SOUTHEAST ALASKA WATERSHED COALITION
CONNECT - INFORM - PARTICIPATE

# Final Performance Report

## 1. ADMINISTRATIVE INFORMATION

**Recipient Project Manager:** Rob Cadmus, rob@sawcak.org, 907-957-9818

**Organization:** Southeast Alaska Watershed Coalition

**Project title:** Developing a Southeast Alaska community-based stream temperature monitoring network

**Agreement number:** F16AP00643

**Date of report:** 12/26/17

**Period of time covered by report:** July 18, 2016 – Sept 30, 2017

## 2. PUBLIC SUMMARY

Stream temperature affects the growth, behavior, and survival of salmon during their freshwater life stages. Increasing air temperatures and declining snowpack will change stream temperatures in southeast Alaska, with uncertain but potentially important impacts on salmon productivity. Monitoring stream temperature in a variety of streams year-round is needed to establish a baseline of current temperature patterns and understand potential effects on salmon, while long-term monitoring is needed to track trends and the effects of a changing climate and other disturbances. Our project, *Developing a Southeast Alaska Community-Based Stream Temperature Monitoring Network*, aimed to coordinate organizations within the region who are monitoring stream temperature to promote high quality data collection, data sharing, and efficient use of resources to better understand current and future stream temperatures in the region. We have identified existing and new community partners in the region who are contributing to the monitoring network, established minimum data collection standards, and provided on the ground training opportunities. Additionally, we have identified long-term data storage options that will make all data available to the public, and produced an easy-to-read document that describes management applications of the data. These include identification of suitable fish habitat for conservation or restoration, informing timing windows for in-stream work, highlighting areas more prone to invasive species, and providing context for regulatory action that may impact stream temperatures. We are continuing to identify new sites that fill key information gaps, coordinate with partners to share resources, and pursue funding to utilize the data to understand how changing stream temperatures will affect the region's aquatic resources.

## 3. EXECUTIVE SUMMARY

The goals of the project, *Developing a Southeast Alaska community-based stream temperature monitoring network*, were to establish a coordinated stream temperature monitoring network in Southeast Alaska, provide region-wide standard methodologies, arrest the potential loss of historical data, and engage community-based tribal and nonprofit organizations in climate change monitoring. Management-relevant objectives included producing a paper describing the natural resource management applications of stream temperature data, identifying data repositories, and developing a strategic monitoring plan for the region.

These goals and objectives were met establishing a Working Group and Steering Committee to guide the white paper and strategic sampling plan, and provide input about data management. Additionally, we did extensive outreach to organizations known to be monitoring, as well as organizations that are not currently monitoring, but may have in interest in doing so. As part of various outreach opportunities, we engaged with over 30 tribal organizations, non-profit groups, business, and agencies throughout the region.

Organizations provided information about current monitoring activities, allowing us to catalog information about 60 sites in the region. Entities indicated strong support for the network and were receptive to the proposed minimum data collection standards. Data and metadata storage options have been identified, and partners have been encouraged to submit data to several outlets. However, this issue has not been fully resolved, as we were working in parallel with multiple statewide efforts (e.g. NCEAS' effort to compile data in the KNB, AKOATS, AK Dept. of Environmental Conservation's Ambient Water Quality Monitoring System), and regional efforts (SE AK GIS Library), each of which had different strengths and drawbacks. In the coming years, we will continue to work with partners to share data and hone in on a stable, user-friendly repository. The strategic sampling plan reflects input from agencies and local community organizations about goals for the network and will be finalized in the coming months under a supplemental grant.

Long-term stream temperature data can provide insights into the impacts of a changing climate on aquatic resources, and this project has brought together entities in Southeast Alaska to share their data, and coordinate efforts to collect high quality data that can be used to assess status and trends in the region. Many of our objectives, including identification of partners, creating a strategic sampling plan, and forming patterns of annual data submission and meetings, lay the ground work for a sustainable network that will last beyond the performance period of this grant and continue to address the NPLCC's goals of providing partners with data to make informed decisions support conservation and sustainable resource management, and to promote coordination and efficiency among scientists and resource managers.

## 4. PUPRPOSE AND OBJECTIVES

This project aims to coordinate a regional stream temperature monitoring network that addresses the need to monitor, study, and manage the effects of climate change on aquatic resources, particularly salmon, in Southeast Alaska. Prior to this project, stream temperature data was being collected throughout Southeast Alaska with no regional sampling plan, no coordination of site selection between organizations, no minimum standards, and no data storage/management between the many entities involved.

