

Northern Puget Sound Steelhead Hatchery Options

HATCHERY EVALUATION AND ASSESSMENT TEAM
WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
MAY 10TH 2018



PSSAG Hatchery Options being considered



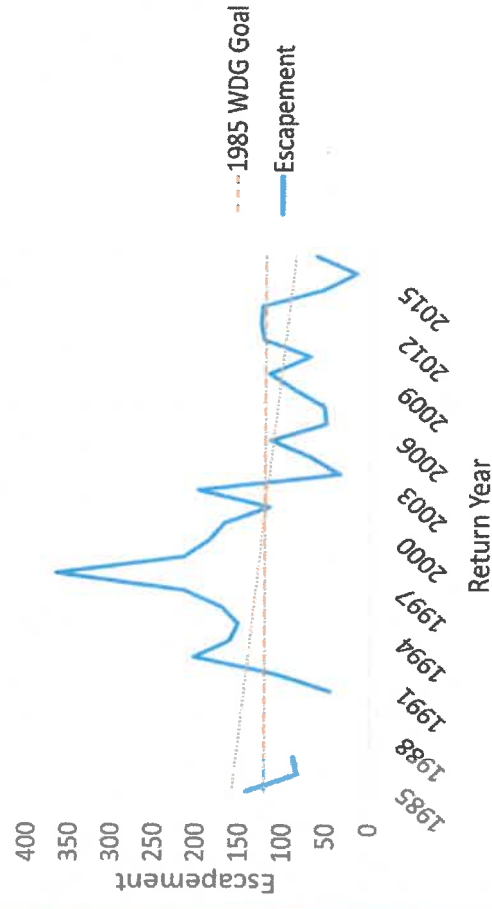
1. Reiter Summer Steelhead: Tolt River Summer Steelhead Stepping Stone Program.
 - a. Conservation Program
 - b. Development of Local Broodstock
2. Stillaguamish Winter Integrated Conservation Program (Under development)
3. Snohomish/ Skykomish Winter Integrated Conservation Program (Under development)

ISIT/AHA Model used to assess program sizes

Tolt River Summer Steelhead - Stepping Stone Program

- ▶ Two part program –
 - ▶ **Part 1:** Conservation program and local broodstock development.
 - ▶ **Part 2:** Phase out Skamania stock at Reiter and S.F. Skykomish and establish Tolt Stock.
- ▶ Modeled after the Hood Canal Steelhead Supplementation Program
- ▶ Conservation program to run two full generations (8 years), then be discontinued.
- ▶ Redd pumping to allow natural selection to drive the conservation program.
 - ▶ <30% of the natural eggs produced for the hatchery program.
 - ▶ Later fish are most representative of native population and will be selected for.

Tolt River Summer Steelhead



Program Overview

- ▶ **Stage 1 (8 years):** Conservation Program and Local Broodstock development
 - ▶ Conservation program releases at Tolt and Tokul Creek Hatchery
 - ▶ Further Segregate Reiter Skamania stock spawn timing during phase out.
 - ▶ Discontinue passing unmarked summer steelhead above Sunset Falls
 - ▶ After 1st Generation of Tolt Program to establish at return
 - ▶ First Generation (F1) Tokul Creek returns used to establish local broodstock to be transferred to Reiter Ponds
 - ▶ Tokul releases discontinued after 8 years
- ▶ **Stage 2:** Establish program at Reiter and S.F. Skykomish
 - ▶ Transfer F1 eggs from Tokul Creek to Reiter Ponds and discontinue Skamania egg-take.
 - ▶ Initially a Segregated program
 - ▶ Release 50% of the program at Reiter and 50% above Sunset Falls
 - ▶ Once Tolt stock natural return becomes established in Sunset Falls transition to an integrated program and reevaluate program size.

Phase 1. Conservation Program Overview



- ▶ Pump Redds to reach egg-take
 - ▶ The expected egg-to-smolt survival is 75% in the hatchery, compared to less than 2% survival if left in the natural environment.
- ▶ Smolts reared to age-1 and age-2 based on condition
 - ▶ Two release groups,
 - ▶ Tolt direct plant
 - ▶ Tokul Creek Hatchery On-station.
 - ▶ Captive brood to be considered if four year average is <50 NOS.
- ▶ Goal to PIT tag smolts to allow for monitoring and sorting to family groups.
 - ▶ Other marking strategies such as coded wire tags under consideration.
- ▶ Both release groups to be discontinued after 8 years.
- ▶ Use recovery phases to determine program goals and release size.

