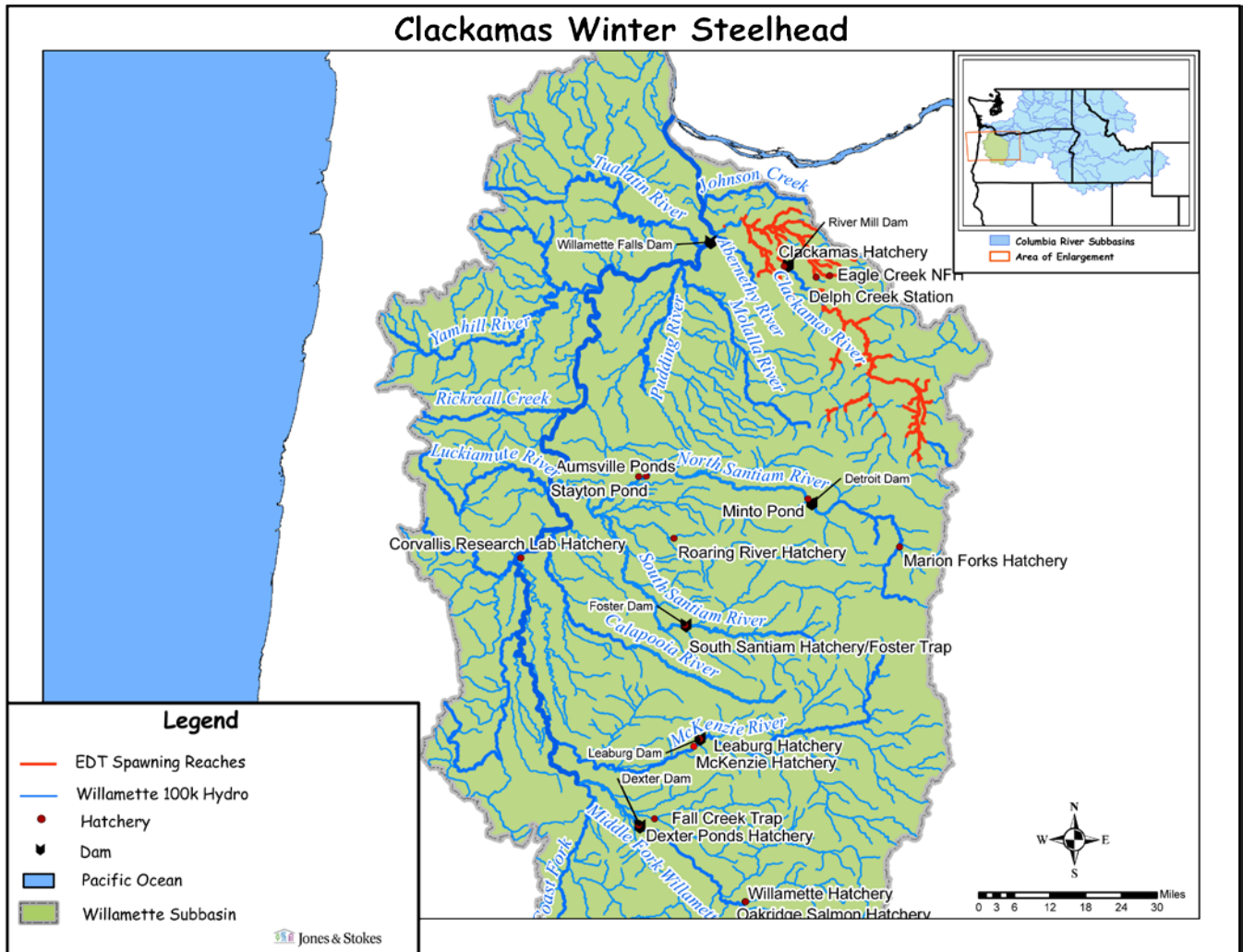


Hatchery Scientific Review Group Review and Recommendations

Willamette – Clackamas Winter Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Clackamas Winter Steelhead

This population represents native late winter steelhead naturally spawning in the Clackamas River above and below the North Fork Dam and major tributaries, including Deep, Clear and Eagle creeks. In addition, this population includes steelhead spawning in lower Willamette River tributaries, such as Johnson and Tryon creeks. Steelhead in these tributaries are part of the Lower Columbia River Steelhead ESU, but have not been identified as an independent population.

