

Project Title: Identifying climate vulnerabilities and prioritizing adaptation strategies for Eulachon populations in the Chilkoot and Chilkat rivers and the application of local monitoring systems.

Funding Announcement #1

Principal Investigator: Brad Ryan, Chilkoot Indian Association, brad13ryan@hotmail.com, 907-766-2323

Cooperators/Partners: Dan Schultz, Takshanuk Watershed Council, dan.schultz@takshanuk.org, 907-766-3542:
Eulachon population research: planning, implementation, coordination of training, field work over sight, and written reports.

Mike Brubaker, Alaska Native Tribal Health Consortium, mbrubaker@anthc.org, 907-729-2464: *Working group training for Local Environmental Observation (LEO) system, and coordination and maintenance of LEO observations.*

Project Summary:

This project will complete a tribally-based climate change vulnerability assessment and adaptation plan for Eulachon that spawn in the Chilkoot and Chilkat rivers near Haines, Alaska. Local monitoring will collect data on spawning populations in the Chilkoot River, and a tribal stakeholder group will be convened to analyze climate change projections, apply traditional knowledge, rank climate vulnerabilities, and prioritized adaptation strategies.

Project Proposal:

Climate change represents a current and future environmental stress multiplier to the population health of Eulachon (*Thaleichthys pacificus*). Investigation into a species' climate change vulnerability commonly requires the application of *climate change exposure* to baseline understandings of a species' *sensitivity and adaptive capacity* (a concept derived from existing trends in population vitality and habitat change). Unfortunately, Eulachon populations across the North Pacific and in the upper Lynn Canal area of Southeast Alaska in particular, still suffer from incomplete baseline understandings of population health. This project will therefore investigate Eulachon climate vulnerability and adaptation strategies through both the continued tribal monitoring of population run strength in harvest areas, and the synchronization of scientific climate projections with Traditional Ecological Knowledge (TEK). The result will be Tribally identified and prioritized adaptation strategies for Eulachon populations that are grounded in local monitoring efforts and directly applicable to the citizen-based management of the fishery.

Objective and Need:

Eulachon, a small anadromous smelt, are a highly nutritious fish (20% fat) that are culturally significant to the Chilkat and Chilkoot peoples of the Tlingit nation. Eulachon have been documented to spawn in ninety-five different rivers along the North Pacific Coast¹. Chilkoot Indian Association (CIA) members traditionally fish for eulachon in the lower ten miles of the Chilkat River and the lower mile of the Chilkoot River, both in close proximity to the town of Haines, Alaska. While the local perception is that eulachon populations are low, there has been little scientific investigation as to the size of the population^{2,3}. It is important for CIA members to understand eulachon population health as the eulachon fishery in Haines is primarily regulated by Tlingit citizen harvesters rather than by external state or federal regulations⁴. Tribal elders have expressed a desire to see better scientific data inform and future management of the Eulachon population, and this is especially true with the ongoing interest of non-natives in subsistence living, who often lack knowledge of cultural management principals. The CIA Tribal council has expressed their support for this project proposal in Resolution 13-04 on April 25th, 2013 (see attached document).

Population and habitat research of Eulachon in the Chilkoot and Chilkat rivers was previously initiated by CIA in the years 2010, 2011, 2012. Population estimates for the Chilkoot River were 2.2 million (95% CI 1.7 to 2.7 million), 12.6 million (95% CI 11.5 to 12.6 million), and 7.1 million (95% CI 6.1 to 8.1 million) in 2010, 2011, and 2012

respectively. Unfortunately, the Chilkat River proved too braided and silty for effective measurement of Eulachon populations⁵. This research provided the first scientifically valid analysis of the strength of Eulachon runs in the area, and complemented existing TEK. This project proposal builds off the success of this previous work and introduces timely climate change discussions into tribal community considerations of this important resource:

Objective: This project seeks to advance tribally directed Eulachon population research along the Chilkoot River, analyze this data alongside the highest resolution climate projections available, and initiate a local working group of tribal experts and other stakeholders to identify and rank Eulachon climate vulnerabilities and adaptation strategies, culminating in an effort to energize tribal landscape level conservation and sustainable resource management

Need: Without local scientific investigations of modern Eulachon populations, and the opportunities for synchronization with TEK and climate projections, tribal management efforts will likely fail to achieve greater Eulachon climate resilience or meet the NPLCC Mission of: *“development, coordination, and dissemination of science to inform landscape level conservation and sustainable resource management in the face of a changing climate and related stressors”*

This project will contribute directly to NPLCC goals to:

1. Maximize the ability of partners to make informed decisions with respect to conservation and sustainable resource management or priority natural and cultural resources subject to climate change and related large-scale stressors in the NPLCC region.
4. Promote identification, use, and sharing of science, traditional knowledge and other relevant information to support conservation/sustainable resource management, and adaptive management decisions.
5. Maximize the availability and accessibility of data and information about large-scale stressors and their impacts on natural and cultural resources, and about conservation/sustainable resource management approaches and effectiveness.

