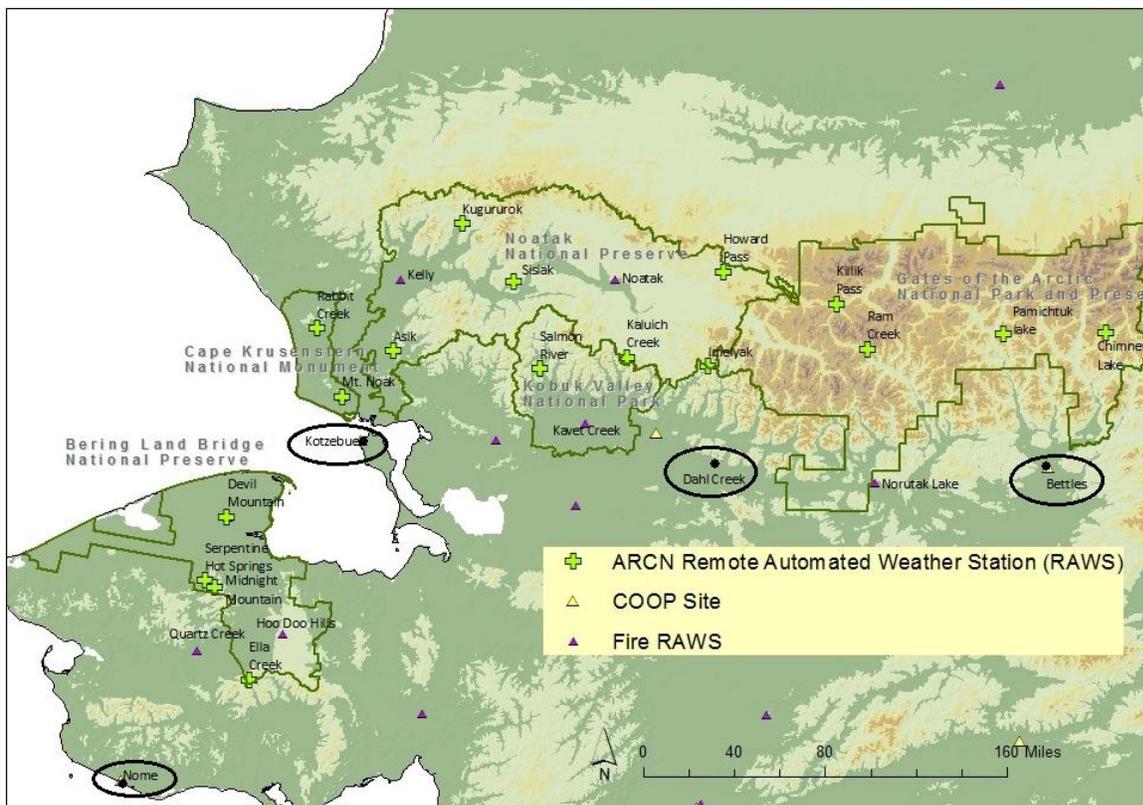


Figure 1. Locations of ARCN I&M RAWS and Fire RAWS and base locations.

**Table 1.** Locations of ARCN I&M RAWS and Fire RAWS installed and maintained in 2012 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	Installation
Pamichtuk Lake	NPS I&M RAWS	67° 45.977'	152° 09.854'	3294	GAAR	Installation
Ram Creek	NPS I&M RAWS	67°37.458'	154° 20.678'	4110	GAAR	Installation
Killik Pass	NPS I&M RAWS	67° 59.007'	155° 00.782'	4355	GAAR	Installation
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	Installation
Salmon River	NPS I&M RAWS	67° 27.594'	159° 50.475'	1262	NOAT	Removal
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	Installation
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	Removal
Serpentine HS	NPS I&M RAWS	65° 51.138'	164° 42.469'	518	BELA	Maintenance
HooDoo Hills	NPS Fire RAWS	65° 35.586'	163° 24.402'	472	BELA	Maintenance
Quartz Creek	NPS Fire RAWS	65° 24.00'	164° 39.00'	130	BELA	Maintenance
Kiana	NPS Fire RAWS	66° 58.36'	160° 26.15'	46	KOVA	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

### **Kotzebue Base**

Stations installed from Kotzebue include: Asik (NOAT); stations maintained from Kotzebue include: Sisiak (NOAT), Mt. Noak (CAKR), Tahinichok (CAKR), and the Kiana Fire RAWS.

Logistics: Staff reached Kotzebue via a charter with Wright Air in a Caravan (pilot Dave Fagre) from Fairbanks on July 11 with a brief stop at Dahl Creek to drop off equipment. Staff maintained and installed sites in WEAR from July 12-14, 2012 via access from a Robinson R44 helicopter chartered from Pollux Aviation.

### ***Sisiak***

Date: July 12, 2012

Time of visit: 1000-1500

Personnel: Ken Hill, Pam Sousanes, Chris Ramsey (pilot)

Mode of transport: R44 helicopter – Pollux – N81191

Purpose of trip: Annual Maintenance

Weather: 62 F, 3-8 mph from S, partly sunny

Sensors replaced: None

Staff flew to Sisiak station (Figure 2) on July 12. A tundra fire was burning to the E-NE on the opposite side of the Noatak River. The station was in good condition. All data were downloaded to update the WRCC archive. Initial examination of the data indicates time stamp problems where data records have been written into future dates. The cause and solution are currently unknown. Before sending a new program, values for the RG-TB, SD, and WS-WD sensors were suspect. A new datalogger program (ARCN\_V3) was sent to the datalogger. The height of the snow depth sensor (82.5 inches) 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. Battery conduit cable was installed, but no drill was available so a hole was cut in the battery box with a knife without problems. The ground wiring was fixed so that the black wire from the copper rod was connected to the tripod base. The green wire from the enclosure was also connected to the tripod base. During the next visit the datalogger should be checked and updated with the latest operating system and program.



**Figure 2.** Sisiak I&M RAWS with tundra fire burning in the background.

**Asik**

Date: July 13, 2012

Time of visit: 1000-1615

Personnel: Ken Hill, Pam Sousanes, Chris Ramsey (pilot)

Mode of transport: R-44 II helicopter – Pollux Aviation, Ltd.

Purpose of trip: Installation

Weather: Cloudy, intermittent showers

Sensors replaced: None

**Narrative:**

Staff flew from Kotzebue to the installation site at Asik (Figure 3) arriving at 10:00 on July 13. The installation went well with only a short rain shower near the end of the installation. The height of the snow depth sensor is 74 inches. All soil temperature sensors went in without incident at 10, 20 and 50 cm. There were no tabs on the tripod feet for guy wire placement. Protective conduit for the battery cable was installed with a modified plug within the enclosure. The antenna tines have dots/stripes for indicating position. DCS was called before departure to confirm a good transmission. During the next visit the datalogger should be checked and updated with the latest operating system and program.



**Figure 3.** Asik I&M RAWS installed 13 July 2012.

***Mt. Noak***

Date: July 14, 2012

Time of visit: morning

Personnel: Ken Hill, Pam Sousanes, Chris Ramsey (pilot)

Mode of transport: R-44 II helicopter – Pollux Aviation, Ltd.

Purpose of trip: Annual Maintenance

Weather: 52 F, 5-10 mph from SE

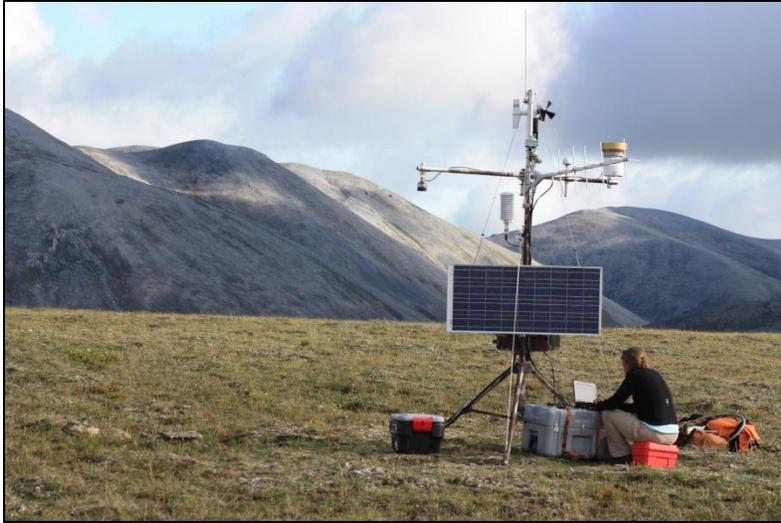
Sensors replaced:

AT-RH

SD

Narrative:

After annual maintenance at Sisiak on July 12, staff visited Mt. Noak (Figure 4) for an initial 15-minute check. The station was in good condition with some sensor problems. This initial check indicated that the AT-RH sensor needed to be replaced because it was reading -99.0. The cause of the failure is unknown, but possibly due to improper sealing between the sensor and cable. Scheduled maintenance continued on July 14. All data were downloaded to send to WRCC to update the archive. The bad AT-RH sensor was replaced with a new HMP 155. The SD sensor was replaced, as a precautionary measure, but later testing did not reveal any problems. Because snow depth readings are calibrated by the HMP 155 temperature output, snow depth readings were being affected. A new program was sent and the height of the snow depth sensor was adjusted to 81 inches. Battery cable conduit was installed with a modified plug inside the enclosure. Bolts were tightened on the solar panel u-bolts, enclosure, and crossarms. The guy wires and antenna tines were tightened. The crossbars were leveled. The antenna tines are the old style with numbers indicating placement. The transmission was tested and verified by DCS. During the next visit the datalogger should be checked and updated with the latest operating system and program.



