



Standard Operating Procedure Updates 2017

Central Alaska Network (CAKN) Climate Monitoring Protocol

Natural Resource Report NPS/CAKN/NRR—2017/1504



ON THE COVER

Photograph of the Gates Glacier climate station in Wrangell-St. Elias National Park and Preserve.
Photograph courtesy of the National Park Service

Standard Operating Procedure Updates 2017

Central Alaska Network (CAKN) Climate Monitoring Protocol

Natural Resource Report NPS/CAKN/NRR—2017/1504

Pamela J. Sousanes¹, Ken Hill¹, Michael Bower², William F. Johnson² and Scott D. Miller³

¹National Park Service

Inventory and Monitoring Program, Arctic and Central Alaska Networks

4175 Geist Rd.

Fairbanks, AK 99709

²National Park Service

Inventory and Monitoring Program, Southeast Alaska Network

3100 National Park Road

Juneau, AK 99801

³National Park Service

Inventory and Monitoring Program, Arctic and Central Alaska Networks

2800 Lake Shore Dr. E

Ashland, WI 54806

August 2017

U.S. Department of the Interior

National Park Service

Natural Resource Stewardship and Science

Fort Collins, Colorado

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

The Natural Resource Report Series is used to disseminate comprehensive information and analysis about natural resources and related topics concerning lands managed by the National Park Service. The series supports the advancement of science, informed decision-making, and the achievement of the National Park Service mission. The series also provides a forum for presenting more lengthy results that may not be accepted by publications with page limitations.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner.

This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Government.

This report is available in digital format [Central Alaska Inventory and Monitoring Network](#) and the [Natural Resource Publications Management website](#). To receive this report in a format that is optimized to be accessible using screen readers for the visually or cognitively impaired, please email irma@nps.gov.

Please cite this publication as:

Sousanes, P. J., K. Hill, M. Bower, W. F. Johnson, and S. D. Miller. 2017. Standard operating procedure updates 2017: Central Alaska Network (CAKN) climate monitoring protocol. Natural Resource Report NPS/CAKN/NRR—2017/1504. National Park Service, Fort Collins, Colorado.

Contents

	Page
Executive Summary	iv
Introduction.....	1
Weather and Climate Monitoring Protocol Development for Alaska Networks	1
Standard Operating Procedure (SOP) Updates	2
Citations and links for the Updated SOPs.....	5
References.....	8

Executive Summary

Details of the 2017 Central Alaska Network Climate Monitoring Protocol Standard Operating Procedure (SOP) updates are provided in this document.

There have been technology changes and instrument updates, as well as minor changes in the field collection methods and reporting. The data have not changed, but the methods for quality assurance and control have been updated and the methods for organizing, storing, archiving, and disseminating the data have improved.

The Alaska Region Inventory and Monitoring (I&M) Program is monitoring climate on a large spatial scale within the four Alaska Networks, which include the Arctic (ARCN), Central Alaska (CAKN), Southeast Alaska (SEAN), and Southwest Alaska (SWAN) Networks. In 2006, when the climate monitoring protocols and SOPs were first drafted for CAKN there were twelve NPS climate stations in three parks, there are now more than fifty stations in thirteen Alaska parks.

The ARCN, CAKN, and SEAN climate and data management staff worked collectively to update the CAKN Climate Monitoring Protocol Standard Operating Procedures (SOPs), which integrated programmatic aspects of the ARCN and SEAN networks. The updated SOPs now include information that apply to all three networks. Consistency among the networks is now critical as we accumulate more data with each passing year. It is imperative that the public, other scientists and researchers, and future NPS staff have a comprehensive perspective of the climate monitoring program and can easily identify the products that are available.

The SOPs describe the annual work flow that is required to measure, record, process, and publish the best quality climate data and to make sure that data are available in a common format that is useful for the larger research community. The SOPs are organized into three main sections 1) field methods, 2) data acquisition and management, and 3) data analysis and reporting.

This is the first major update to the SOPs. There are now thirteen SOPs that will be published individually to allow for more effective and efficient versioning in the future. The individual SOPs will be compiled each year prior to the field season and published as an SOP set so that it is clear how the data were collected and managed each year. The individual SOPs and the annual SOP compilation will be discoverable under the ARCN, CAKN, and SEAN programs.

