Bogachiel Wild Steelhead Broodstock Program – Options Document

August 19, 2014

Background

The Washington Department of Game entered into a 25-year cooperative agreement with the Olympic Peninsula Guides' Association (OPGA) on June 17, 1986. The purpose of the agreement was:

> "to provide a maximum of 100,000 winter steelhead smolts of wild Soleduck River stock annually for release into the Soleduck River. These fish shall be reared to release size (larger than 10 fish /pound) on OPGA managed facilities and are to be used to produce additional harvestable adult steelhead for commercial and sport fishermen on the Quillayute River system. Returning adults from this project will be considered hatchery fish for the purposes of harvest management."

The OPGA was to draw broodstock each year from early returning Sol Duc wild steelhead, to be collected prior to February 1. The early returning wild steelhead were targeted to provide additional harvestable steelhead during the period between the December peaking early-timed hatchery returns and the later wild returns. There was an additional assumption that returning Snider origin steelhead that escaped the fisheries would bolster the early portion of the wild return, which is typically subjected to higher exploitation rates than the later timed peak return of wild steelhead.

This agreement expired June of 2011, prompting a review of the project to assess its performance in light of its original purpose and the more recently developed Hatchery and Fishery Reform Policy guidelines, and management directives contained in the Statewide Steelhead Management Plan. A written assessment of the performance of the program, completed spring of 2011, is available for download from the web at: http://wdfw.wa.gov/publications/01187/. This information, combined with public comment and discussion, provided the basis for the decision to designate the Sol Duc River a "wild steelhead gene bank", and move the broodstock program to the Bogachiel River on an interim basis while determining whether to renew, renew with modifications, or terminate the program.

This document describes program options that have been identified, and includes broodstock collection protocols, egg incubation, rearing location(s), release goals, locations, and procedures, adult collection procedures, projected proportion hatchery-origin spawners (pHOS) and proportionate natural influence (PNI), and monitoring plans. These program options will undergo technical review by the Hatchery Scientific Review Group (HSRG), be discussed with the Steelhead and Cutthroat Policy Advisory Group (SCPAG), and public input will be solicited before the final decision.

Objectives

This program has two objectives:

1. Produce steelhead for harvest by treaty and state fisheries - target a January return that provides additional harvestable steelhead during the period between the December peaking early-timed hatchery returns and the later wild returns.
2. Supplement the spawning numbers of the early timed portion of the wild winter steelhead population. Program fish that are not harvested will be allowed to spawn naturally, and

the program will be sized to target the pHOS requirements of the HSRG guidelines for integrated programs (see 'Program Type', below).

Program Size

The program size, or target number of smolts to be released, will not exceed 35,000 smolts, and will be determined by projecting likely survival and harvest rates to assess numbers of program fish potentially mixing with the wild fish on the spawning grounds. Consequent pHOS and PNI values will be evaluated, and the program size adjusted to meet or exceed guidelines for these parameters specified in the Hatchery and Fishery Reform Policy. Another factor that may also be considered when sizing the program is the likelihood of delayed ocean migration of program juvenile steelhead after release. Volitional release will be used to minimize this life history pattern.

Program Type

The program will be designated an "integrated" program, with a pNOB, or proportion natural origin broodstock, of 1.00 (100%). Guidelines for an integrated program are most stringent for populations designated "primary". This designation has not been determined for the Bogachiel wild steelhead population, but will be targeted in the design of this program. Guidelines are:

- pHOS < 0.30. pHOS = proportion of hatchery origin spawners in the naturally spawning escapement;
- PNI > 0.67. PNI = Proportionate Natural Influence = pNOB/(pNOB + pHOS), (a PNI > 0.5 is required for a population designated "contributing").

The pHOS should be estimated for both the entire wild escapement, and for the estimated early portion of the escapement that might be most affected by straying program fish, assuming early entry tends toward early spawn timing. In addition, the pHOS for the early timed hatchery winter steelhead stock should be considered. Measured by timing of redds in index areas of the Bogachiel, the pHOS for the early timed steelhead program is estimated at about 10%, and ranges from 4.7% to 17.3% over the past 6 years.