**Figure 4.** Mt. Noak I&M RAWS.

***Tahinichok***

Date: July 14, 2012

Time of visit: afternoon

Personnel: Ken Hill, Pam Sousanes, Chris Ramsey (pilot)

Mode of transport: R-44 II helicopter – Pollux Aviation, Ltd.

Purpose of trip: Annual Maintenance

Weather: 55 F, 5-10 mph from S, intermittent showers

Sensors replaced:

Two antenna tines (the model with the imprinted numbers on the end of the tine)

Narrative:

Initial examination of the data indicated time stamp problems where data were written into future dates. The cause and solution are currently unknown. The ARCN\_V3 program was loaded on July 12 and all data were downloaded. Scheduled maintenance continued on July 14. Two antenna tines had been damaged and were replaced (#1 and #3). A battery conduit was installed with a modified end at the enclosure; the conduit extended through the enclosure hole and was held in place with electrical putty. The lower cross arm on the station was moved for a better snow depth reading. The height of the snow depth sensor is 83 inches. All bolts on the crossarms, solar panel, tripod, guy wires, and radiation shields were tightened. The battery box was secured to the tripod legs with ratchet straps. The grounding wires were re-wired correctly. All values were checked before departing the station and DCS confirmed a transmission. The desiccant was replaced in the enclosure. There was sign of caribou in the area as well as terns nesting nearby to the SE. During the next visit the datalogger should be checked and updated with the latest operating system and program.



**Figure 5.** Tahinichok I&M RAWS.

***Kiana RAWS***

Date: July 16, 2012

Time of visit: morning

Personnel: Pam Sousanes, Chris Ramsey

Mode of transport: R-44 II helicopter – Pollux Aviation, Ltd. en route from Kotzebue to Dahl Creek

Purpose of trip: RAWS maintenance

Weather: Isolated showers to the west, mostly cloudy at site, light wind

Sensors replaced: none

Narrative: While traveling en route from Kotzebue to Dahl Creek, Pam stopped at the Kiana RAWS (Figure 6) which is normally maintained by the NPS Radio Shop out of Anchorage. Larry Weddle, the NPS Western Area Fire Management Officer, informed us it had been down a few weeks and asked if we could visit the site and get the station running. The station looked good upon arrival, with no obvious sensor damage. We turned power off on the datalogger, disconnected the battery from the datalogger and transmitter, waited a few minutes and reconnected. We did not verify transmission at the site, but confirmed that the station was running after the trip.



**Figure 6.** Kiana Fire RAWS

### **Dahl Creek Base**

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

Logistics: Staff reached Dahl Creek via a commercial flight from Kotzebue to Kobuk. The Pollux Aviation Ltd., R-44 helicopter and pilot flew from Kotzebue to Dahl Creek and were used to ferry the crew and gear from Kobuk to Dahl Creek. We stayed in the NPS bunkhouse at Dahl Creek.

### **Howard Pass**

Date: July 16, 2012

Time of visit: afternoon

Personnel: Ken Hill, Pam Sousanes, Chris Ramsey (pilot)

Mode of transport: R-44 II helicopter – Pollux Aviation, Ltd.

Purpose of trip: Annual maintenance

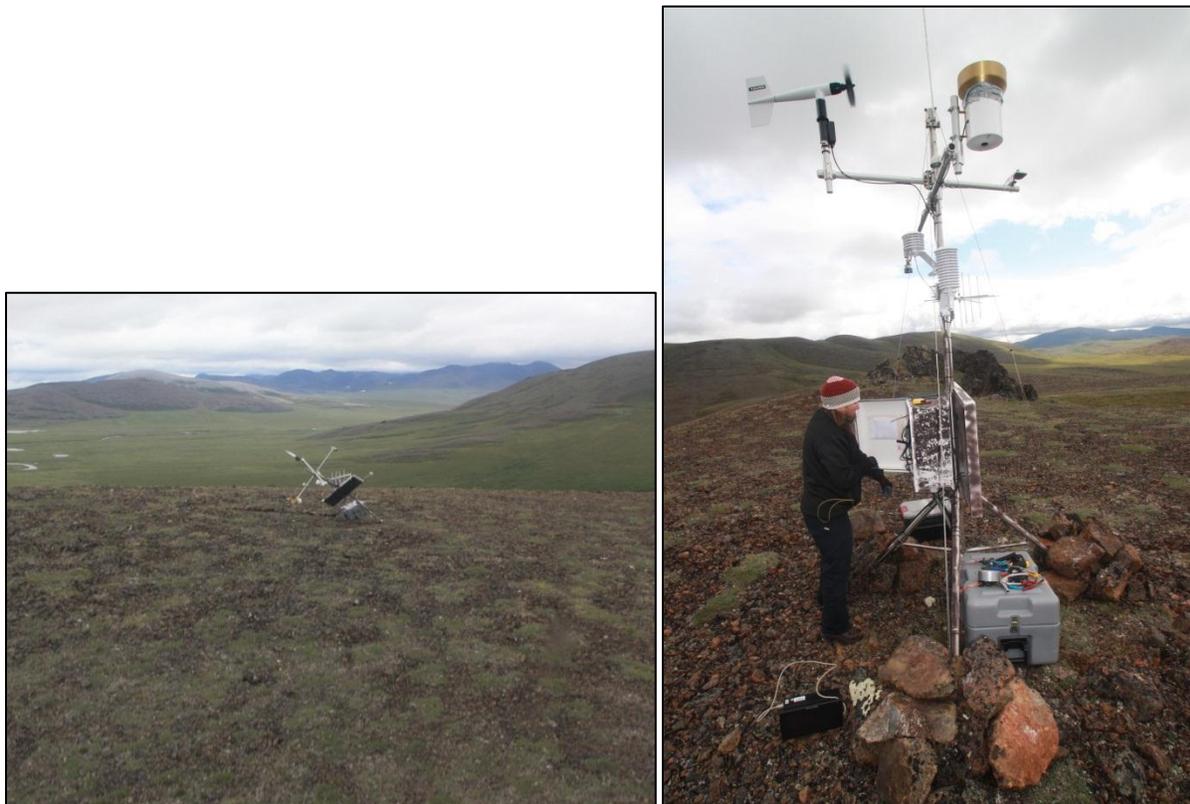
Weather: 25-40 mph from SW, 40 F, mostly cloudy, isolated showers

Sensors replaced:

AT-RH

Narrative: The Howard Pass station was accessed from Dahl Creek by R44 helicopter. Upon arrival the station was in poor condition and the weather was very windy. The tripod was tipped over with the NE leg up in the air (Figure 7). The battery box kept the station anchored. The tripod was tipped upright and repaired. The AT-RH sensor was replaced with a new model (Vaisala HMP 155). The RG-TB, SD, WS-WD, and ST sensor were tested and all were okay. All data were downloaded to update the WRCC archive. The ARCN\_V3 program was installed and the snow sensor height adjusted to 93 inches. The CM206 crossarm was moved out for a

better snow depth reading. The conduit for the battery cable was installed with a modified plug within the enclosure. The grounding wiring was corrected. All bolts and guy wires were tightened. Rocks were placed on the tripod feet to add stability. The antenna tines on this station have stripes to indicate the position. The desiccant was replaced in the enclosure. During the next visit the datalogger should be checked and updated with the latest operating system and program.



**Figure 7.** Howard Pass I&M RAWS was tipped over on arrival (left) and subsequently repaired and maintained (right).

### ***Salmon River***

Date: July 19, 2012

Time of visit: 20:30-22:30

Personnel: Ken Hill, Pam Sousanes, Chris Ramsey (pilot)

Mode of transport: R-44 II helicopter – Pollux Aviation, Ltd.

