Version 2 – July 14, 2016

Climate Change in Southeast Alaska – Informing Sustainable Management of Water Resources and Anadromous Fisheries

April 12-15, 2016

Workshop Outcomes

1. **List of available tools to predict streamflow, comparisons**

   The Streamflow Discharge/Watershed Classification Group provided a Discharge Model Guide that describes and compares nine regional discharge models for the Gulf of Alaska.

2. **Status of streamflow prediction tools incorporating climate change**

   There are no evident plans to expand empirical models to incorporate climate change. Daily time step process models *could* be used for peak flow estimation, but may have poor predictive ability into the future. Further work may be needed, see **Next Steps**, below.

   Janet Curran (USGS) mentioned a project in the works to evaluate trends.

3. **Status of regional watershed classification(s) for use in finer scale vulnerability assessment**

   USFS - PNW Research Station has a project in review, available summer 2016.

   This could be an important tool to integrate and display the diversity of water resources and fish habitats across the region to inform protection, monitoring, and adaptation strategies. See **Next Steps**, below.

4. **Baseline map of existing stream temperature data**

   Two online resources (UAS SEAKRegionalStreamTemperature and AKOATS) provide a good start. Continue outreach to interested partners to fill in the gaps: who is currently collecting data, where do they collect it and are they willing to share it?

5. **Process to endorse field protocols for stream temperature**

   Sue Mauger (Cook Inletkeeper) has published Stream Temperature Data Collection Standards and Protocol for Alaska. Break-out group participants generally agreed that this publication provides minimum standards for data collection. Most federal/state agency data collection efforts would exceed these standards. See **Next Steps**, below.

6. **Recommendation for managing/expanding current stream temperature network**

   See Stream Temperature Working Group information in **#9**, and in **Next Steps**, below. Engage with Anadromous Fish / Habitat Ecology group to ensure that natural variability is built into network, including year-round data and lakes.

   Tier1: Leverage existing capacity/organization/networks and historical information
   Tier2: Build out the network to fill gaps - tied to funding and articulating management needs
   Tier3: Strategic site placement to meet specific questions of interest

7. **List of critical knowledge gaps in context of management decisions**

   Physical-based streamflow models that can drive constituent loads, inform infrastructure and restoration design, and assess climate change impacts in streams (scour, etc)

   Process models for extreme events (rain-on-snow, glacial outburst floods)

   Weather and climate data to inform streamflow models, especially for higher elevations

   Regional watershed classification based on predicted hydrograph changes; include updated glacier mapping

   Thermal regimes in streams and lakes, natural variability

   Stream productivity, including geomorphic setting and latitudinal gradients

   Effects of changing climate on freshwater fish life history (e.g., emergence timing, and fitness of juvenile fish over the course of a growing season)

   Effects of changing climate on marine fish life history (e.g., years at sea, distribution shifts)

   Identify vulnerable stocks and habitats at risk to protect genetic diversity

   Relationship between freshwater and marine fisheries harvest management and outcomes for genetic patterns and life histories in context of changing climate and ocean and stream conditions.

   Pollutant concentrations as stressors (urbanized watersheds, mines)

   Effects of hatcheries and straying which might reduce genetic diversity and change demographics (distribution, abundance) of other stocks

   How will changes in abundance and species composition of anadromous fish in freshwater environments influence the sharing economy of customary and traditional users and what may be the consequences for communities throughout SE Alaska?

   What tools are available to aid users of salmon in SE Alaska (commercial, recreational, customary & traditional) to anticipate change in salmon resources to facilitate long-term planning?

   What form should integrated models (stream temperature/hydrologic regime/climate trend) take to effectively inform prioritization of stream restoration, infrastructure maintenance, and other management actions?

8. **Beginnings of a strategic plan, action items**

   [In development, review draft in August; there are some obvious action items to be plucked from the **Next Steps**, below.]

   Potential reviewers: Workshop planning committee and participants, Teri Camery, Sean Eagan, Angie Flickinger, Christopher Estes, others?

9. **List of topics/participants for regional working group(s)**

See **Next Steps**, below, for likely topics.

Existing regional working groups include SEAKFHP, Interagency Hydrology Committee for Alaska (IHCA).

A small Stream Temperature Working Group has been established: Scott Harris (SAWC), Eran Hood (UAS), Emil Tucker (USFS), and Sue Mauger (Cook Inletkeeper). The Stream Temperature Steering Committee includes: the Working Group, Angie Flickinger (SAWC), Emily Ferry (SEACC), Jeff Nichols (ADFG), Brock Tabor (ADEC), Gretchen Pikul (ADEC), Ryan Toohey (USGS), Deborah Hart (SEAKFHP), Michael Winfree (UAS), Ray Paddock (CCTHITA) and Dan Isaak (USFS – NORWest). The steering committee will meet approximately once every couple months, and the primary functions will be to advise the Working Group on 1) ensuring any network development considers the management context, 2) data collected will inform management, 3) network development addresses regional monitoring needs, and 3) integrating with other networks.

Next Steps

Draft action plan. Identify 1) target users/collaborators; 2) issues/management problems to address; 3) applicable timeframe or management horizon; 4) indicators of success.

Utilize SEAKFHP and IHCA to continue collaboration and information sharing.

Increase collaboration with agencies, tribes, and conservation organizations to support continued or expanded data collection (stream gages, weather, etc).

Anadromous Fish / Habitat Ecology group would like to engage with the Freshwater Temperature group when devising questions to be asked in setting up a monitoring program for SE Alaska. Winter temperatures are important to track. Specific emphasis on lake systems and how to track, specific to sockeye effects.

Share regional watershed classification; compare to Chugach NF approach. Package existing information spatially (temperature, hydrologic regimes, stream habitat, etc) and apply NetMap tools for displaying regional diversity and developing strategies for protection, monitoring, and adaptation to inform resource managers.

Synthesize information to actively inform management. Develop a protocol to employ incoming information (stream temperature, hydrologic regime, salmon stock status, climate projections) in setting priorities for watershed restoration, infrastructure maintenance, and other management actions.

Test and apply regional discharge models, assess strengths and weaknesses, report back to authors.

Confirm Stream Temperature Steering Committee and Working Group. Tasks include acceptance of data collection standards, network coordinator, white paper on management relevance, strategic plan that identifies the key questions that need to be answered using the stream temperature network.

Submit NPLCC stream temperature proposal (done).

Schedule small, focused adaptation workshops. Include tribes and social scientists/economists. Develop adaptation training modules that could apply to various entities (agencies, subsistence users, general public, etc).

Provide a forum for freshwater and marine salmon experts to develop a synthesis of "salmon status" informed by climate change.

Bring social scientists and economists together with salmon biologists and hydrologists to develop a synthesis regarding potential social/cultural/economic outcomes of salmon status. This synthesis would be designed to inform the adaptation workshops.

Compose an Adaptation Plan based on spatially explicit analyses (example of this from the Olympic Peninsula) to protect a network of systems and functions.

- Identify the risks and threats
- Identify ways to minimize stressors
- Identify ways for management to be more responsive to dynamic systems
- Build inherent variability into monitoring