In coordinating a community-based network, the Southeast Alaska Watershed Coalition (SAWC) is targeting tribal, nonprofit, and other local entities, in addition to agencies that have traditionally participated in monitoring. Near and long-term products of the network, including methodologies, a white paper, and data, are aimed at resource managers, environmental program managers, and researchers in the region.

The goals of this project are to 1) establish a coordinated stream temperature monitoring network in Southeast Alaska, 2) Provide region-wide standard methodologies, 3) Arrest the potential loss of historical data, and 4) Engage community-based tribal and nonprofit organizations in climate change monitoring. Specific objectives that were proposed to meet the goals are listed in Table 1, along with how they were addressed.

Goal 1 Objectives:

1. Convene working group and steering committees for bi-monthly teleconferences to inform development of the network.
2. Implement action items identified by the freshwater temperature workgroup of the Southeast Alaska Climate Adaptation Workshop in April 2016.
3. With committee input, develop a "white paper" describing the utility of stream temperature data for resource managers.
4. Develop an Implementation Plan for the Southeast Alaska Stream Temperature Monitoring Network.

Goal 2 Objectives:

1. Adopt minimum stream temperature data collection standards for the region.
2. Complete a Strategic Sampling Plan to prioritize monitoring site locations.

Goal 3 Objectives

1. Establish and maintain a catalog of active monitoring sites, and integrate site data collection efforts with the Alaska Online Aquatic Temperature Site (WALCC project).
2. Maintain SAWC's ten monitoring sites, and incorporate into the regional Network.
3. Collect and store temperature data from all sites in the network.

Goal 4 Objectives:

1. Recruit community-level partners (tribes, watershed councils, non-profits, municipal governments) to maintain prioritized sites.
2. Conduct stream temperature monitoring training for community level partners.
3. Provide technical assistance to community and agency partners to maintain critical long-term sites.

## 5. METHODS, ORGANIZATION AND RESULTS

**Table 1.** Activities and methods.

| Activity | Purpose | Methods |
|---|---|---|
| Working group and steering committee meetings | Inform network development and ensure design will ultimately meet the needs of key stakeholders | The working group and steering committee met via phone conference approximately every three months for steering committee, as needed (see Table 4); more frequently for working group. Members are scattered across the region so in-person meetings were not feasible, and they occurred on as-needed basis so as not to waste people's time. |
| Maintain existing temperature sites | Maintain, collect, and manage data from 10 SAWC sites | SAWC conducted field visits during 2016 and 2017 to maintain loggers and download data. |
| Participate in Southeast Alaska Environmental Conference | Recruit tribal participants and integrate efforts with Central Council of the Tlingit and Haida Indian Tribes of Alaska | The conferences attract representatives in natural resources positions from most of the tribal communities in the region, and we chose this venue to maximize face-to-face interactions and efficiently share information with these groups. |
| Develop a management applications white paper | Describe management context and need for the development of a stream temperature network | The white paper was led by Sue Mauger, who has many years of experience collecting and using stream temperature data. She provided drafts to the steering committee and working group for review and to ensure important SE Alaska-specific issues were addressed. |
| Data collection standards | Adopt minimum data collection standards for the region | The working group adopted, and the steering committee approved standards that had been previously proposed for all of Alaska. These had been thoroughly vetted by agencies and applied in other monitoring networks, and the committee felt they met our needs as well. |
| Strategic Sampling Plan | Based on key stakeholder and steering committee input, develop a sampling plan for selecting monitoring sites | Michael Winfree and Rebecca Bellmore led the development of the strategic sampling plan. Similar to the White Paper, the steering committee and working group were frequently consulted during development, and will be asked for approval. The strategic sampling plan is nearly complete, and will now be completed as part of the 2017 Agreement as per SAWC's 03/13/2018 conversation with USFWS Project Service Officer. |
| Update site catalog | Catalog all sites in the region and submit metadata to AKOATS | In our original proposal, SAWC was to host all of the stream temperature data and |