Purpose of trip: Annual maintenance

Weather: 10-20 mph, 50 F, mostly cloudy, isolated showers

Sensors replaced:

All sensors removed due to extensive bear damage

Narrative: We accessed the Salmon River station from Dahl Creek the night of July 19 after 3 days of weather delays. Upon arrival the station was in poor condition. The station had received extensive damage by a bear (Figure 8). The tripod was damaged beyond repair and all sensors were damaged. Everything was removed from the site except the battery box, guy wires, tripod

pegs, enclosure box, short crossarm, long crossarm, and the solar panel (Figure 8). Compliance for an electric bear fence will be required before the station can be reinstalled.



**Figure 8.** Salmon River I&M RAWS was destroyed by a bear (left). The station was disassembled, sensors were retrieved, and undamaged equipment was left on site (right).

### ***Kaluich***

Date: July 20, 2012

Time of visit: midday

Personnel: Ken Hill, Pam Sousanes, Chris Ramsey (pilot)

Mode of transport: R-44 II helicopter – Pollux Aviation, Ltd.

Purpose of trip: Installation

Weather: Breezy, 45 F, partly cloudy, isolated showers

Sensors replaced: All sensors installed

Narrative: The Kaluich site was accessed from Dahl Creek by R44 helicopter. Chris Ramsey (pilot) dropped staff at the installation site and returned to Dahl Creek to retrieve additional gear and fuel. The installation went smoothly and quickly and was finished in about 3 hours. The ARCN\_V3 program was compiled on the datalogger. The station was photographed before departure (Figure 9). All values were verified for accuracy with DCS before departure. Rocks were placed on the tripod feet to add stability. The program and operating system should be updated during the next visit.



**Figure 9.** Kaluich I&M RAWS installed July 20, 2012.

***Imelyak***

Date: July 20, 2012

Time of visit: 15:30

Personnel: Ken Hill, Pam Sousanes, Chris Ramsey (pilot)

Mode of transport: R-44 II helicopter – Pollux Aviation, Ltd.

Purpose of trip: Installation

Weather: 15-25 mph, partly cloudy

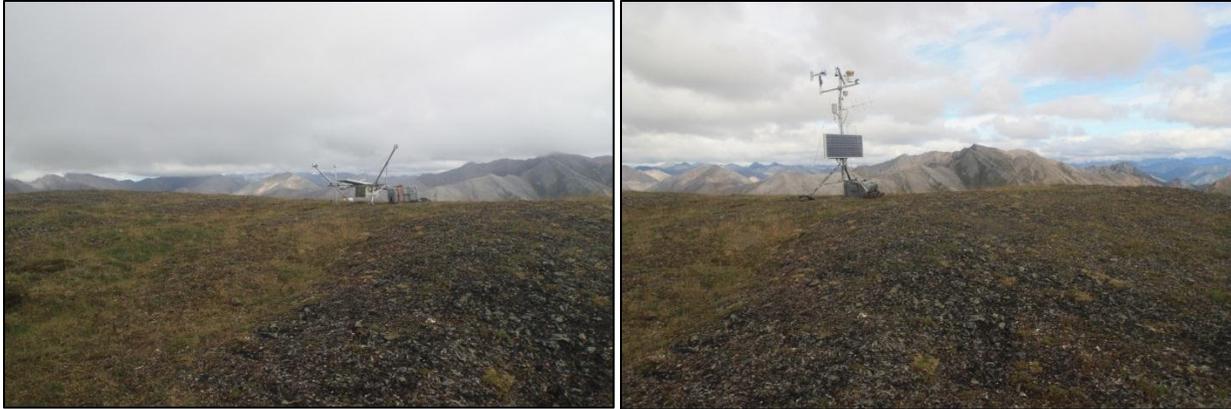
Sensors replaced:

WS-WD

CR1000 datalogger

TX312 Transmitter

Narrative: The Imelyak site was accessed from Dahl Creek by R44 helicopter after the Kaluich installation. Upon arrival the station was in poor condition. The tripod had tipped over and was overturned with the south leg up (Figure 10). The enclosure was face down and filled with water. The datalogger, transmitter, and charging regulator were submerged. The tripod was tipped upright and the contents of the enclosure were removed except for the charging regulator which was dried and reinstalled. All wire ends were dried and re-wired to a new CR1000 datalogger and new TX312 transmitter. Rocks were placed on the tripod feet to add stability and the solar panel was moved down on the mast to reduce drag. All bolts and guy wires were tightened. The height of the snow depth sensor is 104 inches. The WS-WD sensor was replaced with a new sensor. A short battery cable was installed without conduit. During the next visit a longer battery cable should be used with protective conduit. The datalogger program and operating system should be checked and updated during the next visit. All sensor readings were checked before departure and the station was photographed (Figure 10).



**Figure 10.** Imelyak I&M RAWS was tipped over upon arrival (left) and subsequently repaired and maintained (right).

### **Bettles Base**

Stations installed from Bettles include: Killik Pass (GAAR); Ram Creek (GAAR); Pamichtuk Lake (GAAR); Chimney Lake (GAAR)

Logistics: NPS staff and approximately 1200 pounds of gear and equipment were transported via a charter with Wright Air on August 6, 2012. The Temsco AS350 helicopter and pilot arrived the same day and were used to ferry the crew and gear from the Bettles base to the climate station sites. We stayed in the NPS/FWS bunkhouse at Bettles. Jeff Rasic, the YUGA archaeologist, accompanied Pam and Ken for cultural compliance of the sites prior to the installation.

### ***Pamichtuk***

Date: August 6, 2012

Time of visit: 1500-1800

Personnel: Ken Hill, Pam Sousanes, Jeff Rasic (YUGA archaeologist), Andy Hermansky (pilot)

Mode of transport: AS350 helicopter from Bettles

Purpose of trip: Installation

Weather: Mostly sunny, calm

Sensors replaced: all sensors installed

### **Narrative:**

Staff departed Bettles at 14:00 on August 6 and arrived at Pamichtuk at approximately 15:00 (~70 miles). A new site was selected approximately 1 mile SE of the original site due to southern exposure limitations. The station (elevation 3300 feet) is located approximately 1.6 miles east of Pamichtuk Lake (elevation 1865 feet). Jeff approved the site for cultural compliance. The installation went quickly and was finished in less than three hours. The datalogger program at the site is ARCN\_V4.1 and should be updated during the next visit. The satellite transmitter LEDs indicated a transmission before departure; the transmission was also verified through DCS. The height of the SD sensor is 82 inches. Before departure on August 6 the station was photographed from all directions (e.g., Figure 11). Staff returned to the site on August 7 to paint the enclosure back of the solar panel.



**Figure 11.** Pamichtuk I&M RAWS installed on August 6, 2012.

***Ram Creek***

Date: August 7, 2012

Time of visit: 1000-1300

Personnel: Ken Hill, Pam Sousanes, Jeff Rasic (YUGA archaeology), Andy Hermansky (pilot)

Mode of transport: AS350 helicopter from Bettles

Purpose of trip: Installation

Weather: Scattered showers, calm

Sensors replaced: all sensors installed

Narrative:

Staff departed Bettles at 09:00 on August 7 and arrived at Ram Creek at approximately 10:00 (~100 miles). A new site was selected approximately 6 miles SE of the original site due to southern exposure limitations. The station elevation is 4135 feet. Jeff approved the site for cultural compliance. The installation went quickly and was finished in less than three hours. The datalogger program at the site is ARCN\_V4.1 and should be updated during the next visit. The soil probes went in easily and a 100 cm depth could be added at the next visit. The transmitter LEDs indicated a transmission before departure. Rocks were placed on the tripod feet to add stability. The station was painted and photographed before departure (Figure 12).



**Figure 12.** Ram Creek I&M RAWS installed August 7, 2012.

### ***Chimney Lake***

Date: August 7, 2012

Time of visit: 1400-1900

Personnel: Ken Hill, Pam Sousanes, Jeff Rasic (YUGA archaeology), Andy Hermansky (pilot)

Mode of transport: AS350 helicopter from Bettles

Purpose of trip: Installation

Weather: Partly cloudy with isolated showers, 6-8 mph wind from the west.

Sensors replaced: all sensors installed

### Narrative:

Staff departed Ram Creek at 13:30 on August 7 and arrived at Chimney Lake site at approximately 14:00. A new site was selected approximately 4 miles SW of the original site due to southern exposure limitations. The station elevation is ~3800 feet on a small knob south of Chimney Mountain. Jeff approved the site for cultural compliance. The calculated walking distance from Chimney Lake is approximately 6 miles with 1500 feet of elevation gain. The installation went quickly and was finished in less than three hours. The datalogger program at the site is ARCN\_V4.1 and should be updated during the next visit. The soil probes went in easily and a 100 cm depth could be added at the next visit. The transmitter LEDs indicated a transmission before departure. Rocks were placed on the tripod feet to add stability. The station was painted and photographed before departure (Figure 13).



