SUSTAINABLE
SALMON
INITIATIVE

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Announcement of
2015 AYK SSI Research Priorities

Prior to release of an official 2015 Request for Proposals (RFP), the Arctic-Yukon-Kuskokwim Sustainable Salmon Initiative (AYK SSI) is providing advance notice of AYK SSI 2015 research priorities. An important goal of our program is to ensure that opportunities for local or regional capacity building are designed into all proposed projects where appropriate. In addition to facilitating collaboration among teams of researchers, it is our intention that this advance notice of priorities will also aid researchers in collaborating with in-region partners to support expanded capacity building opportunities.

Proposals addressing and advancing our priorities will be selected for funding of up to three years in duration via a competitive proposal process. Informed by expert peer reviews and review by our science panel, the AYK SSI Steering Committee will select projects for funding at its March 2015 meeting. Total research funding under this RFP (minimum of $925,000 and potentially up to maximum of $2.9M) as well as the proposal deadline and submission instructions will be announced in an RFP to be released in late-November or early-December 2014. We anticipate a late January proposal submission deadline.

SPECIES OF SPECIAL CONCERN: AYK Region Chinook Salmon Populations

The AYK region has experienced disastrous declines of Chinook salmon over the past decade, resulting in years of region-wide commercial fishing closures, extensive restrictions of subsistence harvests, and unmet escapement targets. The 2012-14 Chinook salmon returns to the Yukon, Kuskokwim, and Unalakleet Rivers continue this overall pattern of very low abundance. In response, the 2015 RFP priorities focus on Chinook salmon as the "Species of Special Concern."

The 2015 research priorities, which were approved by the AYK SSI Steering Committee, are drawn from two sources:

1) Themes 1-4 are drawn from the **AYK SSI Chinook Salmon Research Action Plan**, a strategic science plan focused on the most likely causes of the decline of Chinook salmon populations (see http://www.aykssi.org/aykssi-chinook-salmon-research-action-plan-2013/).

2) Theme 5 is drawn from the broader **AYK SSI Research and Restoration Plan**, a science-based roadmap that identifies knowledge gaps and establishes research priorities for AYK salmon (see http://www.aykssi.org/ayk-plan/).

Example research questions for each of the priority research themes can be found in these two salmon science plans. However, we remind prospective PIs that these are not the only questions of importance. Our intent is that example questions will serve to stimulate researchers to craft their own hypotheses and questions as they develop research proposals.

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2015 AYK SSI CHINOOK SALMON RESEARCH PRIORITIES

THEME 1 – Density-Dependent Effects: Has the long-term variation and recent declines in AYK Chinook salmon stocks been caused by strong density-dependent effects on population dynamics?

Description: High spawner abundances of salmon in some streams can cause declines in the recruitment of the next generation via strong density-dependent effects- a biological phenomenon referred to as "overcompensation." At high spawner densities competition for critical resources (e.g., spawning habitat, food resources for overabundant juveniles) may become so intense as to substantially reduce survival to levels below what is needed for cohort replacement, thereby leading to temporary population declines. At the other extreme, stock productivity may decrease as the abundance declines to low levels as a result of depensatory mechanisms (such as reduced probability of fertilization or impaired group dynamics leading to increased predation). This theme encourages research evaluating the evidence for strong density-dependent effects in AYK Chinook salmon populations, including overcompensation and depensation, and assessing the contributions of these feedbacks to observed population dynamics.

THEME 2 – Drivers of Freshwater Mortality: Have changes in the suitability or productivity of freshwater habitat used for spawning, rearing, and migration contributed to declines in AYK Chinook salmon stocks?

Description: This theme examines the way in which productivity and population dynamics of Chinook salmon populations are linked to forcing factors that control growth and survival during the freshwater component of their life cycle. For most salmon populations, the freshwater stages sustain over half of the total egg-to-adult mortality. Adult, embryonic, and juvenile stages are all vulnerable to changes in freshwater environmental conditions. For example, incubating embryos can be affected by several variables including winter temperatures, oxygen regimes, and flow-related gravel scouring. Juvenile salmon, prior to ocean entry, may be limited by food resources that affect growth rates and associated survival during smolting, and by mortality losses to freshwater predators. The central question underlying this research hypothesis is whether any specific variable(s) in the freshwater environment could have contributed to the observed trends in AYK Chinook salmon.

THEME 3 – Drivers of Marine Mortality: Have changing ocean conditions (physical and biological) in the Bering Sea increased mortality of Chinook salmon and contributed to the decline of AYK stocks?

Description: This theme examines the way in which productivity and population dynamics of Chinook salmon populations are linked to environmental conditions that control growth and survival during the marine (including estuarine) component of their life cycle. During their marine life phase, changes in the physical environment (e.g., temperature) could affect salmon directly via physiological processes, or indirectly through changes in the food web. For example, increased upwelling can lead to higher primary and secondary production, leading to increased food availability for juvenile salmon. Changes in the biological environment, such as food web structure (i.e., prey, competitors, predators), can also affect feeding rates and ultimately survival. Additional research is needed to improve our understanding of the role of environmental forcing on salmon population dynamics and, in turn, to develop the capacity to distinguish between freshwater and marine drivers of those dynamics.

THEME 4 – Escapement Quality: Has selective fishing or other environmental factors altered the size, sex ratio, and composition of life history types in ways that have contributed to recent declines of AYK Chinook salmon?

Description: This theme focuses on the role of genetic selection by fisheries or other environmental factors to change the genetic component that determines age, size, growth, and time to maturity (phenotypic characters). Phenotypic characters are determined both by genetics and the environment. For example, genetics control the potential for growth and the environment provides food that controls the expression of that potential. The genetic changes hypothesized could affect the recruitment of subsequent generations of salmon.

THEME 5 – Management for sustainability under uncertainty: What management approaches are likely to be most robust to uncertainties of our mechanistic understanding of AYK Chinook salmon?

Description: Scientific understanding of AYK ecosystems will always be incomplete and a mechanistic understanding of the causes of variation in Chinook salmon populations may be sufficiently limited that prescriptive management is not effective. This theme encourages retrospective and simulation studies that assess the performance of different management approaches for maintaining productive Chinook salmon under varying levels of uncertainty. This research could include development and application of modeling approaches that evaluate risk under different management strategies, address critical data uncertainties, and develop alternative schemes for applying adaptive management to AYK Chinook salmon.