Introduction

The CAKN climate monitoring program has been operational for ten years and this is the first major update to the SOPs. Changes to the SOPs are primarily due to updates and upgrades in technology, including updates to the datalogger, the datalogger program software, and the metadata software. Changes have also been made to the data management SOPs due to changes in external data portals and to include more clarification of discreet data levels and data quality and assurance processes. Two additional SOPs have been written that address 1) the annual work flow and 2) field safety. None of the methods have been changed and the rationale behind monitoring climate as part of CAKN remains the same.

Weather and Climate Monitoring Protocol Development for Alaska Networks

The four Alaska networks consider weather and climate to be an important vital sign. The CAKN was the first network funded and the first to have a complete monitoring plan in place, SWAN was next, followed by ARCN, and then SEAN. All of the networks collaborated and shared staff and resources to develop the weather and climate monitoring programs. Both CAKN (Sousanes 2006) and SWAN (Lindsay et al. 2012) published climate monitoring protocols that were peer reviewed by experts. ARCN and SEAN published protocol development summaries as part of the overall monitoring plans, which incorporated elements from CAKN and SWAN.

The CAKN and ARCN weather and climate monitoring programs are maintained with shared staff; the SEAN does not have a dedicated staff member for the program so the CAKN and ARCN staff have been working with SEAN staff to develop similar strategies for the weather and climate vital sign to move all three networks forward. There is ongoing collaboration and coordination with SWAN staff.

The weather and climate monitoring protocol implementation plans for ARCN and SEAN describe the development process and the implementation of the CAKN climate monitoring protocol.

Standard Operating Procedure (SOP) Updates

The Standard Operating Procedures for the CAKN weather and climate monitoring protocol were updated and revised to include ARCN and SEAN details. Two major updates include the Data Management SOP (10) and the Data Quality and Assurance SOP (11). The ARCN, CAKN, and SEAN network staff worked collaboratively to define discreet data levels and to implement robust data quality and assurance processes. Two additional SOPs were included that address, 1) the annual deliverable schedule (SOP 1), and 2) field safety (SOP 3).

There were 24 SOPs included in the CAKN Climate Monitoring Protocol (Sousanes 2006). Out of the 24, two have been deleted entirely, two have been added, and nine have been combined and updated. The new SOP and titles are listed below with references to the older SOPs.

The following SOPs have been added:

SOP 1: Annual Deliverable Schedule. The purpose of this new SOP is to outline the workflow that is required to produce the annual deliverables for the climate monitoring program and the list of deliverable products that will be generated on an annual basis.

SOP 3: Field Safety. This new SOP provides information on basic safety principles for climate monitoring fieldwork, aviation safety requirements, and field safety practices.

The following SOPs have been updated:

SOP 2: Compliance, Permitting, and Updating Site Maps. Updates to this SOP include links to new compliance documents and updates on current annual compliance requirements for each park. The SOP also provides guidance on updating the climate station location map if new sites are added to the program.

SOP 4: Climate Data Specifications, Sampling Frequency, and Measurement Intervals. This SOP includes the latest climate station configuration and specifications on equipment and data standards. This updated SOP is a combination of the old SOP 3 - *Initial Climate Equipment List*, SOP 4 - *Sensor Specifications*, and SOP 11 - *Links to Instruction Manuals*. The sampling frequency, measurement intervals, and calibration schedule have not changed.

SOP 5: Field Laptop Setup. The software for linking a datalogger to a laptop has changed, this updated SOP addresses the software changes and methods for setting up a laptop prior to field season.

SOP 6: Datalogger Programming. The datalogger and programming software have both been updated. This updated SOP addresses the programming software and current program instructions for the datalogger.

SOP 7: Satellite Transmitter Programming (GOES) and Data ingest System (WFMI). This SOP combines and updates the old SOP 7 - *Obtaining GOES ID* and SOP 8 - *GOES Programming*. The satellite transmitter software and hardware has been updated. This SOP

also includes the instructions for using and accessing the Wildland Fire Management Information System, which is the central ingest system for the GOES data stream.

SOP 8: Site Installation and Maintenance Equipment Checklist. This SOP combines and updates the old SOP 9 - *Station Deployment Equipment List* and SOP 10 - *Climate Station Installation*. Some of the mounting hardware has changed since the original design and some sensors have been updated.

SOP 9: Annual Site Visit. This SOP combines and updates the old SOP 12 - *Data Collection –PDA*, SOP 13 - *Data Collection – Loggernet*, SOP 15 - *Station Maintenance*, SOP 16 - *Station Maintenance Checklist*, and SOP 17 *Photo Documentation*. The rationale for combining all of the SOPs is that all of the information is necessary to complete an annual site visit. The Loggernet software has been updated; this SOP addresses changes associated with the update. The SOP also includes instructions on what to do post field season.