**Figure 13.** Chimney Lake I&M RAWS installed August 7, 2012.

***Killik Pass***

Date: August 8, 2012

Time of visit: 0930-1400

Personnel: Ken Hill, Pam Sousanes, Jeff Rasic (YUGA archaeology), Andy Hermansky (pilot)

Mode of transport: AS350 helicopter from Bettles

Purpose of trip: Installation

Weather: Partly cloudy with intermittent rain/snow, 10-15 mph wind. Near freezing.

Sensors replaced: all sensors installed

**Narrative:**

Staff departed Bettles at 09:00 on August 8 and arrived at Killik Pass at approximately 14:00. A new site was selected approximately 4 miles SW of the original site due to southern exposure limitations. The station elevation is ~4350 feet approximately 1.5 miles north of a lake (elevation 3180 feet). The site was approved by Jeff for cultural compliance. The installation went quickly and was finished in less than three hours. The datalogger program at the site is ARCN\_V4.1 and should be updated during the next visit. The soil probes went in easily and a 100 cm depth installation could be attempted at the next visit. The transmitter LEDs indicated a transmission before departure. Rocks were placed on the tripod feet to add stability. The station was painted and photographed before departure (Figure 14).



**Figure 14.** Killik Pass I&M RAWS installed August 8, 2012.

### **Nome Base**

Stations maintained from Nome include: Devil Mountain (BELA); Serpentine (BELA); Midnight Mountain (BELA); HooDoo Hills Fire RAWS (BELA); and Quartz Creek Fire RAWS.

Logistics: NPS staff flew via commercial airline to Nome and based out of Nome and Quartz Creek for the station maintenance. Gear was transported via Evert's Air Cargo (with delays) and a Bering Air R-44 helicopter was contracted to ferry staff from the base locations to the climate sites.

### ***Devil Mountain***

Date: August 23, 2012

Time of visit: 0930-1300

Personnel: Ken Hill, Pam Sousanes, Russell Rowe (Bering Air Pilot)

Mode of transport: R44 from Bering Air 4138M

Purpose of trip: Annual maintenance

Weather: Isolated rain showers, light breeze, 52 F.

Sensors replaced:

AT-RH

WS-WD

SD

Soil 20 cm

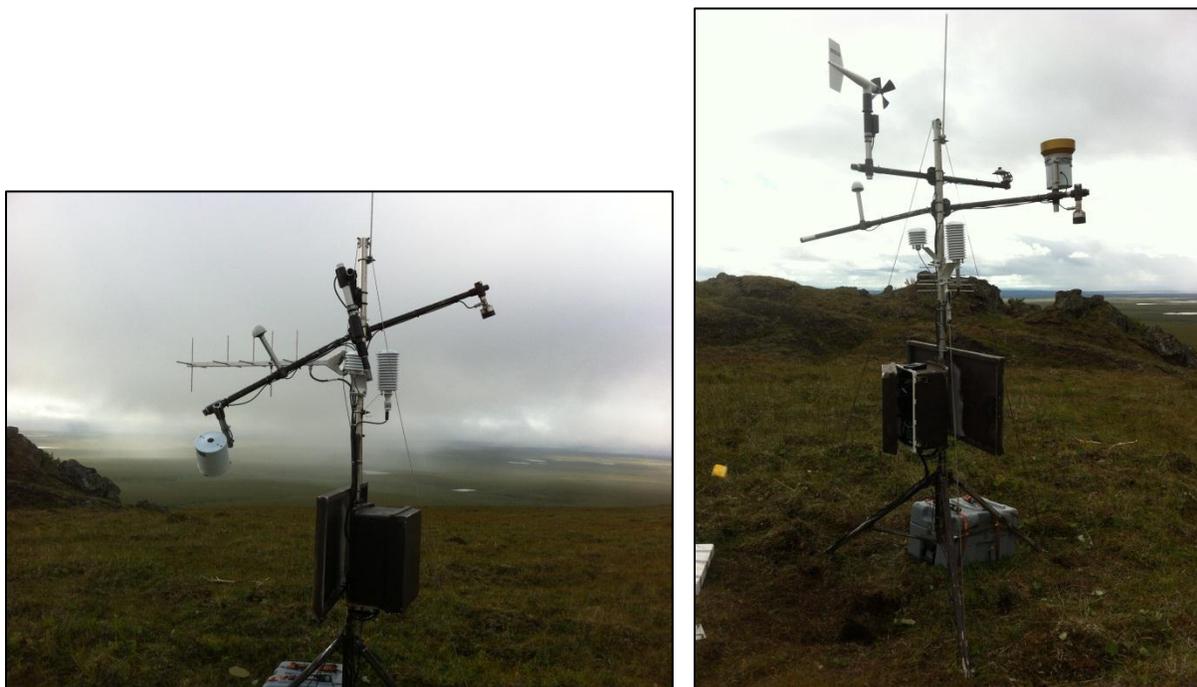
Soil 50 cm

Antenna

Narrative:

NPS staff drove the Kougarok road from Nome the morning of August 23 and met the Bering Air R44 helicopter at Quartz Creek at 11:30. Staff arrived at Devil Mountain site at 13:00. The site had been damaged by a bear (Figure 15). The precipitation bucket was upside down and the wind sensor was destroyed. The solar panel and enclosure were facing E-W on arrival. Two soil

temperature sensors had been cut. The HMP-155 sensor was replaced with a HMP-45. The WS-WD sensor was replaced. The SD sensor was replaced. The antenna was replaced. The RG-TB was moved to the other side of the bent CM206 crossarm. The 20 cm and 50 cm soil temperature sensors were repaired and/or replaced. The long CM206 crossarm is bent and needs to be replaced during the next visit. The ARCN\_V6 program was loaded to the CR1000 datalogger and the snow depth sensor was recalibrated to 0 inches. All bolts, guy wires, and grounding wires were tightened. The solar panel and antenna were realigned. All bolts and guy wires were tightened. Data were downloaded from the station for updating the WRCC archive. Before departure the station was photographed (Figure 15). Conduit for the power cables was left in the enclosure and should be installed during the next visit. The CM206 crossarm is bent and should be replaced at the next visit. A bear fence should be installed during the next visit. The datalogger operating system and program should be checked and updated next visit.



**Figure 15.** Devil Mountain I&M RAWS before (left) and after (right) maintenance. The station had been damaged by a bear.

### ***Midnight Mountain***

Date: August 23, 2012

Time of visit: 1400-1700

Personnel: Ken Hill, Pam Sousanes, Russell Rowe (Bering Air Pilot)

Mode of transport: R44 from Bering Air 4138M

Purpose of trip: Station removed due to rime ice

Weather: 50 F, 10 mph from SE, Partly cloudy.

Sensors replaced: All sensors removed

Narrative:

After maintenance at Devil Mountain, staff traveled to Midnight Mountain. Photos from the previous winter showed the station completely encased in ice (Figure 16). Upon arrival on August 23, the site was severely damaged and the steel mast was bent at a ninety degree angle with the antenna pointing into the ground. All sensors were removed and appeared to be in decent condition. The batteries, battery box, tripod, solar panel, mast, and cross arms were left at the site and will be removed at a future date. We will evaluate placing sensors on the adjacent NPS repeater site that is scheduled for replacement in 2013.



**Figure 16.** Midnight Mountain was encased in rime ice for most of the 2012 winter (left). All sensors were removed during the August 23, 2012 site visit (right).

### ***Serpentine***

Date: August 23, 2012

Time of visit: 1400-1700

Personnel: Ken Hill, Pam Sousanes, Russell Rowe (Bering Air Pilot)

Mode of transport: R44 from Bering Air 4138M

Purpose of trip: Annual maintenance

Weather: 50 F, 10 mph from SE, Partly cloudy.

Sensors replaced: None. Soil sensors repaired.

### Narrative:

After maintenance at Devil Mountain, staff traveled to Serpentine. The site was in good condition with a few minor problems. Wildlife had damaged the 20 cm and 50 cm soil temperature sensors which were repaired by splicing. A few antenna tines were on the ground which were replaced and tightened. All data were downloaded to send to WRCC to update the archive. ARCN\_V5 program was loaded to replace ARCN\_V1 and the snow depth sensor was recalibrated. Before departure the station was photographed and all bolts were checked and tightened as needed (Figure 17). The datalogger operating system and program should be checked and updated during the next visit.



