

Climate Change in Southeast Alaska – Fostering Strategic Collaboration and Informing Sustainable Management of Priority Resources

Final Report Submitted to the North Pacific Landscape Conservation Cooperative

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Cooperators: Southeast Alaska Fish Habitat Partnership (SEAKFHP), Southeast Alaska Watershed Coalition (SAWC), Alaska Coastal Rainforest Center, Trout Unlimited, State of Alaska, Sitka Conservation Society, Forest Service Alaska Region, Forest Service Pacific Northwest Research Station, Central Council Tlingit Haida Indian Tribes of Alaska, Sitka Tribe of Alaska, University of Alaska Southeast, The Nature Conservancy, Alaska Climate Science Center, US Fish and Wildlife Service, Tongass Collaborative Stewardship Group.

Project Summary

This project emphasized two NPLCC Priority Topics:

- Effects of hydrologic regime shifts on rivers, streams, and riparian corridors
- Effects of changes in the hydrologic regime on anadromous fish

Cooperators identified resources important to stakeholders and vulnerable to climate-related stressors in Southeast Alaska. The project fostered collaboration between scientists, managers, and stakeholders, achieving objectives that align with “[A Climate Change Vulnerability Assessment for Aquatic Resources in the Tongass National Forest](#)” (EcoAdapt, 2014) and the SEAKFHP [Strategic Action Plan](#):

- share information about climate-related stressors and effects on NPLCC Priority Resources in the Tongass National Forest and southeast Alaska at large;
- develop strategic priorities for improving understanding, reducing risks, and increasing adaptive capacity and resilience;
- coordinate support for increasing knowledge and informing resource managers

The objectives were achieved primarily through a 2016 workshop and follow-on activities through the end of 2017, including development of a Tongass National Forest (Tongass NF) action plan for aquatics climate change. NPLCC funds (\$33,000) paid for workshop travel for scientist presenters and tribal participants at workshops, workshop supplies, and Tongass NF employee workshop travel and salary supporting follow-on activities. Additional details are available on request. The Tongass NF and cooperators effectively leveraged these NPLCC funds to achieve additional outcomes related to stream temperature monitoring, streamflow modeling, and further development of vulnerability assessment tools and adaptation measures.

Accomplishments as of December 31, 2017

An Interim Progress Report was submitted to the NPLCC on December 31, 2016. This Final Report includes all project outcomes and accomplishments.

2016 Workshop:

A [workshop](#) was held in Juneau, Alaska April 12-14, 2016. Speakers and participants represented tribes, city government, state government, federal government, academic institutions, conservation groups, and non-governmental organizations. Topics focused on the themes of streamflow and watershed classification, freshwater temperature, and anadromous fish and habitat ecology were presented to 130 attendees. Breakout sessions for each of the three themes produced follow-on actions and priorities that were presented in closing out to all attendees. The workshop concluded with a panel discussion of how climate change information can inform management decisions. An evening social and poster session was sponsored by the Alaska Coastal Rainforest Center and Trout Unlimited.

The SEAKFHP coordinator played a significant role in the success of the workshop by convening the workshop steering committee, outreaching to a wide array of participants, and supporting workshop logistics. An experienced Forest Service facilitator kept the workshop on track and focused on outcomes.

The SEAKFHP [website](#) hosts all workshop presentations and materials. Workshop [outcomes](#) include:

- A Stream Temperature Working Group and Steering Committee continues collaboration on efforts related to freshwater temperature.
- Sharing of online maps of existing stream temperature data (University of Alaska Southeast's [SEAKRegionalStreamTemperature](#) and [AKOATS](#))
- A [stream discharge model guide](#) that compares nine regional discharge models applicable to southeast Alaska.

A topic that continues to motivate discussion and collaboration is the natural variability of habitats and salmon life histories in the context of vulnerability and adaptation to climate change. Relevant publications by workshop presenters include:

- [Sloat, M. R., Reeves, G. H. and Christiansen, K. R. \(2016\)](#), Stream network geomorphology mediates predicted vulnerability of anadromous fish habitat to hydrologic change in southeast Alaska. *Glob Change Biol.* doi:10.1111/gcb.13466
- [Adelfio, L.A. \(2016\)](#), Geomorphic and climatic controls on water temperature and streambed scour, Copper River Delta, Alaska: implications for understanding climate change impacts to the Pacific salmon egg incubation environment. Master of Science Thesis submitted to Oregon State University.

Action Plan:

The Action Plan guides collaboration and tracks Tongass NF progress on a core set of short term priorities for monitoring, adaptation, and education related to aquatics climate change. The initial Action Plan was informed by the 2016 workshop. A draft was circulated to Forest Service staff and collaborators in 2017 and has been recently updated for 2018, reflecting ongoing efforts with collaborators. Actions completed or underway include:

- Participate in stream temperature working group and NPLCC-funded Southeast Alaska Watershed Coalition project (underway).
- Continue funding stream temperature network (annually); data management agreement established with University of Alaska Southeast (2017).
- Continue funding data collection at eight Natural Resources Conservation Service snow courses in Tongass NF (annually).
- Continue funding two US Geological Survey stream gages in Tongass NF (annually).
- Support continued data analyses on the effect of wood on streambed scour, following on Sloat et al 2016. Funds provided through Forest Service Pacific Northwest Research Station. Adapt streambed scour into a dynamic model in NetMap funded through TerrainWorks (2017).
- Develop protocol for spatial watershed vulnerability tool (12-digit HUC scale) that can be populated with new information and overlapped with corporate data layers (underway).
- Pilot small, focused adaptation workshop (2017).
- Develop guidance for using aquatics climate change information in project planning (underway).
- Present climate change overview to leadership and aquatics personnel (2017).