The Clackamas River population is one of five winter steelhead populations in Oregon's portion of the Lower Columbia River Steelhead ESU. Clackamas steelhead are managed differently above and below North Fork Dam. The lower component includes hatchery strays from the three steelhead programs operating in the basin; however, very few to none are found in the tributaries other than Eagle Creek (personal communication, Todd Alsbury, ODFW, January 2008). The upper river component is managed as a wild fish sanctuary. Marked hatchery steelhead (early-timed winter run, late-timed winter run, and summer steelhead) are not passed upstream of North Fork Dam.

There is little data regarding the population status of late winter steelhead in the lower Willamette tributaries. The Johnson Creek winter steelhead component spawns in mainstem Johnson Creek and its tributaries and the Tyron Creek component (including Arnold Creek) historically spawned at least up to the Marshall Cascade. The life history of the Johnson Creek steelhead is based on other lower Willamette winter steelhead, notably steelhead in the Clackamas River and Tryon Creek that are believed to be late-run populations returning to freshwater and spawning during their fifth and sixth years.

McElhany et al. (2007 review draft) reviewed the winter steelhead population in the entire Clackamas River subbasin, comprising both the Lower and Upper Clackamas late winter steelhead components. The population long-term geometric mean is about 1,800 natural origin spawners, which is in the very low risk minimum abundance threshold category (McElhany et al. 2007 review draft). For comparison, the abundance in recent years of returning adults to North Fork Dam has been several hundred to a few thousand, although the long-term average is approximately 450 (Subbasin Plan). In recent years (1990-2005), the geometric mean of natural-origin spawners was 1,168, with a recent hatchery fraction of about 0.25 (McElhany et al. 2007 review draft). Over the same period, the geometric mean recruits per spawner was 0.617. The 25% average recent hatchery fraction makes it difficult to obtain a precise estimate of population productivity for wild fish only.

Virtually the entire historic habitat accessible to winter steelhead in the Clackamas River remains accessible today (ODFW 2005). Losses of accessibility are limited to higher order tributary streams, primarily due to watershed development in the lower basin. Spatial structure has likely been reduced by habitat degradation in lower basin tributaries (McElhany et al. 2007 – review draft).

In the lower Columbia River, most wild steelhead are 4 to 6 years of age at first spawning (Busby et al. 1996). Abernethy (1886) reported that steelhead entered the river from December 1st to February 15th. Currently, Clackamas River winter steelhead enter the river from February through May and spawn from May to June (Murtagh et al. 1992). Olsen et al. (1992) reported that prior to the introduction of early-winter (Big Creek) steelhead, passage at North Fork Dam peaked in May. The majority of steelhead return at 4 years of age, with a repeat spawning incidence of 11% (Chilcote 2001). The apparent change in run timing may be due to a number of factors – further investigation is needed.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Clackamas River Winter Steelhead are part of the Lower Columbia Steelhead DPS which was listed as Threatened under the ESA in 1998.
- **Population Description:** The entire Clackamas River Winter Steelhead (Late) population is designated as a Primary population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes current viability as NA with a viability goal of High.
- **Recovery Goal for Abundance:** The recovery goal is NA; the current abundance for the entire Clackamas late winter steelhead population (both upper and lower) is 277; the viable abundance is 1,000, and the potential abundance is 2,000.
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (e.g., from EDT) – Upper Clackamas:** Productivity: 10.1; Capacity: 3,345. **Lower Clackamas:** Productivity: 3.1; Capacity: 1,134.

2.2 Current Hatchery Programs Affecting this Population

There are three hatchery programs of steelhead released into the Clackamas River, late-winter (integrated), early-winter (segregated), and summer run (segregated). Since 1999, only unmarked steelhead have been allowed above North Fork Dam, although prior to that the hatchery contribution was about 25% of the run.

Clackamas River Hatchery Winter Steelhead (Late) integrated harvest/conservation program: The Clackamas Hatchery winter steelhead (#122) derived from late returning “native” spawners is the only hatchery stock considered part of the ESU (SHAGG 2003). The ODFW Clackamas Hatchery currently rears a winter run broodstock (#122) developed from unmarked fish at North Fork Dam. In 2003, 18 females and 32 males were spawned (including 25 unmarked fish) at the Clackamas Hatchery for the “wild” broodstock. Under this program, approximately 165,000 yearling late winter steelhead are released into the Clackamas River each year (HGMP 2001). Due to water quality and quantity limitations at the hatchery, a portion of the program involves out-of-basin incubation and rearing at other hatchery facilities. Approximately 115,000 smolts are released at the Clackamas Hatchery, 25,000 smolts are acclimated and released at the Cassidy acclimation site, and 25,000 smolts are acclimated and released at the Foster site.