Tolt River Summer Steelhead – Conservation Program -- Phases

- ▶ <120 NOS
 - ▶ Maximum Tolt Release of 8,000 smolts
 - ▶ Maximum Tokul Release of 20,000 smolts
 - ▶ Tokul adult returns used to establish Skykomish program and maintain Tolt abundance above 100 spawners.
 - ▶ HSRG standards do not apply
- ▶ <50 NOS: Focus is on the conservation program and preserving the Tolt Population.
 - ▶ Captive broodstock considered
 - ▶ Expected total release (5,200 to 15,500)
- ▶ 51-120 NOS: Joint Focus Tolt and Local Broodstock
 - ▶ Expected total release (15,500 to 28,000)
- ▶ >120 NOS
 - ▶ Maximum Tolt Release 3,500 smolts
 - ▶ Maximum Tokul Release of 20,000 smolts
 - ▶ Meet HSRG standards for primary population

Tolt Summer Steelhead Conservation Program – Model Parameters

- ▶ Smolt productivity = 110 smolts per female
- ▶ Capacity = 2,854 smolts
 - ▶ May be low as additional capacity available downstream.
 - ▶ Source: Thomas Buehrens
- ▶ Wild SAR% = 2.9%
- ▶ SAR% = (Smolts at capacity)/(Escapement)
- ▶ Hatchery SAR% = 1.5%
- ▶ Based on Reiter Summer steelhead SAR%.
- ▶ Stray rates
 - ▶ 70% of releases expected to return to their release site (Tolt);
 - ▶ 5% of Tokul fish to Tolt.



Conservation Program Model

Results >120 NOS

- ▶ Tolt Release Maximum 3,500 smolts
- ▶ Tokul Release Maximum 20,000 smolts
- ▶ Tolt Steelhead Population with Maximum Hatchery Program
 - ▶ Fitness in 2041 = 95.9%
 - ▶ Average pHOS = 29.2% (95% CI: 22.4% to 35.9%)
 - ▶ PNI = 0.77 (95% CI: 0.74 to 0.81)
 - ▶ Average Tolt NOS = 147 (95% CI: 136 to 158)
 - ▶ May be projecting low due to smolt capacity
 - ▶ Average Tolt HOS = 73 (95% CI: 49 to 97)

Reiter and Sunset Falls Summer Steelhead Program

- ▶ 120 Adults needed to meet current program size (116,000).
 - ▶ Between 100-300 adults expected from the Tokul release group.
- ▶ Phase out Skamania stock releases and replace with Tolt stock once first generation hatchery eggs are available from Tolt Program.
 - ▶ Differentially mark Skamania and Tolt releases during the overlap period.
- ▶ Discontinue passing unmarked Skamania origin returns above Sunset Falls.
 - ▶ Release 50% of Tolt stock program above Sunset Falls.
- ▶ Consider transporting surplus Tokul adult returns above Tolt and Reiter needs to above Sunset Falls to jump start the population.
- ▶ Initially a segregated program out of Reiter
- ▶ Transition to an integrated program once the Tolt stock becomes self-sustaining above Sunset Falls.

Questions?



Summary of Information Presented on Potential Integrated Steelhead Hatchery Program on the Skagit River

Draft May 9, 2018

| Major Topic | Subtopic | Date Presented | Summary |
|----------------------|-----------------------------------|----------------|--|
| | Purpose | January 18 | Harvest - support catch & keep fishery |
| | Number Released | January 18 | Maximum program size of 200,000 |
| | Broodstock Origin | January 18 | Natural-origin broodstock collected above the Sauk River |
| | Release Strategy | January 18 | Volitional release, primarily age 2 smolts |
| Description | Status | January 18 | <p>1) Facilitated co-manager technical staff process in 2016 to describe what a program would look like if a policy decision was made to initiate a wild broodstock program.</p> <p>2) Co-manager technical staff provided a draft description of a potential program in early 2017.</p> <p>3) WDFW stated in February 2017 that additional technical analysis was necessary, and that a WDFW policy decision would not occur until after the PSSAG process.</p> <p>4) New technical analysis has been completed and discussed with the PSSAG.</p> <p>5) PSSAG is considering the potential program as a component of a Northern Cascades portfolio.</p> |
| Cost | Total Cost | March 29 | Estimated annual cost of program is \$208,024. NOAA Fisheries may require additional monitoring programs that would increase the cost of the program. |
| | Cost per Recreational Fish Caught | 1/ | \$520 - \$3,500 |
| Recreational Fishery | Catch | March 29 | Catch of ~60 to 400 depending upon abundance of wild steelhead |
| | Season Length | March 29 | Hatchery program projected to reduce the length of the season when the abundance of wild fish is less than 6,000. |
| | Economic Value | March 29 | Hatchery program projected to reduce the economic values of the recreational fishery when the abundance of wild fish is less than 6,000. |

