

Use of Native-Origin Brood for Winter Steelhead Restoration in the Elwha River Watershed

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Development of a new hatchery broodstock originating from natural-origin winter steelhead in the Elwha River is currently underway. This population is intended to replace supplementation efforts that have previously used a *naturalized* stock of steelhead originating from the Chambers Creek Hatchery (Washington Department of Fish and Wildlife, South Puget Sound). This new stock will be used to promote recovery of winter steelhead in the Elwha River following removal of the Elwha and Glines Canyon dams in 2011 and represents one of the first efforts on Washington State's North Olympic Peninsula to manage steelhead enhancement efforts on a watershed basis. Broodstock development will involve a minimum of four year-groups and will take up to 16 years to fully implement.

The Elwha River Fish Restoration Plan (U.S. Dept. of Commerce, NOAA Tech. Memo, NMFS-NWFSC-90) identifies this stock as best suited to promote and achieve restoration of winter steelhead in the Elwha River watershed. Design of protocols for capture, fish culture and releases has been developed through consultation and partnerships between the Lower Elwha Klallam Tribe, USFWS, NOAA, WDFW, NWIFC and NPS.

Steelhead redds are identified annually in April and May. Embryonic development is thermally tracked and redds are selected to be hydraulically pumped in June and July of the year. Harvested eggs and fry are transported to the Lower Elwha Hatchery where they are incubated and reared.

At the hatchery each fish is photographed to document pigmentation and receives a PIT tag used to track the fish throughout its residency at the hatchery. Fin clips from each fish provide tissue for genetic analyses and determination of the fish's parental lineage. This genetic analysis provides the basis for development of spawning protocols and matrices.

Following tagging, fish are moved to outside rearing units where they are reared for four years. Fish health status is monitored at critical life history stages by staff of the NWIFC and routine diagnostic examinations coupled with rearing

condition recommendations provide staff guidance to insure that stock quality is maintained throughout hatchery rearing and that fish health needs unique to this natural-origin stock of fish are met.

Upon completion of parental lineage analysis, the number of fish reared at the hatchery is reduced to 400 fish per brood year.

At age 3, males and females are segregated and reared separately for the duration of residency at the hatchery. Sexual maturity of age-3 females is assessed every six weeks April to July. Ripe 3-year-old females are manually stripped of eggs and females are returned to rearing tanks for reconditioning and are reared to maturity being spawned as age 4 adults.

Beginning in March of their fourth year females are assessed for ovulation on a weekly basis. Ripe fish are spawned and mated with three males. Selection criteria for males include:

1. Males be genetically unique from one another,
2. Females be genetically unique from each of the three males
3. Males will be used up to in three matings during a spawning season.

Following spawning eggs from each female is divided into three aliquots. Each aliquot is fertilized by a single male and following fertilization eggs from each female are recombined for incubation. At ponding fish from all matings are reared collectively.

Fish are being reared for release as age-2 smolts. NOAA Fisheries scientists from have provided us with growth curves based upon local native steelhead populations in the region. These growth curves are successfully being used to develop feeding schedules that have allow us to meet target growth rates, minimize the development of bi-modal fish sizes in the population and inhibiting development of aggressive fish behavior during the 2-year rearing period.