SOP 10: Data Deliverable Creation, Validation, Certification and Dissemination. This SOP updates the old SOP 18 – *Maintenance Log*, SOP 19 - *Data Quality –Accessing ASCADS*, and SOP 20 – *Entering Metadata into ASCADS*. This SOP references new data management standards and the application of data certification levels. It also includes methods for publication and dissemination of certified data. Note: SOP 10 provides a significant improvement to the data management process thanks to the SEAN network data manager with review and input from the CAKN/ARCN data manager and climate staff.

SOP 11: Quality Control and Record Processing. This SOP updates the old SOP 21 - *Data Access and Archiving*. A decade ago any data quality processing was done at the data ingest level with the National Interagency Fire Center and it was minimal. This SOP describes the local level quality control that is now being implemented by ARCN network staff using Aquarius software.

SOP 12: Annual Reporting and Deliverable Publishing. This SOP updates the old SOP 22 – *Data Analysis* and SOP 23- *Reporting* and describes the method for reporting on the climate monitoring protocol and the process for archiving all of the annual deliverables.

The following SOPs are no longer necessary:

SOP 1: Evaluating New Climate Station Locations. This SOP was critical in the development stage of the climate monitoring effort, but now that the stations have been installed and are in operational status it is no longer necessary to have this as a stand-alone SOP. If new stations are added in the future, Appendix A - *Climate Site Evaluation*, in the CAKN Climate Monitoring Protocol narrative can be referenced (Sousanes 2006).

SOP 14: Data Collection - Storage Module. We no longer use on-site storage modules at the climate stations because the memory capacity of the dataloggers has improved. The onboard storage capacity is now between 2MB and 4MB, enough space for multiple years of data.

The methodology across networks is consistent and the SOPs can be used among the three networks. If needed, SOPs or additions to SOPS will be added to the protocol implementation plans for either ARCN or SEAN. If future SOP updates or changes apply to only one network a parenthetical network acronym will follow the version number, i.e. SOP 12: Annual Reporting Version 2.01 (ARCN).

Citations and links for the Updated SOPs

Links and citations for the Standard Operating Procedure (SOP) Updates 2017 for the Weather and Climate Monitoring Protocol: Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks.

SOP 1: Annual Deliverable Schedule

Sousanes, P., K. Hill, M. Bower, W. Johnson, and S. Miller. 2017. Standard Operating Procedure (SOP) 1: Annual Deliverable Schedule, Version 1.0. Weather and Climate Monitoring Protocol, Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks. National Park Service, Fairbanks, Alaska. Available online at <https://irma.nps.gov/DataStore/Reference/Profile/2243685>.

SOP 2: Compliance, Permitting, and Updating Site Maps (WC_B)

Sousanes, P., K. Hill, M. Bower, W. Johnson, and S. Miller. 2017. Standard Operating Procedure (SOP) 2: Compliance, Permitting, and Updating Site Maps (WC_B), Version 2.0. Weather and Climate Monitoring Protocol, Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks. National Park Service, Fairbanks, Alaska. Available online at <https://irma.nps.gov/DataStore/Reference/Profile/2243687>.

SOP 3: Field Safety

Sousanes, P., K. Hill, M. Bower, W. Johnson, and S. Miller. 2017. Standard Operating Procedure (SOP) 3: Field Safety, Version 1.0. Weather and Climate Monitoring Protocol, Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks. National Park Service, Fairbanks, Alaska. Available online at <https://irma.nps.gov/DataStore/Reference/Profile/2243689>.

SOP 4: Climate Data Specifications, Sampling Frequency, and Measurement Intervals

Sousanes, P., K. Hill, M. Bower, W. Johnson, and S. Miller. 2017. Standard Operating Procedure (SOP) 4: Climate Data Specifications, Sampling Frequency, and Measurement Intervals, Version 2.0. Weather and Climate Monitoring Protocol, Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks. National Park Service, Fairbanks, Alaska. Available online at <https://irma.nps.gov/DataStore/Reference/Profile/2243690>

SOP 5: Field Laptop Setup

Sousanes, P., K. Hill, M. Bower, W. Johnson, and S. Miller. 2017. Standard Operating Procedure (SOP) 5: Field Laptop Setup, Version 2.0. Weather and Climate Monitoring Protocol, Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks. National Park Service, Fairbanks, Alaska. Available online at <https://irma.nps.gov/DataStore/Reference/Profile/2243691>.