**Figure 17.** Serpentine I&M RAWS.

***HooDoo Hills Fire RAWS***

Date: August 23, 2012

Time of visit: 1700-1800

Personnel: Ken Hill, Pam Sousanes, Russell Rowe (Bering Air Pilot)

Mode of transport: R44 from Bering Air 4138M

Purpose of trip: Annual maintenance

Weather: Isolated rain showers, light breeze, 52 F.

Sensors replaced:

WS-WD

AT-RH

Narrative:

After maintenance at Serpentine, staff traveled to HooDoo RAWS. The site had been damaged by a bear. Pam replaced the WS-WD and AT-RH. The SR was repaired by splicing and the GOES antenna tines were replaced. The GOES antenna needs to be replaced, a temporary fix using cable ties was attempted to keep the antenna pointed in the right direction for transmission. Ken installed a solar electric fence for bear protection (Figure 18). The fence stakes are situated so that the mast can be lowered between the NE and NW posts.

Second visit:

Date: September 18, 2012

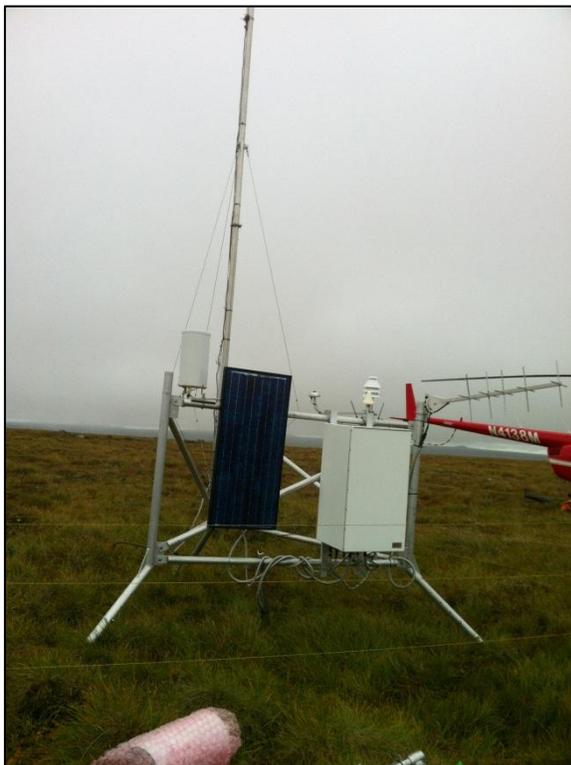
Time of visit: 10:00-12:30

Personnel: Ken Hill, Pam Sousanes, Russell Rowe (Bering Air Pilot)  
Mode of transport: R44 from Bering Air 4138M  
Purpose of trip: Maintenance  
Weather: Cloudy. Isolated fog and snow showers.

Sensors replaced:  
Antenna

Narrative:

We returned to the HooDoo Hills Fire RAWS station again on September 18, 2012 via Bering Air R44 helicopter from Nome. Upon arrival it became clear that a bear had gone through the electric fence (hair on the posts) and damaged the fence grounding rods. The cable for the solar radiation sensor was ripped, but was repaired by splicing. The antenna was lying on the ground and the weld had been damaged. A new GOES antenna was used as a replacement. The bear fence was also repaired.



**Figure 18.** HooDoo Hills NPS Fire RAWS.

**Quartz Creek Fire RAWS**

Date: August 23, 2012  
Time of visit: 1900-2100  
Personnel: Ken Hill, Pam Sousanes, Phil Westcott (WEAR outreach/film)  
Mode of transport: Government vehicle from Nome  
Purpose of trip: Annual maintenance  
Weather: Cloudy

Sensors replaced:  
Battery  
RG-TB

Narrative:

The RG-TB was replaced and the larger 12V battery in the battery enclosure was replaced at the Quartz Creek Fire RAWS station (Figure 19). We could not get the smaller battery in the datalogger enclosure out for replacement; although it was scheduled for replacement it is still in good shape. Ken participated in a short film interview by Phil Westcott.



**Figure 19.** Quartz Creek NPS Fire RAWS (Photo from 2009).

***Ella Creek***

Date: September 18, 2012

Time of visit: 13:00-16:30

Personnel: Ken Hill, Pam Sousanes, Russell Rowe (Bering Air Pilot)

Mode of transport: R44 from Bering Air 4138M

Purpose of trip: Installation

Weather: Cloudy. Isolated fog and rain/snow showers.

Sensors replaced: Everything installed except antenna

Narrative:

Access to Ella Creek was via a Bering Air R44 helicopter from Nome. There was patchy snow cover, intermittent fog, and occasional rain/snow shower at the installation site upon arrival. The installation went smoothly and was completed within three hours. There is no data transmission at the site because there was not an antenna available for installation. The soil sensors were installed easily in rocky terrain. All soil temperatures were reading about 32° F. The ARCN\_V6 program was installed with operating system 25. Rocks were placed on the tripod feet for added stability. The station was photographed before departure (Figure 20). An antenna will be installed during the next visit.



**Figure 20.** Ella Creek I&M RAWS installation

## **Appendix A: Logistics Summary 2012**

### **Kotzebue Logistics July 11-15**

Pam and Ken traveled to Kotzebue by arranging a Wright Air caravan charter (tail 9WV with pilot Dave Fagre). We stopped briefly at Dahl Creek to drop off supplies. ARCN typically employs an expeditor in Kotzebue to help with logistics. In 2012, the expeditor, Evan Watson, was able to pick us up from the NPS hangar, provide us with keys for NPS housing and vehicles as needed. We delivered supplies for the coastal lagoons project and stored it in the I&M cache at the NPS warehouse. We also talked with Ben Crosby at the NPS hangar. We visited Lee Anne Ayres and Tina Moran at the USFWS to update them on our projects. We met with Jim Dau at Alaska Fish and Game to provide support for his dataloggers. We dropped off a copy of our flight plan at the NPS office and met with various staff. Nick Dougal, the WEAR chief of maintenance, supplied a key to the NPS hangar. We maintained/installed Tahinichok, Mt. Noak, Asik, and Sisiak from the Kotzebue base. Ken and Pam traveled directly to Dahl Creek from Kotzebue (see below).

### **Dahl Creek Logistics July 16-20**

Ken traveled from Kotzebue to Kobuk on Bering Air's scheduled flight service. Pam traveled with Chris Ramsey (Pollux pilot) in the R44 helicopter with a short stop at the Kiana RAWs to cycle the power. Ken waited in Kobuk for Pam and Chris to arrive and move him to Dahl Creek with the remaining gear. Fuel keys for Dahl Creek were obtained from the Fairbanks aviation manager. There is an NPS 100LL AvGas tank in Dahl Creek. It is important to check with the NPS pilots that have been using the tank and the Northern Hub Aviation Manager to ensure there is adequate fuel in the tank. In 2012, the Nova Copper mining operation at Dahl Creek had Jet-A fuel available for purchase. NPS cabin keys at Dahl Creek were obtained from Jim Lawler. If a generator is needed, check with Tara Whitesell (ARCN logistics), the Northern Hub Aviation Manager, and the NPS pilots, there may be one already in Dahl Creek. There is a propane cook stove and propane refrigerator at the Dahl Creek cabin. A new 5-gallon propane tank was installed in July 2012. Check with the pilots and aviation manager for current supply. After consecutive weather days without flying at Dahl Creek, we maintained/installed Kaluich, Imelyak, Howard Pass, and Salmon River in less than 24 hours. Pam and Ken returned to Fairbanks on an Evert's Air Piper charter. Some gear was left at Dahl Creek and later retrieved by NPS pilot Curtis Cebulski.

### **Bettles Logistics August 6-8**

Ken, Pam, and Jeff Rasic (YUGA archaeologist) traveled to Bettles on a Wright Air caravan charter with gear for four installations. Staff stayed in the NPS/USFWS bunk house after checking in with DaleLynn Gardner at the NPS office in Bettles. A NPS vehicle was used as needed to ferry gear from the bunkhouse to the air strip. Andy Hermansky, the Temsco A-star helicopter pilot on a 90-day contract with NPS, traveled from Denali and also stayed in NPS housing. Killik Pass, Ram Creek, Pamichtuk Lake, and Chimney Lake stations were installed from the Bettles base. Ken and Pam returned to Fairbanks with Andy in the helicopter. Jeff returned on a scheduled Wright Air flight.