| | | |
|---|---|---|
| | | metadata, and submit the latter to AKOATS, beginning in summer 2017. However, it was decided that SAWC is not really the appropriate entity for this activity, especially into the future. To promote a more sustainable approach to data and metadata storage, we have been working to identify more permanent repositories and encourage partners to submit data on their own, and develop habits of submitting each year. |
| Gap analysis | Identify site location gaps | We are following a published approach (Jackson et al. 2016, DOI: 10.2166/nh.2015.106) to assess the variability of specific watershed characteristics across the region, compare this to what is currently being monitored, and identify major gaps in coverage. Potential sites to fill these gaps will be identified and included in the strategic sampling plan. |
| Recruit community participants | Based on the gap analysis, identify and recruit organizations to adopt sites (priority for community and tribal organizations) | Community participants have been recruited through outreach at meetings (Southeast Environmental Conferences 2016, 2017, SE AK Watershed Restoration Workshop 2018) and individual contacts. We have identified several groups who are willing to help with site maintenance, and will continue to work with them on site identification as we finalize the strategic sampling plan. |
| Site installation training | Train community participants in site installation, data collection, and data management | We hosted two hands-on/field trainings for community partners and provided methods and protocols materials on SAWC's website. |
| Site installation support | Support community participants in installing sites | The Science Director has been in communication with people who are installing new sites to answer questions, and made a site visit to Klukwan to help install new sites. |
| Site maintenance and data management support | Support site maintenance. Ensure all metadata is integrated into AKOATS | SAWC has partnered with the Sitka Tribe of Alaska to help maintain SAWC sites, and the Science Director has been available to help answer partners' questions about site maintenance and data management. The Science Director has repeatedly encouraged partners to submit metadata to AKOATS. |

**6. PROJECT RESULTS**

- The SAWC Science Director has engaged with over 30 tribal organizations, non-profit groups, business, and agencies throughout the region and garnered interest in and support for the network (Table 2). Regional

conferences and one-on-one engagement were effective ways to share information about the network and get organizations interested in participating.

- SAWC has a catalog of 60 temperature sites across the region (Fig 1) and has been working with partners to submit data and metadata to repositories, and find partners willing to support key sites. Because SAWC will not be hosting the data, or acting as a middle-man, submitting data on behalf of organizations for the long-term, we are struggling to make sure that organizations will continue to regularly submit updates.
- The working group and steering committee met regularly, and
    - accepted a set of minimum standards for stream temperature monitoring for the region, which have been communicated to potential partners,
    - approved a White Paper describing the management applications of stream temperature data, and
    - is continuing to provide input to the strategic sampling plan.
- A stream temperature monitoring training workshop was held for community-based tribal and nonprofit groups in May, 2017, and another field training session was held in September, 2017 (Fig 2).
- The White Paper describing the management applications of stream temperature data is completed, approved, and has been released to the public. (Link to Management Applications of Regional Freshwater Temperature Data for Southeast Alaska).
- The network will be leveraged by and supported in the future by a recently funded Alaska Sea Grant project that proposes to integrate stream temperature data into salmon life cycle models to explore potential impacts of climate change on salmon productivity in the region.

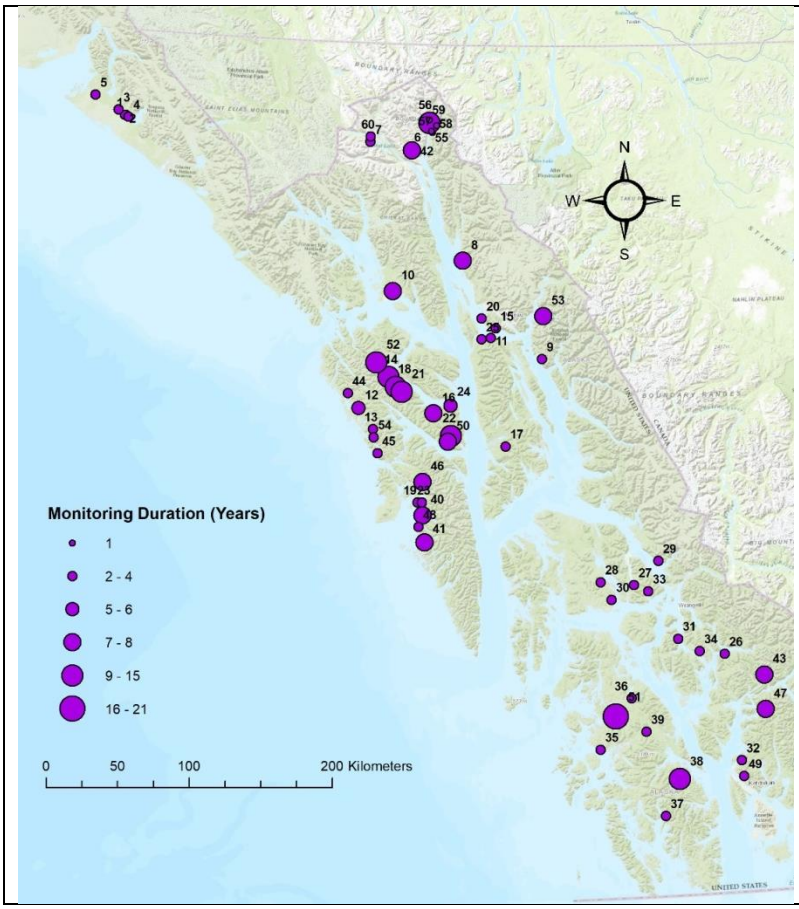


**Figure 1.** Existing stream temperature monitoring network. The numbers used to label each point correspond with the Watershed Number column in Appendix A.

