## STUDY CODE: - APH-21-01-FOS

## TITLE: Rapid Genetic Sorting at Foster Adult Fish Facility

**MANAGEMENT PURPOSE:**

Evaluate the efficacy of using genetic sorting as a tool for managing upstream passage of adult spring Chinook and winter steelhead. In the South Santiam, an evaluation to determine a suitable means of holding, genetically identifying, and sorting fish at the Foster Adult Fish Facility for transport above either Foster Dam (to the upper South Santiam) or Green Peter Dam (to the upper Middle Santiam). Any reintroduction of fish above Green Peter will require a means of identifying fish homing to the Middle Santiam and separate them from fish homing to the upper South Santiam, so they may be transported to the correct natal river. Genetic testing and sorting techniques developed for use at Foster may be applied elsewhere in the Willamette Basin.

**FISH PROGRAM FEATURE:** CRFM

**BIOLOGICAL OPINION ACTION:** RPA measure 4.1

**BACKGROUND:** The US Army Corps of Engineers, Portland District (Corps) is currently working on an Environmental Impact Statement (EIS) and consulting with NMFS and USFWS on the Willamette Valley Project. One information need for the EIS effort is to determine how reintroduction of natural origin (NOR) spring Chinook above Green Peter Dam. Any reintroduction effort at Green Peter Dam will need to consider how to move adult NOR returns back above Green Peter, as no functional adult collection facilities currently exist at that dam. Today, Foster Dam serves as the collection point for all fish originating upstream, and all NOR fish are outplanted to the South Santiam River above Foster. If fish runs are established not just in the South Santiam but also in the Middle Santiam above Green Peter Dam, both above Foster Dam, adults homing to both watersheds will first be collected at Foster.

One option is to ‘sort’ fish that are homing to the Middle Santiam from fish that are homing to the South Santiam above Foster. This could be done before or after transport. Hatchery orign returns are identifiable by an external mark, however natural origin returns are not externally marked. If done before transport, a genetic test would need to be conducted to determine if a fish is from (and should be transported to) the Middle Santiam or South Santiam.

Rapid genetic assessment (RGA) is a tool utilized at other locations (e.g. bull trout in the Lewis River, Christian Smith, USGS, pers. comm.); however, fish numbers in many of these programs are low. Genetic tests must be sent to a laboratory and usually require at least 24 hours to process. A means of uniquely identifying fish will be needed, and fish will need to be held for multiple days prior to being sorted and transported. Operational means of marking, holding, and moving larger numbers of fish at Foster would need to be developed. For example, the means of returning the fish from the holding pools to the anesthetic tank is through a fish lock. The lock was designed for hatchery fish and not for handling and passing of wild ESA-listed fish, and has the potential to cause injury and mortality.

Sorting could alternatively be done post-transport, by releasing all NOR fish to Foster Reservoir and letting fish volitionally sort. Middle Santiam fish could be left to spawn in the South Santiam River, if the genetic introgression was deemed acceptable. Otherwise, adult collection at Green Peter and transport above the dam would be required. A means of warming the Green Peter adult fish ladder and lower Middle Santiam River would require investigation.

**Key uncertainties:**

1. What is the most efficient, effective, and safe way to trap and transport adult fish originating from two different tributaries above a dam?
2. Can a rapid genetic assessment tool be developed?
3. What are the tradeoffs between additional handling, holding, and sorting and adult survival and productivity?
4. What are the implications of “self-sorting” by release directly into the reservoir directly above the adult collection point?
5. What are the trade-offs between holding fish for direct transport to their natal stream versus immediate transport to the reservoir?

**Objectives:**

1. Identify and evaluate the efficacy of a RGA tool suitable for use at Foster and other Willamette Project dams, and which/how many markers would be necessary to genetically sort fish.
2. Determine and describe the logistics required to perform RGA at Foster. This includes:
	1. the timeline for genetic sampling, processing, and conveyance of results; and how long fish would need to be held as a result,
	2. how fish could be uniquely marked to visually identify specific fish with minimum handling,
	3. the number of holding ponds required to hold fish for multiple days, and how often the Foster trap would need to be cleared of fish to reduce fish ‘pile-up’.
3. Determine if and what operational modifications to the Foster Adult Fish Facility are necessary in order to initiate a RGA program at Foster.
4. Assess the genetic risk in allowing Middle Santiam and South Santiam fish to interbreed; i.e., what are the implications for not genetically isolating fish homing to these rivers.

SCHEDULE: TBD

**NMFS Comments:**

Similar to above, given the lengthy period between pedigree analyses, the decisions in any one spawning season about outplanting could lead to greater success if allowing homing instinct encourages local adaptation.