Methods:

CIA has established effective and reliable methods of Eulachon population estimates on the Chilkoot River. CIA will utilize this established research protocol and equipment in the two seasons of Eulachon population research outlined in this proposal. All major equipment for the population research will be provided by CIA in-kind (a match of approximately \$5500). The population research utilizes a mark recapture method ($N = \frac{(M+1)(C+1)}{(R+1)} - 1$) where N= total population size, M=marked initially, C=total in second sample, and R=marked recaptures. 95% confidence intervals are calculated using the equation $N = \pm (1.96)(SE)$. The population is estimated for an annual population. Initially marked groups are captured using modified fyke net traps and dip nets. The modified fyke net traps were modeled after traps used by the USDA Forest Service, Juneau Ranger District Biologists to trap eulachon on the Antler River in Berners Bay, AK. The captured eulachon are transferred in small groups to plastic dishpans where they are easily handled to clip off the adipose fin using retina scissors and returned directly to the river. To avoid excessive increases in temperature and reduce the possibility of disease transmission, the water in the dishpan is changed between each group. No anesthetic will be used because many of the clipped fish are being harvested by subsistence fisherman the same day and the readily available anesthetic is not approved for consumption by the FDA.

To allow time for the marked fish to mix with the unmarked fish the recapture groups are captured a minimum of 0.75 Km upstream from initial capture. Two capture methods are used for the recapture group; when sufficient numbers of subsistence users are present the fish collected for subsistence use within the designated area are examined, when subsistence users are not present crews of two wade the river with dip nets making sure to sample all portions of the river. The captured fish are then examined for a clipped adipose fin before releasing. To avoid repetitive sampling of the same fish, the sampling crews start at a downstream point and work their way upstream.

CIA staff will also attempt to develop a population index to be coupled with the population estimates described above. To establish the population index the fyke net will be fished for one hour after low tide each day of the Eulachon Run. At the completion of one hour the entrance to the trap will be closed and the fish in the trap will be quantified. The total number of Eulachon captured in one hour intervals will be correlated with the mark recapture

population estimates to provide an abundance reference for the population index. If the population index is found to be a valid and reliable research method, the research could be conducted annually with a small workforce contributing a few hours each day during the 10-14 day Eulachon run. This population index may prove to be the best working method for population methods if more comprehensive management plans are developed.

Key cooperators in the Eulachon population research include Dan Schultz from the Takshanuk Watershed Council (TWC). Mr. Schultz had direct participation in and management of the previous population research efforts. CIA partnered directly with the TWC in its previous Eulachon research efforts. Principal Investigator for this project, Brad Ryan, worked at TWC during that research and compiled the final reports. Mr. Ryan will again assume this responsibility as a staff member of CIA and Dan Schultz will work to coordinate CIA field techs, compile research data, acquire permits, oversee CIA equipment, and reporting to CIA.

There are a wide range of Alaska and Pacific Northwest specific climate projections increasingly becoming available. This includes such information as community specific temperature and precipitation projections (under different GHG emissions scenarios) provided by the Scenarios Network for Alaska and Arctic Planning (SNAP) at the University of Alaska Fairbanks⁶. Such information, alongside appropriate projections on ocean acidification, sea-level rise, etc., will be combed for its relevance to the Eulachon life cycle by CIA staff working alongside Traditional Knowledge Holders and other local environmental management stakeholders convened in a working group. This **Eulachon Climate Change Working Group** will meet 4 times per year during the project period. The meetings will be organized with the following objectives:

	Year 1	Year 2
Meeting 1	Initiate Eulachon Climate Rapid Impact Assessment	Review ranking of Eulachon climate vulnerabilities
Meeting 2	Review Eulachon Climate Rapid Impact Assessment	Identify relevant adaptation strategies for vulnerabilities
Meeting 3	Training on Local Environmental Observation (LEO) system, community monitoring	Roundtable on LEO system information gathering and future use
Meeting 4	Initiate ranking of Eulachon Climate Vulnerabilities	Prioritize adaptation strategies

A Eulachon Rapid Climate Impact Assessment will arise from the synthesis of high-resolution climate change projections (Climate Exposure) with scientific and TEK understandings of Eulachon life cycles (sensitivity and adaptive capacity) (YR1: Meetings 1&2). The result will be a descriptive document that allows the identification of key Eulachon Climate Vulnerabilities. The Vulnerabilities will then be ranked based on a Sensitivity X Adaptive Capacity matrix (YR1: Meeting 4, YR2: Meeting 1). The nature of these ranked vulnerabilities will lead the identification of adaptation strategies which will eventually be prioritized by their attendance to impacts measured by: magnitude, timing, persistence and reversibility, likelihood, distributional nature, system at risk, and potential for implementation (YR2: Meetings2&4). Working group Traditional Knowledge Holders not participating in an organizational capacity will be compensated for their attendance to each meeting with a small honorarium.

