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Mr. Volk and Mr. Clark,

Thank you for the opportunity to review and comment on the draft document "Alaska Chinook Salmon Knowledge Gaps and Needs". I appreciate your attention to address the causes of low returns of Chinook salmon runs which have impacted our local fishing communities and economies.

I support the inclusion of freshwater survival (feature #4) as a critical component of a stock assessment program; however, overall the draft document minimizes the importance of freshwater issues and poorly articulates the relevant gaps in our freshwater habitat knowledge. Our ability to discern population impacts during the freshwater phase of the salmon life cycle is extremely limited. I believe more attention needs to be given to thermal, hydrologic and habitat impacts to Chinook salmon populations occurring in the freshwater environment for the following reasons:

- Based on an assessment of 48 non-glacial salmon streams in Cook Inlet in 2009, water temperature in 81% of the streams were above 15°C and 35% of the streams were above 20°C along adult migration corridors. Hicks (2000) recommended that daily maximum temperatures should not exceed 20° to 21°C in order to prevent migration blockage of adult Chinook salmon.ⁱ The conventional wisdom is that if a decline in salmon populations happens across a large region, then the problem must be in the ocean; however, stressful water temperatures are found consistently across streams throughout the Cook Inlet regionⁱⁱ. Thermal impacts in freshwater systems are not isolated occurrences and are regionally relevant to Chinook survival.
- In addition to a warming trend, there is some evidence of an associated drying cycle that may be affecting wetlands, lake levels and other surface waters. For example, spruce trees are now taking root in muskeg areas, and treeline appears to be rising in the Kenai Mountains on the eastern edges of the Kenai River basin.ⁱⁱⁱ Drying wetlands may have a

significant impact on water availability and summer base flows in small streams. Our knowledge of instream flow requirements seasonally is limited throughout Alaska.

- Southcentral Alaska has had three significant (50-100 year) flood events in the last 10 years: 2002, 2006 and 2012. Fall floods are tough on salmon - not to mention our roads, culverts, bridges and basements. Salmon eggs in gravels are vulnerable; juveniles may be able to find refuge, but in big events chances are high that they will get stranded when flood waters recede. Climate modelers and hydrologists have been telling us for years that one expected outcome of a changing climate is that we will experience more fall storms and more extreme storms. The state of Alaska has not invested in water quantity monitoring generally and specifically not in gauging stations on smaller non-glacial systems to determine if flood frequencies are increasing in these important rearing habitats.
- The Draft Gap Analysis highlights the need to improve our ability, geographic scope and techniques for counting Chinook, mostly adults. However, our knowledge of habitat use by juvenile Chinook salmon is almost non-existent. We have little information about over-wintering habitat use or availability and potential risks to that habitat. We don't know about migratory corridors through large river systems as adults move upstream to spawn or smolt move out. If we don't know where the Chinook are and when, we can't create watershed planning tools to protect their habitat.

I encourage you to include our lack of knowledge of thermal, hydrologic and habitat impacts to Chinook salmon populations in the GAP Analysis.

Again, thank you for your attention to this important issue.

Sincerely,



Sue Mauger
Science Director

ⁱ Hicks, M. Evaluating standards for protecting aquatic life in Washington's surface water quality standards. Draft discussion paper and literature summary. Revised 2002. Washington State Department of Ecology, Olympia, WA, 197 pp. (2000).

ⁱⁱ Mauger, S. 2011. Stream Temperature Monitoring Network for Cook Inlet Salmon Streams 2008-2010. Alaska Clean Water Action (ACWA) Grant 11-01, FY2011 Final Report. Cook Inletkeeper, Homer, Alaska. Available at: <http://inletkeeper.org/resources/contents/stream-temperature-report/view>

ⁱⁱⁱ Berg, E. 2001. Drying kettle ponds reveal a drying trend on the Kenai Peninsula. Refuge Notebook. Online at: <http://chinook.kpc.alaska.edu/>