**Table 2.** Organizations that have been contacted and expressed interest in the network. Those in bold are more actively involved and either are already monitoring or plan to monitor stream temperature.

| ORGANIZATION | TYPE |
|---|---|
| Kai Environmental | Business |
| **Sustainable Growth Solutions** | Business |
| **National Park Service** | Federal |
| NOAA (Alaska Pacific River Forecast Center) | Federal |
| **US Forest Service** | Federal |
| US Fish & Wildlife Service | Federal |
| **US Geological Survey** | Federal |
| **Alaska Whale Foundation** | Nonprofit |
| **SAWC** | Nonprofit |
| SE AK Conservation Council (SEACC) | Nonprofit |
| SEAK Fish Habitat Partnership (SEAKFHP) | Nonprofit |
| Sitka Sound Science Center | Nonprofit |
| **Takshanuk Watershed Council** | Nonprofit |
| The Nature Conservancy | Nonprofit |

| | |
|---|---|
| **AK Dept. of Environmental Conservation** | State |
| **AK Dept. of Fish & Game** | State |
| University of AK Fairbanks | State |
| **University of AK Southeast** | State |
| Central Council Tlingit and Haida Indian Tribes of Alaska (CCTHITA) | Tribal |
| **Chilkat Indian Village** | Tribal |
| **Chilkoot Indian Village** | Tribal |
| Craig Tribal Association | Tribal |
| **Hoonah Indian Association** | Tribal |
| **Ketchikan Indian Community** | Tribal |
| **Klawock Cooperative Association** | Tribal |
| Metlakatla Indian Community | Tribal |
| Organized Village of Kasaan | Tribal |
| Petersburg Indian Association | Tribal |
| **Sitka Tribe of Alaska** | Tribal |
| **Skagway Traditional Council** | Tribal |
| **Village of Hydaburg** | Tribal |
| **Wrangell Cooperative Association** | Tribal |
| Yakutat Tlingit Tribe | Tribal |

**Figure 2.** Top: SAWC partnered with the Chilkat Indian Village and Cook Inletkeeper to host a stream temperature monitoring methods workshop in Klukwan, AK in May 2017. The workshop built local capacity for the network and built commitment to maintain stream temperature monitoring sites. Bottom left: SAWC's Science Director and Wrangell Project Coordinator conducting training on stream temperature monitoring at the 2017 Southeast Environmental Conference at Wrangell's Pat Creek. Bottom right: SAWC Science Director working with members of the Chilkat Indian Village to install a stream temperature data logger, September 2017.

## 7. FINDINGS AND CONCLUSIONS

The stream temperature monitoring network coordination project successfully engaged with many entities that are already monitoring in the region and identified several new potential partners who are interested in monitoring. Through this engagement, we were able to compile site information for 60 monitored watersheds in the region, many of which were not previously cataloged in AKOATS. Partners were made aware of (and many

have been trained in the field on) data collection methods and procedures to produce high quality, shareable data. The Steering Committee and Working Group have been instrumental in producing a useful white paper describing the management applications of stream temperature data, and provided input regarding the types of environmental gradients that should be considered in the gap analysis and addressed in the strategic sampling plan. Data and metadata storage options have been identified, and partners have been encouraged to submit data to several outlets. However, this issue has not been fully resolved, as we were working in parallel with multiple statewide efforts (e.g. NCEAS' effort to compile data in the KNB, AKOATS, AK Dept. of Environmental Conservation's Ambient Water Quality Monitoring System), and regional efforts (SE AK GIS Library), each of which had different strengths and drawbacks. In the coming years, we will continue to work with partners to share data and hone in on a stable, user-friendly repository.

