MEMORANDUM

Date: September 25, 2019
To: Chehalis Basin Strategy, Aquatic Species Restoration Plan Science and Technical Review Team
From: John Ferguson, Anchor QEA LLC
Re: Potential List of Early Actions Focused on Spring-Run Chinook Salmon

Spring-run Chinook Salmon Early Actions

Over the past year, there has been an increased concern within the Aquatic Species Restoration Plan (ASRP) Science and Technical Review Team (SRT) regarding the current status of spring-run Chinook salmon (*Oncorhynchus tshawytscha*) in the Chehalis Basin. At the August 28, 2019 meeting, I volunteered to describe some potential early actions that could be implemented that focus exclusively on spring-run Chinook salmon. The following list of potential actions was developed to support continued discussion of spring-run Chinook salmon in the Chehalis Basin:

1. **Install Beaver Dam Analogs (BDAs) to Reduce Interbreeding (Heterozygosity) with Fall-Run Chinook -Salmon**
   A. **Action:** Experimentally evaluate whether BDAs installed at a selected site(s) within the Newaukum or Skookumchuck rivers can effectively reduce interbreeding. Identify potential sites and willing landowners; install BDAs at selected site(s); and design, implement, and report on their effectiveness based on monitoring after installation.
   B. **Background:** The March 27, 2019 presentation to the SRT by Tasha Thompson (University of California, Davis) identified some important trends regarding Chinook salmon genetics. Tissue sample analysis indicated there was a decrease in the percentage of homozygous spring-run Chinook salmon in samples collected in 2009 and from 2014 to 2016 compared to an earlier period (2001 to 2005). Analysis of samples identified in the field as spring-run indicated that homozygosity was eliminated in samples collected in the Skookumchuck River and upper mainstem Chehalis River locations, and heterozygosity appeared in the more recent samples collected in the Newaukum River. Also, samples collected from the Skookumchuck River changed from 100% homozygous for spring-run Chinook salmon to 100% heterozygous between the earlier and more recent time periods analyzed.
   C. **Objective/Outcome:** Develop a tool to reduce interbreeding among spring- and fall-run Chinook salmon populations in the Skookumchuck and Newaukum rivers, which are spring-run Chinook salmon strongholds, by preventing early migrating fall-run Chinook salmon from entering key spring-run Chinook salmon spawning areas and interbreeding with spring-run Chinook salmon. This tool involves temporarily installing a BDA during summer, allowing natural beaver colonization processes to occur that would result in the BDA turning into a weir, managing the weir to exclude fall-run Chinook salmon once spring-run Chinook salmon

have migrated upstream, and removing the weir in the fall to allow fall-run Chinook salmon full access to spawning habitats.

2. **Synthesize Environment Information During Adult Holding**
   A. **Action:** Synthesize existing information on the environmental conditions that adult spring-run Chinook salmon are exposed to during holding, identify information gaps that need to be filled, and identify key thermal refugia areas to protect or modify.
   B. **Background:** Information on temperature (FLIR flight from 2013; Washington Department of Fish and Wildlife riverscape surveys (Winkowski et al. 2018)), groundwater sources (Kathy Dube (Watershed Geodynamics) identified bedrock locations that are potential indicators of groundwater sources and Anchor QEA, LLC, evaluated potential groundwater locations), and holding behavior (Liedtke et al. 2016) is available and needs to be synthesized to identify current and potential areas of cooler-water inputs. Cooler-water inputs could be surface flows from tributaries or groundwater sources.
   C. **Objective/Outcome:** Integrate among all the available information to identify existing sites that need protection and additional sites that have the potential to be developed to create holding pools with cooler water through use of engineered logjams (ELJs) or other means. Identify any information gaps, such as the need for FLIR data in the Skookumchuck and Newaukum rivers upstream of the spatial extent of the 2013 flight, to repeat the U.S. Geological Survey 2015 (Liedtke et al. 2016) study, or to conduct additional groundwater surveys. The overall objective is to expand the quantity and quality of holding areas for adult spring-run Chinook salmon to reduce pre-spawn mortality and losses to poaching.
3. **Evaluate Sediment Wedge Effectiveness**
   A. **Action:** Design, install, and monitor an experimental sediment wedge(s) to verify the level, duration, and extent of benefits in water temperature reduction.
   B. **Background:** Sediment wedges associated with ELJs will cool river temperatures by increasing hyporheic flow. The question for the ASRP is whether this feature provides the level of absolute change and extent of change (downstream) sufficient to meet the program's goals. Experimentally install and monitor sediment wedges at several key locations (e.g., Stillman Creek) to evaluate the overall effectiveness of this technique and inform ASRP formulation. Information is needed to verify that this technique works and is effective, rather than basing the ASRP on a key assumption.
   C. **Objective/Outcome:** Identify the design characteristics of sediment wedges needed so they perform as expected if installed.
4. **Implement Proof-of-Concept Restoration on Lands Owned by Sierra Pacific Industries and Weyerhaeuser Company**
   A. **Action:** Develop simple, in-channel restoration projects to evaluate the speed at which restoration actions can be approved and implemented on Sierra Pacific and Weyerhaeuser lands.

B. **Background:** During the August 2019 tour of the South Fork Chehalis River, the Sierra Pacific representative indicated the company had a flat corporate structure and implied the review and approval process for restoration projects would be streamlined. This needs to be verified because it may be decided that rapid actions with willing landowners who control large areas of headwater habitat are needed. If the South Fork Chehalis River and upper mainstem Chehalis River are deemed high-priority area for restoring spring-run Chinook salmon, then access to the upper watersheds and quality habitats in those areas will be critical to successfully stabilize and expand populations in these areas.

C. **Objective/Outcome:** Deign, review, and implement small in-channel restoration projects that inform the time required for projects on Sierra Pacific and Weyerhaeuser lands to be implemented to support ASRP planning. Completed projects will benefit Chinook and coho salmon and steelhead.

5. **Implement Plantings of Open Riparian Reaches Designated as High-Priority Areas for Shading**

A. **Action:** Develop riparian planting designs using selected species, implement the planting, and monitor seedling survival.

B. **Background:** Riparian planting to increase shading of streams and rivers to reduce water temperatures is a key element of the ASRP. Shading is needed in some locations to reduce water temperatures for spring-run Chinook salmon; however, these are long-term restoration actions, and information is needed now on their design and any issues associated with implementation, such as verification that the plantings will take root and the selected species will survive and grow as expected.

C. **Objective/Outcome:** Design, implement, and monitor riparian planting projects to ensure they can be implemented (landowners are willing participants) and perform as expected to inform ASRP planning efforts. Completed projects will benefit Chinook and coho salmon and steelhead.

Reference

Liedtke, T., M. Zimmerman, R. Tomka, C. Holt, and L. Jennings, 2016. Behavior and movements of adult spring Chinook salmon (Oncorhynchus tshawytscha) in the Chehalis River Basin, southwestern Washington, 2015. U.S. Geological Survey report to the Washington Department of Fish and Wildlife.

John Winkowski, Eric Walther, Mara Zimmerman, 2018. Summer Riverscape Patterns of Fish, Habitat, and Temperature in Sub Basins of the Chehalis River, 2013-2016. FTP 18-02. Fish Science Division, Washington Department of Fish and Wildlife, Olympia, WA. May 2018.