As examples:

- The average wild escapement to the Bogachiel in the last 10 years (2004 – 2013) is 1,948 fish, which would need to represent 70% or more of the total natural spawning fish to obtain a pHOS of < 0.30. The subsequent natural spawners from the program fish would be limited to 835. If we assume a 3% smolt to adult survival rate, and an in-river harvest rate of 59% (recent 10 year mean), a program size as large as 50,000 would meet the pHOS criteria.
- However, looking at the early timed portion of the wild return, catch coefficients used to model the Indian Gill Net fishery show that 29.75% of the wild run has entered the river through week 5, corresponding to the end of January (Appendix A). Through the end of week five, then, 580 wild steelhead would correspond to the "early timed" portion of the run, and would need to represent at least 70% of the naturally spawning early fish. A pHOS limited to 30% hatchery origin spawners would limit program natural spawners to 248 fish. At a 3% survival rate from smolt to adult, and an in-river harvest rate of 59% that would point to a program size of 20,000 smolts.

Broodstock

Broodstock for this program will be unmarked wild steelhead captured each year in January in the Bogachiel River. Initial genetic analyses suggest Bogachiel and Calawah origin winter steelhead are from the same stock (Kassler et. al., 2011). If further genetic analyses reveal

differences in the genetic structure between the Calawah and Bogachiel wild steelhead stocks, then the broodstocking captures will be limited to upstream of the confluence with the Calawah River.

Collection

OPGA guides and their clients will capture these fish by hook and line, secure them in individual holding tubes in the river, and arrange transportation for them to the hatchery, where they will be held until spawned. Guides engaged in this process will need to carry a copy of a letter from WDFW permitting the broodstocking activity, and will carry with them sufficient holding tubes to hold captured fish and transfer them to the hatchery (to avoid "tethering" captured fish). Fishing conditions in January vary year to year, which may limit the number of broodstock available to hook and line collection for any given year. Other collection or transportation methods may also be employed if necessary, upon written agreement of the OPGA and WDFW.

Goal

The target number of broodstock will depend on the program's release goal, and will include consideration of the risk of magnifying the broodstock's genetic composition within the wild population. To increase the genetic diversity within the broodstock, additional broodstock beyond egg take needs may be collected and only partially spawned, then returned to the Bogachiel River.

Adult Holding location

On an interim basis, broodstocked steelhead will be held at the Sol Duc Hatchery in circular tanks on spring water until spawned. The broodstock will be held at the Bogachiel Hatchery as soon as infrastructure is acquired to accommodate the program.

Spawning

Broodstocked steelhead will be examined weekly to assess spawning condition.

Location

These wild broodstock steelhead will be spawned at the Sol Duc hatchery on an interim basis until the Bogachiel Hatchery develops adequate infrastructure to allow holding and spawning on site.

Protocols

As females ripen they will be partially spawned with two or more males. The eggs collected per female will depend on her maturity, the number of females available, and the egg take goal.

Disposition of Spawned Steelhead

Females will then be released back into the Bogachiel River, while males may be spawned multiple times, then also released into the Bogachiel River, or sacrificed for disease screening as needed.

Egg Incubation

On an interim basis, flexibility will be maintained in where the eggs will initially be incubated: either at the Sol Duc or Bogachiel hatchery depending on the egg take timing and the need to slow down the early egg takes with cold Sol Duc water. Eyed eggs or green eggs and milt will then be transferred to the Bogachiel Hatchery for final incubation and hatching. Incubation will occur entirely at the Bogachiel Hatchery when adequate infrastructure is developed.

Rearing

Initial rearing following hatching will occur at the Bogachiel Hatchery. The duration of rearing at Bogachiel will depend on the location chosen for the program and the rearing facilities available. Efforts will be made to minimize variation in size among juveniles from different egg take dates. This will require additional modification to existing facilities at Bogachiel Hatchery.