## 8. LESSONS LEARNED AND RECOMMENDATIONS

There has been a lot of interest in generating, sharing, and using stream temperature data on the part of agencies, university researchers, tribal organizations, and nonprofits in the region. Environmental program managers, researchers, and others understand that their efforts will be amplified by participating in the network and sharing their data. Additionally, these individuals have been very receptive to suggestions for minimum data collection standards and excited about training opportunities and the white paper on management applications. In short, interest and excitement have been high. However, getting individuals and organizations to participate in network-related activities that require additional work has been a challenge. For example, organizations have been slow to contribute data and metadata to repositories. The White Paper and Implementation Plan developed slower than expected, in part because of slow feedback on the part of potential partners. Our experience so far suggests that maintaining the network will likely require a dedicated coordinator to keep participants motivated and accountable to their agreements. Another issue that has come up with on-the-ground implementation is the somewhat arduous process that Tribal organizations have to go through to add the new monitoring activities to their work plans (most have been aiming to monitor using IGAP funds). To address this, we have been working with them to provide "plug-and-chug" text that can be readily incorporated into their Quality Assurance Project Plans. Many of our objectives, including identification of partners, creating a strategic sampling plan, establishing memorandum of understanding, and forming patterns of annual data submission and meetings, are meant to lay the ground work for a sustainable network that will last beyond the performance period of this grant.

## 9. MANAGEMENT APPLICATIONS

This project had several key management-relevant products and outcomes:

1. Management Applications White Paper. This document describes the relevance of stream temperature data to various natural resource management applications. This document is meant to both inform managers and be useful as a way to advocate for resources for continued monitoring.
2. Data repositories. We identified several repositories for storing continuous stream temperature metadata and data: SE AK GIS Library, the Alaska Online Aquatic Temperature Site (AKOATS), the Knowledge Network for Biocomplexity (KNB), and DEC's Ambient Water Quality Monitoring System.

3. Implementation and Strategic Sampling Plan: When completed, this plan will provide an approach for natural resource managers to identify high priority sites for continued monitoring, or to initiate new monitoring.

Metrics of success:

1. Partners continue to submit data and metadata to repositories.
2. Partners continue to communicate to use resources efficiently to maintain and initiate important monitoring sites.
3. Data that has been made more easily accessible is used in future research and studies.

Please see the outreach section for how we informed managers about the network, and worked with them to develop and share the white paper and strategic sampling plan. A list of managers, administrators, and decision-makers who SAWC worked with is listed in Table 3.

**Table 3. Managers, administrators, decision-makers who SAWC has worked with to date as part of the project:**

| | |
|---|---|
| Jeff Nichols | Alaska Dept. of Fish and Game, Regional Fisheries Research Coordinator; as a Steering Committee Member Jeff has contributed to project direction and product development. |
| Emil Tucker | US Forest Service, Hydrologist and manager of stream temperature monitoring on the Tongass NF; as a key working group member, Emil has provided significant input on the project direction and products. |
| Patricia Warren | Chilkat Indian Village, Environmental Planner; Patricia helped to host a methods training workshop and has assisted with site selection and installation for her organization and outreach to other Tribal organizations. |
| Brock Tabor | Alaska Department of Environmental Conservation, Water Quality Standards Section Manager; as a member of the Steering Committee, Brock has contributed to project direction and product development. |
| Gretchen Pikul | Alaska Department of Environmental Conservation, Environmental Program Specialist; Gretchen has facilitated contact between the network and DEC's database coordinator. |
| Julianne Thompson | US Forest Service, Region 10 Watershed Program Manager; Julianne has provided input on project direction and its relationship to the Tongass National Forest, and supported the strategic sampling plan with data sources. |
| Sheila Jacobson | US Forest Service, Region 10 Forest Fish Program Manager; Sheila has provided input on project direction and its relationship to the Tongass National Forest. |
| Ian Johnson | Hoonah Indian Association Environmental Coordinator; Ian has participated in trainings, provided feedback on documents, and is leading HIA's monitoring effort. |

## 10. PUBLICATIONS AND OUTREACH

Communication and outreach activities have: 1) connected with and supported potential network partners, 2) raised the awareness of key players (agency, nonprofit, tribal, private sector, etc.) about the need and achievements of the Stream Temperature Monitoring Network, 3) communicated with the steering committee and working group, and 4) shared information about the network with the general public.

Through phone, email, and face-to-face meetings, SAWC's Science Director has stayed in contact with the individuals and organizations that are engaged in the Stream Temperature Monitoring Network. This has included ensuring the SAWC websites is kept up-to-date with relevant network information. SAWC connected with potential partners at the Southeast Environmental Conferences in 2016 in 2017 (Figure 2). This initial outreach was followed up with individual calls and meetings with potential partners, and invitations to the May, 2017 Stream Temperature Monitoring Training were sent to interested parties. This training was also advertised through SAWC's network and the Central Council of Tlingit and Haida Indian Tribes of Alaska's network. Follow-up information about the training was sent out via email to participants and those who were interested but unable to attend, and the information was also posted on SAWC's website.