Regional freshwater stream temperature monitoring network:

The Stream Temperature Working group created at the 2016 NPLCC-sponsored workshop continues to guide the management of a [regional freshwater stream temperature monitoring network](#) that now includes more than 100 instrument sites in Southeast Alaska. SAWC received additional NPLCC funds to produce a white paper on the [management relevance of stream temperature data](#), develop a strategic sampling plan with partners, and train communities and tribes to assist with and expand the network.

Regionally supported/endorsed stream temperature monitoring protocol:

The Stream Temperature Working Group endorsed [Stream temperature data collection standards for Alaska: Minimum standards to generate data useful for regional-scale analyses \(Mauger, et al. 2015, Journal of Hydrology: Regional Studies 4 \(2015\) 431–438\)](#). At the 2016 workshop, break-out group participants generally agreed that this publication provides minimum standards for data collection. Most federal/state agency data collection efforts exceed these standards.

State-sponsored stream temperature data repository and access strategy:

In the short term, stream temperature network data collected by the Forest Service and others is archived at University of Alaska Southeast. Several participating agencies have internal stream temperature databases that do not allow access by external collaborators. The Stream Temperature Working Group is actively considering options with a goal to move forward as a statewide group (beyond southeast Alaska), housing all data in a repository with open access and transparency. Currently, the [AKOATS](#) database houses metadata (site locations and descriptions). The [National Center for Ecological Analysis and Synthesis](#) (NCEAS) houses all the Alaska stream temperature data.

2017 Stream Discharge Workshop

Following on the 2016 NPLCC-sponsored workshop, the Alaska Coastal Rainforest Center convened a Stream Discharge Workshop in October 2017 to form a work group and further discussion about discharge modeling priorities in the context of climate change. Participants included federal and state agencies, University of Alaska Fairbanks, tribes, and NGOs.

Regional watershed classification procedure / salmon habitat vulnerability assessment tool:

A watershed classification procedure could integrate and display the diversity of water resources and fish habitats across southeast Alaska to inform protection, monitoring, and adaptation strategies. At the 12-digit HUC scale, watersheds are classified by their streamflow regime as glacial-, snowmelt-, or rain-driven using glacier maps, imagery, and elevation. In 2017, the Tongass NF began developing a watershed scale salmon habitat vulnerability assessment tool using updated climate model downscaling products provided by Jeremy Littell of the Alaska Climate Science Center. Maps depicting future trends in snow indices overlaid with 12-digit HUC boundaries provide the base for integrating additional information such as salmon populations, habitat indices, and subsistence priorities. Regionally, these maps display a first approximation of likely changes and impacts of climate change; they will inform the stream temperature monitoring network. At the individual watershed scale, other information (landslide prone terrain, salmon spawning reaches, streambed scour, road locations, etc) can be considered for project level assessment and adaptation measures.

2017 Adaptation Workshop

An Aquatic Climate Change Adaptation Workshop was held in Juneau on April 17-20, 2017 to develop guidance for incorporating aquatics climate change information and adaptation actions into project planning. Workshop participants included tribal representatives, US Fish and Wildlife Service staff, and Forest Service scientists and specialists representing hydrology, fisheries, wildlife, engineering, and recreation. Participants brainstormed a conceptual ecological model to identify elements of the system to consider when developing management actions to address negative consequences of climate change on coho salmon in SE Alaska. A recurring theme at the workshop was the importance of identifying and acknowledging landscape-scale and watershed-scale variability as a mediating factor in the consequences of climate change in SE Alaska (e.g., Sloat et al, 2016). This variability will be a critical consideration for adaptation measures and project-level guidance that can be applied to locations where they are most needed and effective. Outcomes from this workshop are in review and will be rolled out with the preliminary Salmon Habitat Vulnerability Assessment Tool in spring 2018.

Presentations to managers and stakeholders:

Julianne Thompson presented climate change information, including a summary of NPLCC project outcomes, to Tongass NF aquatics personnel in January, 2017 and to Tongass NF managers in October, 2017. Project outcomes and progress were also included in the annual Climate Performance Scorecard annually submitted to the Forest Service Alaska Region. Additional presentation of adaptation measures and the Salmon Habitat Vulnerability Assessment Tool is planned for spring 2018.

Communication and outreach:

SEAKFHP facilitated initial engagement and support of the cooperators and the workshop steering committee. Use of SEAKFHP's website to host workshop materials and other climate change resources has greatly enhanced all cooperators' ability to rapidly share and update information as needed. The workshop was highlighted in the All-Alaska Fish Habitat Partnerships ESRI [Story Map](#). Continued participation in SEAKFHP, Interagency Hydrology Committee of Alaska, and the Stream Temperature Working Group have proven to be valuable venues for ongoing dialog with other agencies and

stakeholders. [SAWC's website](#) is an asset for continued sharing and collaboration on stream temperature monitoring.

The NPLCC-sponsored 2016 workshop materials and follow-on activities have been shared broadly to Forest Service managers and aquatic specialists in the Alaska Region. Several workshop participants attended the Southeast Alaska Climate Change Summit held in Ketchikan, Alaska, September 22-23, 2016. SAWC and other cooperators continue to participate in annual Southeast Environmental Conferences, providing further opportunity for communication and outreach on potential collaboration opportunities with tribes as they work on climate change adaptation plans.