
# Harding Icefield Weather Station

# Kenai Fjords National Park

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## Harding Icefield Weather Station - Fun Facts

Percentage of successful transmissions: 72% since September 1, 2004 (due to icing conditions)
Highest peak wind: 80.5 mph (Oct 3, 2004)
Highest hourly average wind: 33.6 mph (July 26, 2004)
Highest temperature: 68° F (Aug 7, 2004)
Lowest temperature: -15 ° F (Feb 2, 2005)
Precipitation to-date: 17.7 inches

## Introduction

The deployment of the Harding Icefield Weather Station was completed in July 14, 2004. The following agencies participated in this cooperative effort:

**National Weather Service – River Forecast Center (NWS-RFC)**: Purchased sensors for the weather station and materials for the precipitation gage. Evaluated potential deployment sites.

**United States Geological Survey – Water Resources Division (USGS-WRD)**: Designed and constructed the precipitation gage. Assisted in deployment and maintenance.

**NPS – Southwest Alaska Network (SWAN)**: Funded the construction of the precipitation gage. Provided the tri-leg tower for the weather station. Provided logistical support (helicopter) for the site analysis and deployment of the weather station. Assisted in deployment and maintenance.

**NPS – Kenai Fjords National Park (KEFJ)**: Prepared the NEPA documentation for the deployment and long term operation of the weather station. Assisted in deployment and maintenance.

## Background

Climate is considered to be the most important broad-scale factor influencing ecosystems. In Alaska, climate patterns reflect latitude, surrounding oceans, topography, and the interactions of these with global circulation (Simpson et al. 2002).

A weather station on the Harding Icefield allows the NWS-RFC access to current weather conditions and also serves as a high elevation data point for use in weather modeling/forecasting efforts.

The SWAN has identified climate monitoring as a critical element.

## The Weather Station

The weather station was purchased from Forest Technology, Inc., one of several providers of automated weather stations. It was set up in Anchorage, Alaska and allowed to operate for several months to test the data logger, programming, sensors and satellite transmission prior to deployment.


## Station Sensor Array

Sensors on the station measure the following parameters: temperature, relative humidity, precipitation, wind speed and direction, snow depth and solar radiation.

The data logger saves to memory all weather observations. These weather observations are transmitted at 43 minutes after the hour, every hour. In the case of a transmission failure, data can be recovered from the data logger during maintenance visits.

Parameters transmitted are:
**Precipitation** - cumulative
**Temperature** – ten minute mean prior to transmit, hourly mean, hourly maximum and hour minimum
**Relative Humidity** - ten minute mean prior to transmit, hourly mean
**Wind Speed and Direction** – ten minute mean prior to transmit, peak 1-minute gust, hourly mean
**Solar Radiation** – hourly mean
**Snow Depth** – depth of snow at transmission time


## All-weather Precipitation Gage

Recording frozen precipitation (snow/ice) is a challenge at remote automated sites in Alaska. The USGS – WRD designed and constructed an all-weather precipitation gage for the Harding Icefield weather station. The gage is modeled after gages currently deployed at several Alaska locations.

Height: 13 feet tall,
Width: 5 feet across at the base,
Weight: 800 pounds,
Antifreeze: 45% propylene glycol, 45% ethyl alcohol and 10% water, approximately 22 gallons,
Can capture 90 inches of precipitation.

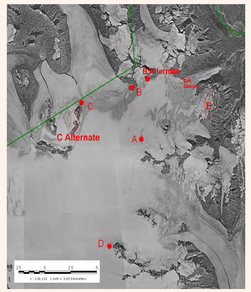


## Site Selection Process

Snow accumulation on the Harding Icefield can be recorded in tens of feet per year. Locating a weather station where it won't get buried by snow limits the possible deployment sites to nunataks. Several potential deployment sites were identified. An inspection of each site was accomplished on December 2, 2003. The purpose of this field inspection was to:

1) Gather information needed to successfully prepare the required NEPA documentation for station deployment and operation.
2) Evaluate each site for its exposure to regional meteorological conditions.
2) Evaluate the geographic, topographic and physical ground conditions at each site.
3) Observe winter time snow conditions at each site.

The National Weather Service prepared a document evaluating and ranking each of the potential deployment sites.




Deployment sites that were considered on the northern Harding Icefield.

Field inspection, December 2003.

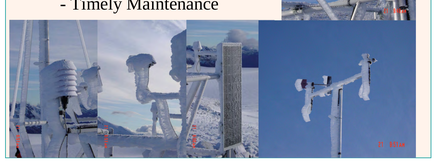
## NEPA Compliance

Kenai Fjords National Park staff prepared an environmental assessment to evaluate deployment, long-term operation and maintenance of a weather station on the Harding Icefield. The Alaska Regional Office (AKRO) provided review of this document.

The NEPA document (EA), completed in June 2004, determined that Site A was the preferred location. This site was also the preferred site identified by the NWS-RFC from a meteorological perspective.

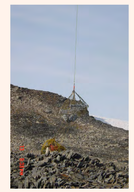
## Challenges:

- Ice and Wind
- Timely Maintenance

## Deployment

The weather station was deployed on July 14, 2004 by NPS personnel from KEFJ, SWAN and AKRO and the USGS – WRD. Equipment and personnel were moved to the deployment site by helicopter. Set-up time took about six hours.
Latitude – 60 ° 07.984'; Longitude – 149° 46.794'
Elevation: 4,340 feet



Precipitation Gage

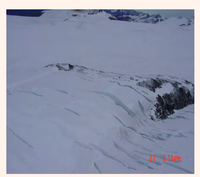
Datalogger and Transmitter

## Maintenance

Annual maintenance is a critical component for the successful operation of this and other weather stations. This site is particularly challenging due to its high elevation and maritime influence (high winds and icing conditions).

The first challenge presented at this site was the failure of the anchoring system for the precipitation gage. The anchoring system was redesigned and installed on September 21, 2004 by a team of NPS and USGS-WRD personnel.

Installation of the new precipitation gage anchoring system.

A view of the weather station and the nunatak.