Location

I. Undie Pond
   A. Acclimation (6 weeks)
   B. Release

II. Mill Creek
   A. Acclimation (6 weeks)
   B. Release

III. Bogachiel Hatchery
   A. Holding adults
   B. Spawning and egg incubation
   C. Short or long term rearing
   D. Transfer or release

Facility Infrastructure Requirements

Regardless of the site chosen for rearing and release of these fish, Bogachiel Hatchery will require 4 additional above ground circular ponds to enable holding adults and to allow different feeding rates for juveniles from the different egg take groups to reduce variation in size. Additional requirements:

I. Acclimation site
   A. Undie Road
      1. Above ground fiberglass raceway
      2. Pumps and piping
      3. Culvert under road and mechanism for volitional release
   B. Mill Creek
      1. Above ground fiberglass raceway
      2. Pumps and piping
      3. Mechanism for volitional release
      4. Removal of extensive in-stream debris for passage to site

II. Long term rearing site
   A. Bogachiel Hatchery pond
      1. Partitioning of Pond to allow rearing of smaller lots
      2. Means to volitionally release
   B. South Calawah pond
      1. Partitioning of Pond to allow rearing of smaller lots
      2. Means to volitionally release

Marking

Anglers are familiar with regulations that allow retention of adipose clipped hatchery steelhead. Program steelhead will be marked with a double fin clip (adipose and left ventral (pelvic)) prior to release to encourage their retention by anglers, and allow them to be distinguished from wild (unclipped) and early timed hatchery (adipose clipped) steelhead. The 2013 brood, released in spring of 2014, will be the only exception. These were the first produced from Bogachiel

broodstock, and two salts returning in 2015/16 will overlap with the three salts returning from the last plant in the Sol Duc (released 2013). Consequently the 2014 (first) Bogachiel release was marked with a right ventral clip.

Smolt Release

Target Size

Smolts will be released at a target size of greater than 10 fish per pound.

Location

Release will be to the Bogachiel River, adjacent to the rearing/release facility.

Acclimation

Acclimation at the release location will be a minimum of 6 weeks. However, until adequate infrastructure is developed, the current acclimation at Bogachiel Hatchery will be as long as possible prior to release, but may not meet the 6 week minimum.

Strategy

Smolts will migrate from the rearing facility out to the river on their own volition. Those remaining will continue to be fed. Those still in the rearing pond after 6 to 8 weeks will be held for additional rearing, then either released the following spring, or planted in Lincoln Park pond, Port Angeles, which has no outlet.

Adult Recovery

Returning program steelhead that escape harvest will be allowed to spawn naturally to bolster the early timed portion of the wild run. Trapping will not be necessary, and the program will be sized to meet the HSRG standard for pHOS for integrated programs of < 30%. If the program is located at Bogachiel Hatchery, returning program steelhead that home to the trap could be transported and released further upstream for additional access and utilization by the sport fishery.

Monitoring

The program will be monitored to evaluate its success at meeting its goal of providing additional harvest during the period between early timed and wild returns. Estimates of pHOS and PNI will also be generated to measure the program against the HSRG standards. WDFW and the Quileute Tribe currently have programs in place to enumerate and sample harvested steelhead.

Current Monitoring

Juveniles

Standard hatchery protocols and procedures incorporate routine monitoring activities during the incubation, hatching and rearing of fish. Among these are: survival/mortality rates, growth rates, incidence of disease, marking (clipping) success rates, and size at release.

Monitoring the proportion of the release that delays or foregoes migration can provide a measure of one aspect of the program's impact on the wild population. Age analysis from scales will include an assessment of proportions of returning adults that spent more than one year in freshwater, indicating a delay in migration after release.

Adults

Harvest

Catch of returning program steelhead will be monitored in the treaty and non-treaty fisheries. The differential mark (double clip) will distinguish them from steelhead of other origins. The recreational fishery and treaty fishery catches will be sampled for fin clips, length, sex, and scales for age analysis.

Escapement

Escapement of naturally spawning fish will be estimated from redd surveys. The proportion of program fish among the natural spawners may be estimated by determining harvest rates of wild and hatchery steelhead in the treaty fishery, and assuming the program fish were harvested similarly. Extrapolating a total run size, then subtracting off the harvests would provide an estimate of the program fish spawning naturally.

Rack Return (Trap)

Program fish that volunteer to the Bogachiel trap will be transported upriver and released to contribute to harvest or natural spawning.

Broodstock

Broodstocked wild steelhead will be genetically sampled each year to have that information available for future analysis if desired and funded.