### **Nome Logistics August 20-24**

Pam and Ken traveled to Nome on a scheduled Alaska Airline flights from Fairbanks. We pre-arranged for local staff to pick us up from the airport. We reserved beds at the NPS bunkhouse and checked in with local staff. We shipped supplies on Evert's Air Cargo from Fairbanks to Nome. We shipped the supplies 4-6 days in advance, but due to weather delays the cargo did not arrive for an additional 3 days. Shipping cargo 8-12 days in advance is a safer time estimate. While in Nome we met with local staff. We reserved a vehicle to transport gear up the Kougarok road to Quartz Creek where a Bering Air helicopter met us for transport to Devil Mountain, Serpentine, and Hoodoo. After returning from site maintenance, we completed maintenance at the Quartz Creek RAWS and participated in a short film interview for an outreach project by Phil Westcott (WEAR staff). Pam and Ken drove back from Quartz Creek to Nome before departing on an Alaska Airlines flight to Fairbanks the following day. Before departing Nome we stored some supplies at the NPS warehouse and shipped additional gear back to Fairbanks on Evert's Air Cargo. This shipment was lost for many weeks by Evert's, but was eventually found in Anchorage with Northern Air Cargo. Evert's Air Cargo arranged for final transport to Fairbanks.

### **Nome Logistics September 18-20**

Pam and Ken returned to Nome in late September to finish up field work that was not completed during the August trip. We were picked up at the airport by Tara Whitesell, ARCN logistic coordinator. We picked up bunk house keys and vehicle keys from the NPS office. The equipment had been stored in the NPS warehouse on 3<sup>rd</sup> street – the keys to the warehouse were obtained from the main office. During this visit we installed the Ella Creek I&M RAWS site and made repairs to the Hoodoo Hills Fire RAWS station.

## Appendix B: ARCN I&M RAWS Components by Station (as of 2012)

**Table 2.** Metadata for Asik I&M RAWS.

Station Name	Item	Model	Start Date	Stop Date
Asik	Antenna	25316 YAGI	7/13/2012	Active
Asik	AT	ThermX	7/13/2012	Active
Asik	AT-RH	HMP-155	7/13/2012	Active
Asik	Battery	100 AH (x2)	7/13/2012	Active
Asik	Crossarm	CM204	7/13/2012	Active
Asik	Crossarm	CM206	7/13/2012	Active
Asik	Datalogger	CR1000	7/13/2012	Active
Asik	Enclosure	ENC 16/18	7/13/2012	Active
Asik	GPS	17992 GPS	7/13/2012	Active
Asik	DLP	ARCN_V3	7/13/2012	Active
Asik	RG-TB	TE525	7/13/2012	Active
Asik	SD	SR50a	7/13/2012	Active
Asik	Solar Panel	75 W	7/13/2012	Active
Asik	SR	Li200x	7/13/2012	Active
Asik	ST	107	7/13/2012	Active
Asik	ST	107	7/13/2012	Active
Asik	ST	107	7/13/2012	Active
Asik	Tripod	CM106	7/13/2012	Active
Asik	TX312	NESDIS ID 3961A40E	7/13/2012	Active
Asik	WS/WD	5103	7/13/2012	Active

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

Station Name	Item	Model	Start Date	Stop Date
Chimney Lake	Antenna	25316 YAGI	8/7/2012	Active
Chimney Lake	AT	ThermX	8/7/2012	Active
Chimney Lake	AT-RH	HMP-155	8/7/2012	Active
Chimney Lake	Battery	100 AH (x2)	8/7/2012	Active
Chimney Lake	Crossarm	CM204	8/7/2012	Active
Chimney Lake	Crossarm	CM206	8/7/2012	Active
Chimney Lake	Datalogger	CR1000	8/7/2012	Active
Chimney Lake	Enclosure	ENC 16/18	8/7/2012	Active
Chimney Lake	GPS	17992 GPS	8/7/2012	Active
Chimney Lake	DLP	ARCN_V4.1	8/7/2012	Active
Chimney Lake	RG-TB	TE525	8/7/2012	Active
Chimney Lake	SD	SR50a	8/7/2012	Active
Chimney Lake	Solar Panel	75 W	8/7/2012	Active
Chimney Lake	SR	Li200x	8/7/2012	Active
Chimney Lake	ST	107	8/7/2012	Active
Chimney Lake	ST	107	8/7/2012	Active
Chimney Lake	ST	107	8/7/2012	Active
Chimney Lake	Tripod	CM106	8/7/2012	Active
Chimney Lake	TX312	NESDIS ID 3961F472	8/7/2012	Active
Chimney Lake	WSWD	5103	8/7/2012	Active

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

Station Name	Item	Model	Start Date	Stop Date
Devil Mountain	Antenna	25316 YAGI	8/18/2011	8/23/2012
Devil Mountain	Antenna	25316 YAGI	8/23/2012	Active
Devil Mountain	AT	ThermX	8/18/2011	Active
Devil Mountain	AT-RH	HMP-155	8/18/2011	8/23/2012
Devil Mountain	AT-RH	HMP-45	8/23/2012	Active
Devil Mountain	Battery	100 AH (x2)	8/18/2011	Active
Devil Mountain	Crossarm	CM204	8/18/2011	Active
Devil Mountain	Crossarm	CM206	8/18/2011	Active
Devil Mountain	Datalogger	CR1000	8/18/2011	Active
Devil Mountain	Enclosure	ENC 16/18	8/18/2011	Active
Devil Mountain	GPS	17992 GPS	8/18/2011	Active
Devil Mountain	DLP	ARCN_V1	8/18/2011	8/23/2012
Devil Mountain	DLP	ARCN_V6	8/23/2012	Active
Devil Mountain	RG-TB	TE525	8/18/2011	Active
Devil Mountain	SD	SR50a	8/18/2011	8/23/2012
Devil Mountain	SD	SR50a	8/23/2012	Active
Devil Mountain	Solar Panel	75 W	8/18/2011	Active
Devil Mountain	SR	Li200x	8/18/2011	Active
Devil Mountain	ST	107	8/18/2011	Active
Devil Mountain	ST	107	8/18/2011	Active
Devil Mountain	ST	107	8/18/2011	Active
Devil Mountain	Tripod	CM106	8/18/2011	Active
Devil Mountain	TX312	NESDIS ID 3961221A	8/18/2011	Active
Devil Mountain	WSWD	5103	8/18/2011	8/23/2012
Devil Mountain	WSWD	5103	8/23/2012	Active

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

Station Name	Item	Model	Start Date	Stop Date
Ella Creek	Antenna	25316 YAGI	9/18/2012	Active
Ella Creek	AT	ThermX	9/18/2012	Active
Ella Creek	AT-RH	HMP-155	9/18/2012	Active
Ella Creek	Battery	100 AH (x2)	9/18/2012	Active
Ella Creek	Crossarm	CM204	9/18/2012	Active
Ella Creek	Crossarm	CM206	9/18/2012	Active
Ella Creek	Datalogger	CR1000	9/18/2012	Active
Ella Creek	Enclosure	ENC 16/18	9/18/2012	Active
Ella Creek	GPS	17992 GPS	9/18/2012	Active
Ella Creek	DLP	ARCN_V3	9/18/2012	Active
Ella Creek	RG-TB	TE525	9/18/2012	Active
Ella Creek	SD	SR50a	9/18/2012	Active
Ella Creek	Solar Panel	75 W	9/18/2012	Active
Ella Creek	SR	Li200x	9/18/2012	Active
Ella Creek	ST	107	9/18/2012	Active
Ella Creek	ST	107	9/18/2012	Active
Ella Creek	ST	107	9/18/2012	Active
Ella Creek	Tripod	CM106	9/18/2012	Active
Ella Creek	TX312	NESDIS ID 3961A40E	9/18/2012	Active
Ella Creek	WSWD	5103	9/18/2012	Active

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

Station Name	Item	Model	Start Date	Stop Date
Howard Pass	Antenna	25316 YAGI	7/7/2011	Active
Howard Pass	AT	ThermX	7/7/2011	Active
Howard Pass	AT-RH	HMP-155	7/7/2011	7/16/2012
Howard Pass	AT-RH	HMP-155	7/16/2012	Active
Howard Pass	Battery	100 AH (x2)	7/7/2011	Active
Howard Pass	Crossarm	CM204	7/7/2011	Active
Howard Pass	Crossarm	CM206	7/7/2011	Active
Howard Pass	Datalogger	CR1000	7/7/2011	Active
Howard Pass	Enclosure	ENC 16/18	7/7/2011	Active
Howard Pass	GPS	17992 GPS	7/7/2011	Active
Howard Pass	DLP	ARCN_V1	7/7/2011	7/16/2012
Howard Pass	DLP	ARCN_V3	7/16/2012	Active
Howard Pass	RG-TB	TE525	7/7/2011	Active
Howard Pass	SD	SR50a	7/7/2011	Active
Howard Pass	Solar Panel	75 W	7/7/2011	Active
Howard Pass	SR	Li200x	7/7/2011	Active
Howard Pass	ST	107	7/7/2011	Active
Howard Pass	ST	107	7/7/2011	Active
Howard Pass	ST	107	7/7/2011	Active
Howard Pass	Tripod	CM106	7/7/2011	Active
Howard Pass	TX312	NESDIS ID 39617266	7/7/2011	Active
Howard Pass	WSWD	5103	7/7/2011	Active