SOP 6: Datalogger Programming

Sousanes, P., K. Hill, M. Bower, W. Johnson, and S. Miller. 2017. Standard Operating Procedure (SOP) 6: Datalogger Programming, Version 2.0. Weather and Climate Monitoring Protocol, Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks. National Park Service, Fairbanks, Alaska. Available online at <https://irma.nps.gov/DataStore/Reference/Profile/2243693>.

SOP 7: Satellite Transmitter Programming (GOES) and Data Ingest System (WFMI)

Sousanes, P., K. Hill, M. Bower, W. Johnson, and S. Miller. 2017. Standard Operating Procedure (SOP) 7: Satellite Transmitter Programming (GOES) and Data Ingest System (WFMI), Version 2.0. Weather and Climate Monitoring Protocol, Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks. National Park Service, Fairbanks, Alaska. Available online at <https://irma.nps.gov/DataStore/Reference/Profile/2243694>.

SOP 8: Site Installation and Maintenance Equipment Checklist

Sousanes, P., K. Hill, M. Bower, W. Johnson, and S. Miller. 2017. Standard Operating Procedure (SOP) 8: Site Installation and Maintenance Equipment Checklist, Version 2.0. Weather and Climate Monitoring Protocol, Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks. National Park Service, Fairbanks, Alaska. Available online at <https://irma.nps.gov/DataStore/Reference/Profile/2243696>.

SOP 9: Annual Site Visit

Sousanes, P., K. Hill, M. Bower, W. Johnson, and S. Miller. 2017. Standard Operating Procedure (SOP) 9: Annual Site Visit, Version 2.0. Weather and Climate Monitoring Protocol, Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks. National Park Service, Fairbanks, Alaska. Available online at <https://irma.nps.gov/DataStore/Reference/Profile/2243697>.

SOP 10: Data Deliverable Creation, Validation, Acceptance, and Dissemination

Johnson, W., K. Hill, S. Miller, P. Sousanes, and M. Bower. 2017. Standard Operating Procedure (SOP) 10: Data Deliverable Creation, Validation, Acceptance, and Dissemination, Version 2.0. Weather and Climate Monitoring Protocol, Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks. National Park Service, Fairbanks, Alaska. Available online at <https://irma.nps.gov/DataStore/Reference/Profile/2243699>.

SOP 11: Quality Control and Record Processing

Hill, K., W. Johnson, P. Sousanes, M. Bower, and S. Miller. 2017. Standard Operating Procedure (SOP) 11: Quality Control and Record Processing, Version 2.0. Weather and Climate Monitoring

Protocol, Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks. National Park Service, Fairbanks, Alaska. Available online at <https://irma.nps.gov/DataStore/Reference/Profile/2243700>.

SOP 12: Annual Reporting and Deliverable Publishing

Sousanes, P., K. Hill, M. Bower, W. Johnson, and S. Miller. 2017. Standard Operating Procedure (SOP) 12: Annual Reporting and Deliverable Publishing, Version 2.0. Weather and Climate Monitoring Protocol, Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks. National Park Service, Fairbanks, Alaska. Available online at <https://irma.nps.gov/DataStore/Reference/Profile/2243701>.

SOP 13: Revising the Protocol

Sousanes, P., K. Hill, M. Bower, W. Johnson, and S. Miller. 2017. Standard Operating Procedure (SOP) 13: Revising the Protocol, Version 2.0. Weather and Climate Monitoring Protocol, Arctic (ARCN), Central Alaska (CAKN), and Southeast Alaska (SEAN) Inventory and Monitoring Networks. National Park Service, Fairbanks, Alaska. Available online at <https://irma.nps.gov/DataStore/Reference/Profile/2243704>.

References

Lindsay, C., B. Giffen, and N. Wilson. 2012. Methods for monitoring climate in southwest Alaska network parks: Version 1.0. Natural Resource Report NPS/SWAN/NRR—2012/582. National Park Service, Fort Collins, Colorado. Available at <https://irma.nps.gov/DataStore/Reference/Profile/2190374>

Sousanes, P. J. 2006. Climate monitoring protocol for the Central Alaska Network – Denali National Park and Preserve, Yukon-Charley River National Preserve, and Wrangell -St. Elias National Park and Preserve. National Park Service, Denali Park, Alaska. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2192457>

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

NPS 953/139885, August 2017

National Park Service
U.S. Department of the Interior



Natural Resource Stewardship and Science
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

www.nature.nps.gov

EXPERIENCE YOUR AMERICA TM