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|--------------------------|--|--|--|
| Tribal Fishery | Season Length | March 29 | Hatchery program projected to increase the length of the tribal fishery when the abundance of wild fish is 4,000 - 8,000. |
| Ecological Effects | Competition & Predator Attraction | March 29 | Negative correlation between number of hatchery fish released and productivity of wild population, based on retrospective analysis of former early winter segregated program at Marblemount Hatchery. |
| Hatchery Origin Spawners | Proportion Hatchery Origin Spawners (pHOS) | January 18 January 18 March 29 1/ | 1) Statewide Steelhead Management Plan: pHOS maximum 0.30 2) Returning Adults – projected pHOS of 0.029 3) Residuals & Precocious Males - projected pHOS of 0.13 ^{2/} 4) Total(adults and residuals) pHOS of ~0.16 ^{3/} |
| Genetic Effects | Proportionate Natural Influence (PNI) | January 18 January 18 1/ 1/ | 1) Statewide Steelhead Management Plan: PNI minimum 0.67 2) Returning Adults – projected PNI of 0.97 3) Residuals & Precocious Males – projected PNI of 0.89 4) Total (adults and residuals) PNI of 0.86 ^{4/} |

1/ Derived from information presented on March 29.

2/ Estimate requires several assumptions; true pHOS will likely vary according to wild population demographics, hatchery residualization rate and survival schedules.

3/ Sensitivity analysis based on residual and precocious males assumptions suggests plausible range for total pHOS of approximately 0.06 – 0.27. pHOS values higher than this range would likely require exceedingly low wild anadromous adult abundance (< 2000).

4/ Variation in pHOS estimates (footnotes 2 & 3) would have cascading effects on PNI.

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)



Photo: Courtesy of Marblemount Hatchery Staff

| | |
|---------------------------------------|---|
| Hatchery Program: | Skagit River Native Winter Steelhead Hatchery Program (Integrated) Marblemount Hatchery |
| Species or Hatchery Stock: | Steelhead (<i>Oncorhynchus mykiss</i>) |
| Agency/Operator: | Washington Department of Fish and Wildlife |
| Watershed and Region: | Skagit River Watershed/North Puget Sound |
| Date Submitted: | Draft |
| Date Last Updated: | February 13, 2017 |

Executive Summary

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|---|--------------|
| 1 | Introduction |
| 2 | Background |
| 3 | Methodology |
| 4 | Results |
| 5 | Discussion |
| 6 | Conclusion |
| 7 | References |
| 8 | Appendix |

2.2.3 Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take.

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

Broodstock collection: Broodstock will be collected by hook and line, net or other non-lethal methods, in the Skagit River, above the confluence with Sauk River from February through June. The broodstock represents a portion of about 2.4% of the average spawner escapement in this system (6,231 for the years 2005-2016). Mortality may occur during collection although fishing techniques, adult netting materials, holding protocols and transfer from boat to tanker trucks will be under the area biologist supervision and implemented to maximize survival of listed fish. Skagit basin co-managers currently conduct two successful native broodstock collection operations using drift tangle nets, one for Summer Chinook and Skagit Chum. These are limited in duration and area; lessons learned and experience from these program will guide this program implementation. Sections of the river not targeted for broodstock collection will not be physically impeded, and won't delay or interrupt migration. However, the process of collecting broodstock may temporarily delay or interrupt the migration of certain individuals. The collection will not affect listed Chinook, since broodstock collection will take place during its absence in the system. Bull trout will be released and annual encounter rates will be monitored to incorporate into the 5 year adaptive management process.