**Table 7.** Metadata for Imelyak I&M RAWS.

Station Name	Item	Model	Start Date	Stop Date
Imelyak	Antenna	25316 YAGI	7/6/2011	Active
Imelyak	AT	ThermX	7/6/2011	Active
Imelyak	AT-RH	HMP-155	7/6/2011	Active
Imelyak	Battery	100 AH (x2)	7/6/2011	Active
Imelyak	Crossarm	CM204	7/6/2011	Active
Imelyak	Crossarm	CM206	7/6/2011	Active
Imelyak	Datalogger	CR1000	7/6/2011	7/20/2012
Imelyak	Datalogger	CR1000	7/20/2012	Active
Imelyak	Enclosure	ENC 16/18	7/6/2011	Active
Imelyak	GPS	17992 GPS	7/6/2011	Active
Imelyak	DLP	ARCN_V1	7/6/2011	7/20/2012
Imelyak	DLP	ARCN_V3	7/20/2012	Active
Imelyak	RG-TB	TE525	7/6/2011	Active
Imelyak	SD	SR50a	7/6/2011	Active
Imelyak	Solar Panel	75 W	7/6/2011	Active
Imelyak	SR	Li200x	7/6/2011	Active
Imelyak	ST	107	7/6/2011	Active
Imelyak	ST	107	7/6/2011	Active
Imelyak	ST	107	7/6/2011	Active
Imelyak	Tripod	CM106	7/6/2011	Active
Imelyak	TX312	NESDIS ID 3961316C	7/6/2011	7/20/2012
Imelyak	TX312	NESDIS ID 3961316C	7/20/2012	Active
Imelyak	WS/WD	5103	7/6/2011	7/20/2012
Imelyak	WS/WD	5103	7/20/2012	Active

**Table 8.** Metadata for Kaluich I&M RAWS.

Station Name	Item	Model	Start Date	Stop Date
Kaluich	Antenna	25316 YAGI	7/20/2012	Active
Kaluich	AT	ThermX	7/20/2012	Active
Kaluich	AT-RH	HMP-155	7/20/2012	Active
Kaluich	Battery	100 AH (x2)	7/20/2012	Active
Kaluich	Crossarm	CM204	7/20/2012	Active
Kaluich	Crossarm	CM206	7/20/2012	Active
Kaluich	Datalogger	CR1000	7/20/2012	Active
Kaluich	Enclosure	ENC 16/18	7/20/2012	Active
Kaluich	GPS	17992 GPS	7/20/2012	Active
Kaluich	DLP	ARCN_V3	7/20/2012	Active
Kaluich	RG-TB	TE525	7/20/2012	Active
Kaluich	SD	SR50a	7/20/2012	Active
Kaluich	Solar Panel	75 W	7/20/2012	Active
Kaluich	SR	Li200x	7/20/2012	Active
Kaluich	ST	107	7/20/2012	Active
Kaluich	ST	107	7/20/2012	Active
Kaluich	ST	107	7/20/2012	Active
Kaluich	Tripod	CM106	7/20/2012	Active
Kaluich	TX312	NESDIS ID 39617266	7/20/2012	Active
Kaluich	WSWD	5103	7/20/2012	Active

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

Station Name	Item	Model	Start Date	Stop Date
Killik Pass	Antenna	25316 YAGI	8/8/2012	Active
Killik Pass	AT	ThermX	8/8/2012	Active
Killik Pass	AT-RH	HMP-155	8/8/2012	Active
Killik Pass	Battery	100 AH (x2)	8/8/2012	Active
Killik Pass	Crossarm	CM204	8/8/2012	Active
Killik Pass	Crossarm	CM206	8/8/2012	Active
Killik Pass	Datalogger	CR1000	8/8/2012	Active
Killik Pass	Enclosure	ENC 16/18	8/8/2012	Active
Killik Pass	GPS	17992 GPS	8/8/2012	Active
Killik Pass	DLP	ARCN_V4.1	8/8/2012	Active
Killik Pass	RG-TB	TE525	8/8/2012	Active
Killik Pass	SD	SR50a	8/8/2012	Active
Killik Pass	Solar Panel	75 W	8/8/2012	Active
Killik Pass	SR	Li200x	8/8/2012	Active
Killik Pass	ST	107	8/8/2012	Active
Killik Pass	ST	107	8/8/2012	Active
Killik Pass	ST	107	8/8/2012	Active
Killik Pass	Tripod	CM106	8/8/2012	Active
Killik Pass	TX312	NESDIS ID 3961C1E8	8/8/2012	Active
Killik Pass	WS/WD	5103	8/8/2012	Active

**Table 10.** Metadata for Midnight Mountain I&M RAWs.

Station Name	Item	Model	Start Date	Stop Date
Midnight Mountain	Antenna	25316 YAGI	7/8/2011	8/23/2012
Midnight Mountain	AT	ThermX	7/8/2011	8/23/2012
Midnight Mountain	AT-RH	HMP-155	7/8/2011	8/23/2012
Midnight Mountain	Battery	100 AH (x2)	7/8/2011	8/23/2012
Midnight Mountain	Cross arm	CM204	7/8/2011	8/23/2012
Midnight Mountain	Cross arm	CM206	7/8/2011	8/23/2012
Midnight Mountain	Datalogger	CR1000	7/8/2011	8/23/2012
Midnight Mountain	Enclosure	ENC 16/18	7/8/2011	8/23/2012
Midnight Mountain	GPS	17992 GPS	7/8/2011	8/23/2012
Midnight Mountain	DLP	ARCN_V1	7/8/2011	8/23/2012
Midnight Mountain	RG-TB	TE525	7/8/2011	8/23/2012
Midnight Mountain	SD	SR50a	7/8/2011	8/23/2012
Midnight Mountain	Solar Panel	75 W	7/8/2011	8/23/2012
Midnight Mountain	SR	Li200x	7/8/2011	8/23/2012
Midnight Mountain	ST	107	7/8/2011	8/23/2012
Midnight Mountain	ST	107	7/8/2011	8/23/2012
Midnight Mountain	ST	107	7/8/2011	8/23/2012
Midnight Mountain	Tripod	CM106	7/8/2011	8/23/2012
Midnight Mountain	TX312	NESDIS ID 3960F688	7/8/2011	8/23/2012
Midnight Mountain	WS/WD	5103	7/8/2011	8/23/2012

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

Station Name	Item	Model	Start Date	Stop Date
Mt. Noak	Antenna	25316 YAGI	7/11/2011	Active
Mt. Noak	AT	ThermX	7/11/2011	Active
Mt. Noak	AT-RH	HMP-155	7/11/2011	7/14/2012
Mt. Noak	AT-RH	HMP-155	7/14/2012	Active
Mt. Noak	Battery	100 AH (x2)	7/11/2011	Active
Mt. Noak	Crossarm	CM204	7/11/2011	Active
Mt. Noak	Crossarm	CM206	7/11/2011	Active
Mt. Noak	Datalogger	CR1000	7/11/2011	Active
Mt. Noak	Enclosure	ENC 16/18	7/11/2011	Active
Mt. Noak	GPS	17992 GPS	7/11/2011	Active
Mt. Noak	DLP	ARCN_V1	7/11/2011	7/14/2012
Mt. Noak	DLP	ARCN_V3	7/14/2012	Active
Mt. Noak	RG-TB	TE525	7/11/2011	Active
Mt. Noak	SD	SR50a	7/11/2011	7/14/2012
Mt. Noak	SD	SR50a	7/14/2012	Active
Mt. Noak	Solar Panel	75 W	7/11/2011	Active
Mt. Noak	SR	Li200x	7/11/2011	Active
Mt. Noak	ST	107	7/11/2011	Active
Mt. Noak	ST	107	7/11/2011	Active
Mt. Noak	ST	107	7/11/2011	Active
Mt. Noak	Tripod	CM106	7/11/2011	Active
Mt. Noak	TX312	NESDIS ID 39616110	7/11/2011	Active
Mt. Noak	WS/WD	5103	7/11/2011	Active