The existence and aims of the network have been communicated to managers and decision-makers via updates at SEAKFHP meetings, at the Southeast Environmental Conference, at a SE AK Watershed Restoration Workshop, and individually on as-needed and opportunistic bases. (See Table 3. for a list of managers and decision-makers who are involved in the project.) The site compilation has been shared with key individuals within the Forest Service and Alaska Department of Environmental Conservation and on the SAWC website. Further, The White Paper describing management applications of water temperature data has been shared directly with key managers and decision-makers in various organizations. We also disseminated the white paper through our network and list of interested and relevant individuals and organizations, as well as through a press release to local news organizations, and posted it to SAWC's website.

The Steering Committee and Working Group have been kept up to date via phone conference meetings (Table 4 lists dates for meetings and workshops), updates have been sent out to the whole group following meetings, and these groups have been alerted via email of any important milestones.

To share information about the project with the general public, press releases about the initiation of the project were sent out, SAWC contributed to two radio stories, and SAWC's website and blog have been kept up-to-date with posts about progress (See Table 5 for links to important press and website posts).

**Table 4. Coordination meetings and workshops**

| | |
|---|---|
| 9/1/16 | Working Group meeting held to go over project objectives, roles, and lay out project timelines. |
| 11/30/16 | Working Group meeting held to approve minimum standards, discuss white paper, strategic sampling plan, next steps. |
| 1/17/17 | Steering Committee + Working Group meeting held to review project goals and objectives, approve minimum standards, discuss the white paper and strategic sampling plan. |
| 4/10/17 | Steering Committee + Working Group meeting held to provide a project update and discuss the white paper and data management options. |
| 5/2 – 5/5/17 | Methods training workshop held in Klukwan, AK, with 22 participants representing 6 Tribal organizations, 3 nonprofits, 2 businesses, and 1 agency. |
| 6/3/17 | Follow-up conference call with training participants to discuss next steps needed to formalize the network, including goals to be included in strategic sampling plan. |
| 7/26/17 | Coordination meeting with key Forest Service individuals – Emil Tucker, Sheila Jacobson, Julianne Thompson. |
| 8/9/17 | Informal call with working group to go over issues related to the White Paper. |
| 8/14/17 | Coordination meeting with key UAS individuals – Eran Hood, Pat Dryer, Michael Winfree. |
| 8/25/17 | Coordination meeting with key Forest Service individuals – Emil Tucker, Sheila Jacobson – to discuss the future of FS monitoring sites. |
| 9/6/17 | Mini field methods training workshop held at the Southeast Environmental Conference with 8 participants representing 4 Tribal organizations and 2 nonprofits. |
| 9/14/17 | Steering Committee + Working Group meeting held to approve the White Paper, discuss data management, the strategic sampling plan, and formalization documents. |
| 12/20/17 | Steering Committee + Working group meeting held to discuss progress on the the Strategic Sampling Plan and Implementation Plan. |
| 3/16/18 | Informal call with Julianne to discuss upcoming monitoring work that the forest service and several tribes will be conducting. |

**Table 5. Presentations, webinars, publications, reports, outreach** (Facebook, twitter, papers, newsletters, etc.)

- Press release 8/8/16
- SAWC Executive Director spoke on KSTK radio news program 8/10/16
- Presentation at the Southeast Environmental Conference 9/23/16
- Presentation at the Southeast Alaska Fish Habitat Partnership steering committee meeting 12/2/16
- News article in KTOO 5/9/17 https://www.ktoo.org/2017/05/09/stream-temperature-monitoring-provide-insight-important-fish-populations/
- Blog post on SAWC website 5/26/17 http://www.alaskawatershedcoalition.org/southeast-alaska-stream-temperature-monitoring-network/
- Presentation at the Southeast Environmental Conference 9/6/17
- White Paper: Management Applications of Regional Freshwater Temperature Data for Southeast Alaska, October 2017. *See Attached*.
- Poster presentation at the SE AK Watershed restoration Workshop 3/6/18
- Southeast Alaska Freshwater Temperature Monitoring Network Implementation Plan: In progress; the document should be released by late spring 2018. Work will continue under a supplemental grant.

