FY21 Willamette RM&E Concept Paper

**STUDY CODE:**

**TITLE: Evaluate reintroduction strategies for adult UWR Chinook salmon at Big Cliff and Detroit dams: above – versus below dam adult outplanting productivity**

**MANAGEMENT PURPOSE:** Inform the outplanting strategy for UWR Chinook salmon into habitat above Minto, Big Cliff, and Detroit dams. Results will guide decisions on number of natural origin adultus to transport above each dam.

**FISH PROGRAM FEATURE:** CRFM

**BIOLOGICAL OPINION ACTION:**

**BACKGROUND:** To meet various fish management objectives in the North Santiam River for approximately two decades, some proportion of annual runs of adult hatchery-origin (HOR) spring Chinook salmon have been translocated (“outplanted”) above Detroit Dam. Translocation was deemed necessary in part because the flow regimes created by the Detroit/Big Cliff flood control facilities produce high Total Dissolved Gas (TDG) levels in the reach below Big Cliff dam. These TDG levels may be harmful to naturally produced alevins and fry in redds located between Minto and Big Cliff Dams. These poor water quality conditions in a reach that otherwise has limited but good physical spawning habitat constrains opportunities for natural production in the mainstem river below Big Cliff dam. In response to poor water quality conditions in this reach in 2015 (specifically high temperatures), both HOR and natural-origin (NOR) spring Chinook were translocated above Detroit Dam. The new adult trapping facility at Minto Dam was completed and became operational in 2012 and is part of a strategy to improve fish passage and translocation management options to support reintroduction of UWR Chinook and steelhead above Detroit Dam. It is important for fish managers to compare the relative performance of adult translocation options to determine whether changes should be made to current translocation procedures over the next decade prior to completion of downstream fish passage (anticipated in 2028). A comparative framework should include metrics of current productivity (as recruits/spawner) for fish groups translocated above Detroit Dam and below Big Cliff Dam.

Pedigree analysis of returning adults has been completed for 2013, 2014 and 2015 returns, yet these results complete only two cohorts (from the 2009 and 2010 brood years). Pedigree analysis provides information on the effective number of breeders, fitness differences, cohort replacement rate, and origin of returns to Minto trap (above or below Detroit Dam). Taken together these data indicate hatchery Chinook released above Detroit Dam are producing offspring. In addition, results on spawner return timing indicate progeny of spawners from above and below the dam were intermixed throughout the run, making it difficult to choose a cut-off date for determining which fish should be released above Detroit or into below-dam reaches. There are insufficient data to inform Minto trap operations with respect to annual translocation decisions prior to completion and validation of downstream passage improvements at Detroit and Big Cliff dams.

A directed study will also inform interim management decisions regarding operational scenarios that improve spill and water temperature profiles below Big Cliff Dam. Several years of adult Chinook returns linked to parental translocation history and release year, and subsequent juvenile outmigration season, would be needed to statistically compare the treatment effects of translocation and environmental (spill, gas exposure, etc.) history on subsequent adult returns. For example, Ho could state that more adults that assigned to above Detroit parents return from cohorts that outmigrated during years of higher spill rates at Detroit. Likewise, adult returns that assign to the reach between Minto and Big Cliff dams could be linked to interim temperature operations for that reach, and potentially even evaluated with respect to high versus low levels of total dissolved gas in that reach.

Lastly, there has been documented reproduction success above Detroit and in the Minto Reach. Past pedigree work indicates that adult return time return to the Minto facility are similar and the production from both sources are intermixed. In some years, there may be more NOR adults return to the Minto Facility than spawning capacity in the Minto Reach. Rapid genetic identification can be a tool to move NOR adults that are progeny of the hatchery translocation efforts back into spawning habitats above Detroit Dam.

The following questions relating to disposition management of adult Chinook returns to Minto trap should be addressed to inform interim translocation protocol decisions:

1. **What is the spawning capacity in the Minto Reach (between Minto Collection Facility and tailrace of Big Cliff Dam)?**
2. **What is the proportion of NOR from outplanted hatchery adults above Detroit and released into the Minto Reach?**
3. **What is the spawning success of NOR adults from outplanted hatchery adults above Detroit and released into the Minto Reach?**
4. **When is it appropriate to transport natural origin Chinook returns above Detroit Dam?**

**CRITICAL UNCERTAINTIES:**

- What is the relative productivity of adult spring Chinook transported above Detroit Dam or into the reach between Minto and Big Cliff?

- Can genetic identification of the origin of returning adults be done rapidly to facilitation real-time fish outplanting decisions?

**OBJECTIVES:**

1. Under existing fish passage conditions, assess relative differences in spring Chinook salmon productivity for different outplanting strategies in the following reaches: above Minto Dam, above Detroit Dam. Some specific estimates and comparisons among these groups may include:

a. Spawner abundance, age structure, reproductive success, and total lifetime fitness for HOR spring Chinook salmon above Detroit Dam

b. Spawner abundance, age structure, reproductive success, and total lifetime fitness for NOR spring Chinook salmon above Minto Dam

c. Proportion of NOR adult Chinook salmon spawners in the North Santiam River below Big Cliff Dam that are progeny of fish that had been outplanted above Detroit Dam

d. Annual abundance and age structure of adult Chinook salmon returning to the North Santiam River, to standardize performance of translocated groups across years

2. Determine if the use of a rapid identification assessment tool is feasible for sorting natural-origin Chinook at Minto trap to inform disposition into habitat above Detroit, above Minto, or other locations.

**SCHEDULE**: 2020 until construction initiation for Detroit

**NMFS Comments** (Note: These comments were provided for earlier version of this draft concept **APH-19-03**)

Following the results from 2020 pedigree analysis, we will have an estimate of the fraction spawning above Detroit, and between Minto and Big Cliff of those that get to Minto . The proposed work would be helpful in following years to outplant spawners to their natal areas, or to inform decisions about natural origin fish above Detroit, possibly choosing F1s where preferable. It may show how survival post-spawning relates to conditions in these two reaches.