**Table 12.** Metadata for Pamichtuk I&M RAWS.

Station Name	Item	Model	Start Date	Stop Date
Pamichtuk	Antenna	25316 YAGI	8/6/2012	Active
Pamichtuk	AT	ThermX	8/6/2012	Active
Pamichtuk	AT-RH	HMP-155	8/6/2012	Active
Pamichtuk	Battery	100 AH (x2)	8/6/2012	Active
Pamichtuk	Crossarm	CM204	8/6/2012	Active
Pamichtuk	Crossarm	CM206	8/6/2012	Active
Pamichtuk	Datalogger	CR1000	8/6/2012	Active
Pamichtuk	Enclosure	ENC 16/18	8/6/2012	Active
Pamichtuk	GPS	17992 GPS	8/6/2012	Active
Pamichtuk	DLP	ARCN_V4.1	8/6/2012	Active
Pamichtuk	RG-TB	TE525	8/6/2012	Active
Pamichtuk	SD	SR50a	8/6/2012	Active
Pamichtuk	Solar Panel	75 W	8/6/2012	Active
Pamichtuk	SR	Li200x	8/6/2012	Active
Pamichtuk	ST	107	8/6/2012	Active
Pamichtuk	ST	107	8/6/2012	Active
Pamichtuk	ST	107	8/6/2012	Active
Pamichtuk	Tripod	CM106	8/6/2012	Active
Pamichtuk	TX312	NESDIS ID 3961E704	8/6/2012	Active
Pamichtuk	WSWD	5103	8/6/2012	Active

**Table 13.** Metadata for Ram Creek I&M RAWs.

Station Name	Item	Model	Start Date	Stop Date
Ram Creek	Antenna	25316 YAGI	8/7/2012	Active
Ram Creek	AT	ThermX	8/7/2012	Active
Ram Creek	AT-RH	HMP-155	8/7/2012	Active
Ram Creek	Battery	100 AH (x2)	8/7/2012	Active
Ram Creek	Crossarm	CM204	8/7/2012	Active
Ram Creek	Crossarm	CM206	8/7/2012	Active
Ram Creek	Datalogger	CR1000	8/7/2012	Active
Ram Creek	Enclosure	ENC 16/18	8/7/2012	Active
Ram Creek	GPS	17992 GPS	8/7/2012	Active
Ram Creek	DLP	ARCN_V4.1	8/7/2012	Active
Ram Creek	RG-TB	TE525	8/7/2012	Active
Ram Creek	SD	SR50a	8/7/2012	Active
Ram Creek	Solar Panel	75 W	8/7/2012	Active
Ram Creek	SR	Li200x	8/7/2012	Active
Ram Creek	ST	107	8/7/2012	Active
Ram Creek	ST	107	8/7/2012	Active
Ram Creek	ST	107	8/7/2012	Active
Ram Creek	Tripod	CM106	8/7/2012	Active
Ram Creek	TX312	NESDIS ID 3961D29E	8/7/2012	Active
Ram Creek	WSWD	5103	8/7/2012	Active

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

Station Name	Item	Model	Start Date	Stop Date
Salmon River	Antenna	25316 YAGI	7/8/2011	7/19/2012
Salmon River	AT	ThermX	7/8/2011	7/19/2012
Salmon River	AT-RH	HMP-155	7/8/2011	7/19/2012
Salmon River	Battery	100 AH (x2)	7/8/2011	7/19/2012
Salmon River	Crossarm	CM204	7/8/2011	7/19/2012
Salmon River	Crossarm	CM206	7/8/2011	7/19/2012
Salmon River	Datalogger	CR1000	7/8/2011	7/19/2012
Salmon River	Enclosure	ENC 16/18	7/8/2011	7/19/2012
Salmon River	GPS	17992 GPS	7/8/2011	7/19/2012
Salmon River	DLP	ARCN_V1	7/8/2011	7/19/2012
Salmon River	RG-TB	TE525	7/8/2011	7/19/2012
Salmon River	SD	SR50a	7/8/2011	7/19/2012
Salmon River	Solar Panel	75 W	7/8/2011	7/19/2012
Salmon River	SR	Li200x	7/8/2011	7/19/2012
Salmon River	ST	107	7/8/2011	7/19/2012
Salmon River	ST	107	7/8/2011	7/19/2012
Salmon River	ST	107	7/8/2011	7/19/2012
Salmon River	Tripod	CM106	7/8/2011	7/19/2012
Salmon River	TX312	NESDIS ID 3960F688	7/8/2011	7/19/2012
Salmon River	WS/WD	5103	7/8/2011	7/19/2012

**Table 15.** Metadata for Serpentine I&M RAWS.

Station Name	Item	Model	Start Date	Stop Date
Serpentine	Antenna	25316 YAGI	8/18/2011	Active
Serpentine	AT	ThermX	8/18/2011	Active
Serpentine	AT-RH	HMP-155	8/18/2011	Active
Serpentine	Battery	100 AH (x2)	8/18/2011	Active
Serpentine	Crossarm	CM204	8/18/2011	Active
Serpentine	Crossarm	CM206	8/18/2011	Active
Serpentine	Datalogger	CR1000	8/18/2011	Active
Serpentine	Enclosure	ENC 16/18	8/18/2011	Active
Serpentine	GPS	17992 GPS	8/18/2011	Active
Serpentine	DLP	ARCN_V1	8/18/2011	8/23/2012
Serpentine	DLP	ARCN_V4.1	8/23/2012	Active
Serpentine	RG-TB	TE525	8/18/2011	Active
Serpentine	SD	SR50a	8/18/2011	Active
Serpentine	Solar Panel	75 W	8/18/2011	Active
Serpentine	SR	Li200x	8/18/2011	Active
Serpentine	ST	107	8/18/2011	Active
Serpentine	ST	107	8/18/2011	Active
Serpentine	ST	107	8/18/2011	Active
Serpentine	Tripod	CM106	8/18/2011	Active
Serpentine	TX312	NESDIS ID 3961C1E8	8/18/2011	Active
Serpentine	WSWD	5103	8/18/2011	Active

**Table 16.** Metadata for Sisiak I&M RAWS.

Station Name	Item	Model	Start Date	Stop Date
Sisiak	Antenna	25316 YAGI	7/13/2011	Active
Sisiak	AT	ThermX	7/13/2011	Active
Sisiak	AT-RH	HMP-155	7/13/2011	Active
Sisiak	Battery	100 AH (x2)	7/13/2011	Active
Sisiak	Crossarm	CM204	7/13/2011	Active
Sisiak	Crossarm	CM206	7/13/2011	Active
Sisiak	Datalogger	CR1000	7/13/2011	Active
Sisiak	Enclosure	ENC 16/18	7/13/2011	Active
Sisiak	GPS	17992 GPS	7/13/2011	Active
Sisiak	DLP	ARCN_V1	7/13/2011	7/12/2012
Sisiak	DLP	ARCN_V3	7/12/2012	Active
Sisiak	RG-TB	TE525	7/13/2011	Active
Sisiak	SD	SR50a	7/13/2011	Active
Sisiak	Solar Panel	75 W	7/13/2011	Active
Sisiak	SR	Li200x	7/13/2011	Active
Sisiak	ST	107	7/13/2011	Active
Sisiak	ST	107	7/13/2011	Active
Sisiak	ST	107	7/13/2011	Active
Sisiak	Tripod	CM106	7/13/2011	Active
Sisiak	TX312	NESDIS ID 3961548A	7/13/2011	Active
Sisiak	WSWD	5103	7/13/2011	Active

**Table 17.** Metadata for Tahinichok I&M RAWS.

Station Name	Item	Model	Start Date	Stop Date
Tahinichok	Antenna	25316 YAGI	7/10/2011	Active
Tahinichok	AT	ThermX	7/10/2011	Active
Tahinichok	AT-RH	HMP-155	7/10/2011	Active
Tahinichok	Battery	100 AH (x2)	7/10/2011	Active
Tahinichok	Crossarm	CM204	7/10/2011	Active
Tahinichok	Crossarm	CM206	7/10/2011	Active
Tahinichok	Datalogger	CR1000	7/10/2011	Active
Tahinichok	Enclosure	ENC 16/18	7/10/2011	Active
Tahinichok	GPS	17992 GPS	7/10/2011	Active
Tahinichok	DLP	ARCN_V1	7/10/2011	7/12/2012
Tahinichok	DLP	ARCN_V3	7/12/2012	Active
Tahinichok	RG-TB	TE525	7/10/2011	Active
Tahinichok	SD	SR50a	7/10/2011	Active
Tahinichok	Solar Panel	75 W	7/10/2011	Active
Tahinichok	SR	Li200x	7/10/2011	Active
Tahinichok	ST	107	7/10/2011	Active
Tahinichok	ST	107	7/10/2011	Active
Tahinichok	ST	107	7/10/2011	Active
Tahinichok	Tripod	CM106	7/10/2011	Active
Tahinichok	TX312	NESDIS ID 3961548A	7/10/2011	Active
Tahinichok	WS/WD	5103	7/10/2011	Active