**11. SIGNATURE**

03/27/2018

Rob Cadmus — Date
Executive Director
Southeast Alaska Watershed Coalition

**Table 6. Expenditures and match as compared to budget.** A signed copy of SAWC's SF-425 Financial Report is also attached.

| Budget Vs. Actual as of 03-27-2018 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Federal Share | | | | *Recipient Share (Match)* | | |
| | **Budgeted** | **Actual** | **Deviation in $** | **Deviation as %** | **Budgeted** | **Actual** | **Notes** |
| **a. Personnel** | $16,320 | $21,090.27 | -$4,770 | -9.7% | *$22,100* | *$26,975* | As per our agreement with the USFWS Project Service Officers on 03/13/2018, there is a modest overspending in staffing that is a result of a need for coordination and the remaining $2,000 in contractual expenses for the Strategic Sampling Plan will now be part of the 2017 agreement. |
| **b. Fringe Benefits** | | | | | | | |
| **c. Travel** | $9,000 | $7,878.41 | $1,122 | 2% | *$6,800* | *$400* | Expenditures are lower than estimated, but actual travel conducted is on track with predicted. |
| **d. Equipment** | $2,280 | $931.32 | $1,349 | 3% | *$5,500* | *$8,474* | Underspending compensated by increased match. |
| **e. Supplies** | $300 | | $300 | 1% | *$21,000* | *$22,600* | |
| **f. Contractual** | $17,000 | $15,000 | $2,000 | 4% | | | Remaining $2,000 is obligated for Strategic Sampling Plan and will be completed as part of the 2017 Agreement as per SAWC's 03/13/2018 conversation with USFWS Project Service Officer. |
| **g. Construction** | | | | | | | |
| **h. Other** | | | | | | | |
| **i. Total Direct Charges** | $44,900 | $44,900 | $449 | 1% | *$55,400* | *$58,449* | |
| **j. Indirect Charges** | $4,490 | $4,490 | $0 | 0% | *$3,000* | | |
| **k. Total** | **$49,390** | **$49,390** | $0 | 0% | ***$58,400*** | ***$58,449*** | |