Each year Meeting 3, concerning the Local Environmental Observation (LEO) system, will be convened by Mike Brubaker, director of the Center for Climate and Health, at the Alaska Native Tribal Health Consortium (ANTHC), Anchorage, AK, where the LEO program is housed. LEO is composed largely of environmental, natural resources, and health professionals at Tribal organizations who share observations about local climate influenced events that are unusual or unique; over 200 individuals in 100 communities are enrolled across Alaska and in western Canada. The participants post observations, photos, and video to a simple, web-based form. Content is reviewed and the information is then posted to Google maps organized by month, topic, and region. Monthly voluntary LEO webinars are held to review observations and provide the results of coordination with outside experts. This collation of tribal environmental observations encourages communication between communities, academic institutions, and resource agencies. The purpose is to increase understanding about climate and other drivers of change and to develop effective adaptation strategies through a robust and effective environmental health surveillance system. The LEO system will provide members of the **Eulachon Climate Change Working Group** direct access to a monitoring system to input ongoing TEK observation of changing Eulachon populations and climate exposure to an audience of state and nation-wide stakeholders with adaptation resources.

The Eulachon population research will be formatted into a reporting form similar to findings in 2010, 2011, and 2012 in order to most easily compare data. This will include a year 1 report and a final (project period) report. The minutes and decisions of the convened **Eulachon Climate Change Working Group** will be compiled into a guidance document in internal draft form (Year 1) and in Final form (project period), available for public access on the CIA website. This monitoring research and guidance document will act as a strong foundation for tribal and community decisions on management of this important resource.

Geographic Extent:

Geographic study area for population research is the Chilkoot river, up to Chilkoot lake which feeds the river. CIAs tribally rooted research methods are mostly low-cost (especially if the population index method is found to be effective and reliable) and could be considered for many Eulachon runs across the Pacific Northwest. The Eulachon Climate Change Working Group will undertake consideration for Eulachon climate vulnerabilities and adaptation strategies for Eulachon populations in both the Chilkoot and Chilkat Rivers. The working group’s application of scientific climate exposure data to TEK-based Eulachon sensitivity and adaptive capacity will provide a model for climate vulnerability assessment and adaptation action planning for any tribal entity or small community across the NPLCC region.

Timeline:

Month	Year 1			Year 2		
	Outcomes	Products	Milestones	Outcomes	Products	Milestones
Oct						
Nov			Meeting 1	Final ranking of Eulachon climate vulnerabilities		Meeting 1
Dec						
Jan						
Feb	Reviewed Eulachon Rapid Climate Assessment		Meeting 2	Identify relevant adaptation strategies		Meeting 2
Mar		Rapid Climate Assessment brief			Eulachon climate vulnerabilities brief	
April						
May			Eulachon Population research completed			Eulachon Population research completed
June	Enrolled LEO members		Meeting 3	Future LEO participation action plan		Meeting 3
July		Eulachon pop. Research: Yr 1 report			Eulachon pop. Research: FINAL report	
Aug						
Sept			Meeting 4	Prioritized adaptation strategies	FINAL Working Group Report	Meeting 4

Disclaimer regarding Data Sharing:

The naming of specific hooligan harvesting sites within the traditional use areas of the Chilkoot and Chilkat Rivers may be withheld from public dissemination. Adaptation strategies dependent on internal discussions by CIA may also be withheld from public review.

References

- ¹ Moody MF, (2008) Eulachon past and present. A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science, The University of British Columbia, Vancouver, BC.
- ² Bishop DM, Carstensen RL, Bishop GH (1989) A report on the environmental studies at Haines airport. Environaid, 12175 Mendenhall Loop Road, Juneau, AK
- ³ Betts M (1994) The subsistence hooligan fishery of the Chilkat and Chilkoot Rivers. Tech Rep No. 213, Alaska Department of Fish and Game, Division of Subsistence, Juneau, AK
- ⁴ Betts M (1994) The subsistence hooligan fishery of the Chilkat and Chilkoot Rivers. Tech Rep No. 213, Alaska Department of Fish and Game, Division of Subsistence, Juneau, AK
- ⁵ Ryan, B., 2012. Run timing and population estimates for eulachon *Thaleichthys pacificus* in the Chilkat and Chilkoot rivers in S.E. Alaska 2010-2012. Chilkoot Indian Association. Haines, AK. Available: <http://www.chilkoot-nun.gov/environmental-services>
- ⁶ <http://www.snap.uaf.edu/>