Broodstock holding: Adults collected for broodstock will be held at the Marblemount Hatchery. Live-spawned fish will be allowed to recover and will be returned to the Skagit River for opportunity of recovery and, potentially, repeat spawning in future years. Fish culture activities at the hatchery will be monitored and recorded, e.g. handling and gamete collection procedures, holding conditions (e.g. water quality including temperature and flow), feeding and transportation, disease, biological sampling and predation may result in some incidental mortality and disease outbreaks.

Operation of Hatchery Facilities: Potential facility operation impacts on listed fish include; water withdrawal, hatchery effluent, and structures like intakes and weirs. Monitoring and maintenance are conducted along with staff observations. Effluent at outfall areas is rapidly diluted with mainstem flows and operation is within permitted guidelines (see HGMP sections 4.1 and 4.2). All permit requirements are followed in order to minimize the potential indirect "Take" associated with the operations of these facilities. Other than incidental mortality described here, no take of listed fish are expected during the normal operation of the hatchery.

Pathology Sampling: *Currently, Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State (WDFW and WWTIT 1998, updated 2006) guidelines requires that a minimum of 60 fish from steelhead hatchery programs are kidney/spleen sampled (WDFW and WWTIT 1998, updated 2006). If needed, sampling protocols may be updated and the Area Fish Pathologist may undertake additional monitoring activities.*

Genetic Effects: This hatchery program will be managed as integrated to reduce the risk of genetic divergence between the propagated and natural-origin components. pHOS will be estimated using pHOFF (see [Appendix A](#) at the end of the document).

Disease Transmission: Interactions between hatchery-reared and naturally-produced populations may lead to pathogen and disease transmission although there is little evidence showing that diseases are transmitted from hatchery fish to natural-origin fish (Steward and Bjorn 1990). WDFW conducts fish disease examinations to ensure minimal disease transmission and to

prevent the introduction and/or spread of any fish diseases. Fish health monitoring efforts include fish health examinations and virus sampling, abnormal fish loss investigations, and pre-transfer and pre-liberation inspections. All activities are done in accordance with guidelines developed under the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTTT 1998, updated 2006).

Rearing Program: Rearing of fish for this program will occur entirely at Marblemount Hatchery. Well water will be used for incubation and initial rearing and mix of Jordan/Clark Creeks and Cascade River water will be used after that. Fish will be released on station.

Hatchery Production/Density-Dependent Effects: Hatcheries can release numbers of fish that can exceed the density of the natural productivity in a limited area for a short period of time, and released fish can compete with listed fish. To minimize negative effects of the released juveniles they will be challenged with the opportunity will be allowed to leave volitionally at fully smolted stage. Indirect take from density-dependent effects is unknown.

Predation: Steelhead released from hatchery programs are unlikely to prey upon listed species of salmonids, but the magnitude of predation will depend upon the characteristic of the listed population of salmonids, the habitat in which the population occurs, and the characteristics of the hatchery program (e.g., release time, release location, number released, and size of fish released). Based on observations of stomach fullness, most steelhead smolts do not begin to feed extensively until about a week after release (Cannamela 1993). WDFW research (Sharpe et al. 2008) has shown that the predation risks from hatchery steelhead smolt releases are minimal on smaller prey fish. Study in the Skagit basin showed that hatchery steelhead smolts did not prey on natural origin steelhead juveniles (Pflug et al. 2013).

Residualism: Steelhead from WDFW programs are reared and released volitionally at a fully smolted stage condition according to the rearing parameters that allow to maximize smolting characteristics and minimize residualization through adhering to a combination of acclimation, release strategies, release guidelines and specific timing (after April 15). Fish not ready for release (not leaving volitionally) are released into landlocked lakes.

In case of this program, fish not leaving at the first year will held until the following spring and offered opportunity to leave volitionally. Non-migrating 2 years old will be held for additional year and given opportunity to leave volitionally as 3 years old. Fish not voluntarily leaving at this time will be released into landlocked lakes.

- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken and observed injury or mortality levels for listed fish.

This program has not yet started.

- Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

Up to 150 natural-origin adults will be collected for broodstock. It is expected that few (x) broodstock will die due to this process. Juvenile mortality from rearing, holding, tagging and marking is expected to be less than X%.