Potential Monitoring

The negative effect of domesticated fish stocks spawning with wild is well documented, but the effect of a program of this design is still debated. Establishing this program provides an opportunity to evaluate its effect on a wild steelhead population's productivity and return timing. **Such a study will require a more extensive and expensive sampling plan** to track parentage through genetic monitoring of adults and/or juveniles. A trapping operation would be necessary to acquire the needed samples.

Duration of Agreement

This agreement shall be valid for six years from date of signature, with an option to renew it as is or with modifications, upon approval of both parties.

Permitting/SEPA

If the program is located at the Bogachiel hatchery, the program would be designed to meet Statewide Steelhead Management Plan and Hatchery Reform Policy guidelines, but would not be sent through the SEPA process.

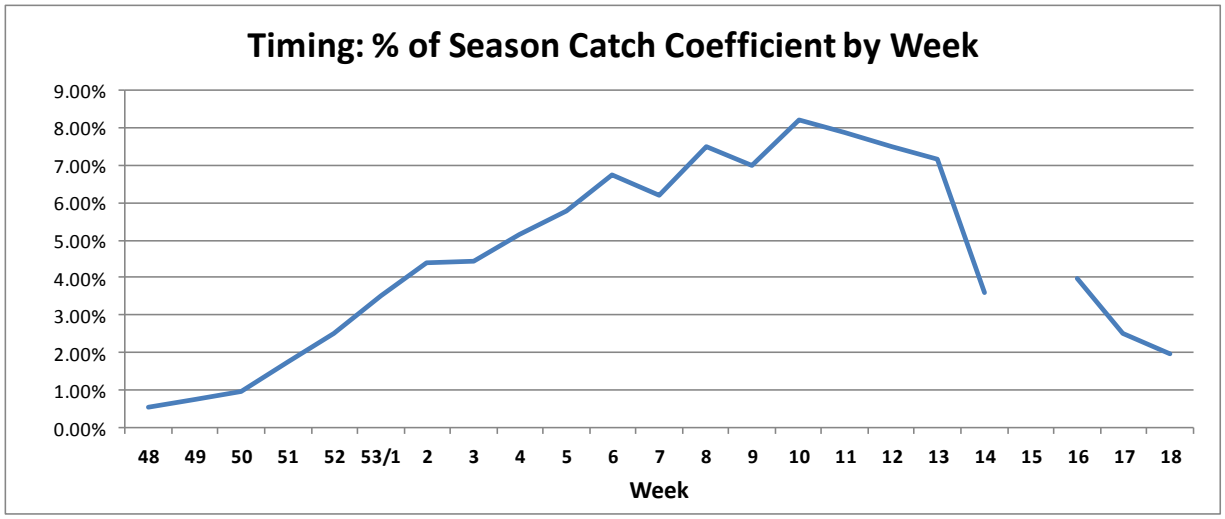
If a new release site is developed, it will require a permitting process including the SEPA review.

Literature Cited

Genetic Analysis of Steelhead (*Oncorhynchus mykiss*), Coho (*O. kisutch*), and Chinook (*O. tshawytscha*) from Washington's Olympic Peninsula with an Emphasis on the Hoh River. 2011. Kassler, Todd, Sam Brenkman, Joe Gilbertson, Mike Gross, David Low, and Adrian Spidle. WDFW Report.

Appendix A.

Wild Run Timing by week from IGN (Indian Gill Net) fishery
Means by week of catch coefficients from 1991/92 through 20012/13 seasons.



Week	Wild Catch Coefficient	Weekly Percent
48	3.807E-05	0.54%
49	5.318E-05	0.75%
50	6.837E-05	0.97%
51	1.237E-04	1.75%
52	1.780E-04	2.52%
53/1	2.482E-04	3.51%
2	3.094E-04	4.38%
3	3.134E-04	4.44%
4	3.625E-04	5.13%
5	4.067E-04	5.76%
6	4.750E-04	6.73%
7	4.380E-04	6.20%
8	5.299E-04	7.50%
9	4.955E-04	7.01%
10	5.807E-04	8.22%
11	5.556E-04	7.87%
12	5.291E-04	7.49%
13	5.051E-04	7.15%
14	2.552E-04	3.61%
15	Closed	
16	2.799E-04	3.96%
17	1.782E-04	2.52%
18	1.393E-04	1.97%
sum:	0.007063	100.00%