Appendix A

| Watershed Number | Watershed | Installation Year | Area ($km^2$) | Elevation (m) | Slope (deg) | Glacier (%) | Lake (%) | Forest (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Ahrnklin | 2014 | 80.90 | 387 | 19 | 7.12 | 0.32 | 36.91 |
| 2 | Antlen | 2014 | 3.60 | 38 | 6 | 0.00 | 3.35 | 65.64 |
| 3 | Echo | 2014 | 17.60 | 169 | 9 | 0.00 | 0.51 | 79.40 |
| 4 | Miller | 2014 | 29.50 | 413 | 22 | 9.08 | 0.44 | 39.86 |
| 5 | Old Situk | 2014 | 20.60 | 50 | 4 | 0.00 | 1.26 | 98.79 |
| 6 | Chilkoot Lake stream | 2014 | 8.70 | 859 | 28 | 2.86 | 0.00 | 20.71 |
| 7 | Clear | 2014 | 2.30 | 417 | 21 | 0.00 | 0.00 | 83.63 |
| 8 | Cowee | -- | 110.50 | 647 | 24 | 11.06 | 0.20 | 57.18 |
| 9 | Limestone | 2014 | 32.30 | 681 | 27 | 0.00 | 1.49 | 41.73 |
| 10 | Salmon_R | 2010 | 93.80 | 277 | 11 | 0.00 | 0.05 | 60.62 |
| 11 | Admiralty | 2014 | 56.10 | 449 | 24 | 0.00 | 1.32 | 55.86 |
| 12 | Black | 2013 | 63.10 | 296 | 22 | 0.00 | 0.67 | 54.84 |
| 13 | Ford arm | 2014 | 26.80 | 313 | 23 | 0.00 | 1.61 | 54.99 |
| 14 | Goose | 2007 | 69.70 | 469 | 23 | 0.00 | 0.13 | 49.50 |
| 15 | Hilda | 2014 | 6.80 | 463 | 23 | 0.00 | 0.00 | 56.68 |
| 16 | Kadashan | 2011 | 43.00 | 319 | 21 | 0.00 | 0.00 | 79.54 |
| 17 | Kanalku | 2014 | 31.80 | 351 | 22 | 0.00 | 3.42 | 79.77 |
| 18 | Long | 2007 | 49.90 | 447 | 22 | 0.00 | 0.22 | 45.67 |
| 19 | No Name | 2014 | 4.60 | 325 | 24 | 0.00 | 0.00 | 75.59 |
| 20 | Peterson | 2014 | 9.40 | 327 | 19 | 0.00 | 0.00 | 87.47 |
| 21 | Seal | 2007 | 50.50 | 400 | 20 | 0.00 | 0.14 | 59.98 |
| 22 | Sitkoh | 2007 | 58.70 | 298 | 20 | 0.00 | 0.00 | 78.47 |
| 23 | Starrigavan | 2014 | 11.50 | 440 | 29 | 0.00 | 0.09 | 62.75 |
| 24 | Trap | 2012 | 11.40 | 388 | 25 | 0.00 | 0.00 | 54.78 |
| 25 | Youngs | 2014 | 14.30 | 607 | 23 | 0.00 | 0.00 | 57.32 |
| 26 | Anan | 2014 | 143.20 | 473 | 20 | 0.00 | 5.66 | 83.74 |
| 27 | Bedrock | 2014 | 9.20 | 315 | 20 | 0.00 | 0.00 | 74.32 |
| 28 | Castle | 2014 | 112.90 | 168 | 13 | 0.00 | 0.10 | 91.65 |
| 29 | Jap | 2014 | 15.60 | 495 | 26 | 0.00 | 0.00 | 85.21 |
| 30 | Kah Sheets | 2014 | 43.80 | 173 | 11 | 0.00 | 4.04 | 84.53 |
| 31 | Kunk | 2014 | 15.00 | 428 | 25 | 0.00 | 6.35 | 85.57 |
| 32 | Lunch | 2014 | 14.60 | 387 | 25 | 0.00 | 1.23 | 96.58 |
| 33 | Ohmer | 2014 | 8.30 | 387 | 16 | 0.00 | 0.00 | 91.71 |
| 34 | Thoms | 2014 | 42.00 | 100 | 10 | 0.00 | 4.43 | 93.50 |
| 35 | Eleven-mile | 2015 | 17.20 | 169 | 10 | 0.00 | 0.58 | 85.91 |
| 36 | Hatchery | 2015 | 104.80 | 234 | 13 | 0.00 | 3.25 | 91.94 |
| 37 | Hetta | 2014 | 22.80 | 336 | 24 | 0.00 | 11.51 | 73.86 |
| 38 | Old Tom | 2003 | 16.50 | 290 | 19 | 0.00 | 3.09 | 91.98 |
| 39 | Rio Roberts | 2014 | 32.00 | 282 | 12 | 0.00 | 0.12 | 98.44 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 40 | Indian River | 2011 | 31.77 | 379 | 27 | 0.00 | 0.00 | 58.90 |
| 41 | Redoubt | -- | 110.48 | 413 | 26 | 0.60 | 12.71 | 39.02 |
| 42 | Chilkoot River | -- | 132.99 | 721 | 32 | 12.62 | 5.75 | 38.06 |
| 43 | Eagle Lake | -- | 30.82 | 407 | 19 | 0.00 | 8.37 | 66.03 |
| 44 | Goulding | 2014 | 84.16 | 293 | 21 | 0.00 | 10.55 | 41.29 |
| 45 | Leo's Creek | 2014 | 12.61 | 341 | 25 | 0.00 | 2.46 | 60.70 |
| 46 | Nakwasina | 2011 | 81.68 | 636 | 31 | 0.13 | 1.30 | 22.21 |
| 47 | Orchard Lake | -- | 157.75 | 491 | 27 | 0.00 | 3.20 | 74.81 |
| 48 | Salmon Lake | 2014 | 29.54 | 391 | 24 | 0.00 | 1.77 | 75.32 |
| 49 | Signal Creek | 2014 | 3.70 | 316 | 21 | 0.00 | 0.12 | 99.92 |
| 50 | Sitkoh Lake | -- | 49.04 | 274 | 19 | 0.00 | 4.10 | 84.06 |
| 51 | Staney Creek | 1997 | 135.14 | 233 | 15 | 0.00 | 0.11 | 94.78 |
| 52 | Tenakee Head | 2007 | 74.65 | 508 | 25 | 0.17 | 0.39 | 35.59 |
| 53 | Turner Lake | -- | 140.56 | 666 | 31 | 5.94 | 9.08 | 9.01 |
| 54 | Waterfall Lake | 2014 | 17.28 | 349 | 25 | 0.00 | 1.02 | 50.10 |
| 55 | Pullen Creek | 2017 | 10.74 | 928 | 26 | 2.57 | 1.49 | 38.63 |
| 56 | Taiya River | 2003 | 273.90 | 908 | 27 | 19.68 | 0.33 | 3.67 |
| 57 | Lower Skagway River | 2017 | 353.44 | 1098 | 28 | 16.12 | 0.36 | 9.85 |
| 58 | Mid Skagway River | 2017 | 101.59 | 1154 | 32 | 32.69 | 0.13 | 7.75 |
| 59 | West Creek | 2017 | 111.69 | 996 | 29 | 28.87 | 0.01 | 20.45 |
| 60 | Herman  Creek | 2014 | 11.81 | 356 | 15 | 0.00 | 1.20 | 98.02 |