Eagle Creek NFH Winter Steelhead (Early) segregated harvest program: The Big Creek Hatchery stock of early winter steelhead return to the Clackamas River earlier (from November to early March) than the native winter steelhead, which arrive from February to June (Murtagh et al. 1992). Furthermore, the peak spawning period for Big Creek-derived fish is January to early March compared with May and June for native Clackamas River winter steelhead. Under this program, approximately 150,000 yearling early winter steelhead are volitionally released onsite (Eagle Creek) April through May of each year (HGMP 2004).

Clackamas River Hatchery Summer Steelhead (South Santiam) segregated harvest program: This program releases a proposed 175,000 summer steelhead from the Clackamas

Hatchery. Average release for brood years 1996 to 2001 were 153,000 smolts. Adult South Santiam Hatchery stock steelhead returning to the South Santiam River are collected at the Foster Dam trap and used as broodstock for this program. Broodstock are held and spawned at the South Santiam Hatchery. Eggs are incubated through the eyed-stage at the South Santiam Hatchery, and then are sent to Bonneville Hatchery where further egg incubation and juvenile rearing takes place. Smolts (at 5 fish/lb) are then sent to the Clackamas Hatchery for final acclimation and release (HGMP 2006). The introduction of early-winter and summer steelhead from outside of the basin may have influenced the diversity of the native late-winter run, although differences in run timing probably limit the degree of introgression. Chilcote (2001) estimated that competition between summer and winter-run steelhead probably reduced the productivity of the winter run population, but it is not know if there has been any effect on life history diversity.

Estimated number of hatchery strays affecting the lower Clackamas population component:

- Hatchery strays from in-basin integrated hatchery program: 373 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 80 fish.

Estimated number of hatchery strays affecting the upper Clackamas population component:

- Hatchery strays from in-basin integrated hatchery program: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 5 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.5 to 3.0 in the lower Clackamas and would not change in the upper Clackamas. Average abundance of natural-origin spawners (NOS) would increase from approximately 520 fish to approximately 800 fish in the lower Clackamas and would not change in the upper Clackamas. Harvest contribution of the natural and hatchery populations would go from approximately 4,000 fish to approximately 150 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Native Clackamas steelhead are considered a single population with two components (lower river and upper river). The single population meets the criteria for a Primary designation with the current hatchery program. The two components are managed as separate units upstream and downstream, respectively, of North Fork Dam.

Recent management changes affecting the upper river component have included the following measures: removing adult summer run steelhead; terminating rainbow trout releases into spawning and rearing habitat; terminating releases of hatchery-origin summer steelhead smolts; terminating harvest above North Fork Dam; planting only adipose-marked rainbow trout into reservoirs; and allowing the retention of only marked rainbow trout in the fishery. These measures likely are leading to strengthening of natural steelhead escapement to the basin. Managers estimate that approximately 70% of existing steelhead habitat is above North Fork Dam, an area that has been designated a wild fish sanctuary.

Lower River Component: The lower river component is heavily hatchery dominated. Currently, the hatchery programs (150,000 segregated early winter steelhead smolts from Eagle Creek National Fish Hatchery, 175,000 summer steelhead smolts outplanted from North Santiam Hatchery, and 165,000 upper river integrated winter steelhead smolts from Clackamas Hatchery) in the lower river are operated consistent with a stabilizing population (for recovery planning purposes).

Upper River Component: The upper river (upstream of the North Fork Dam) is managed for wild fish production. There appears to be little or no straying of hatchery fish into this area because of selective removal of all marked hatchery fish at North Fork Dam. The existing program at Clackamas Hatchery includes natural-origin broodstock from this upriver population (released into the lower river) and is operated consistent with a primary population designation.

Alternative Management Strategies for the Lower River Component

Stabilizing Designation: Should it be determined to manage the lower river component consistent with a stabilizing designation, the upper river component still could meet the standards of a primary designation. The lower river population component could be managed to maintain the current segregated (early winter and summer) and integrated (winter) programs.

Contributing Designation: Should it be determined to manage the lower river component consistent with a contributing designation, the upper river component still could meet the standards of a primary designation. Two alternatives are available for the lower river population component:

- 1) Maintain current segregated programs (early winter and summer), eliminate the current integrated program, and develop an integrated program with broodstock that spawn in the lower river of approximately the same size at the existing program (164,000 smolts); or,
- 2) Eliminate the current segregated programs (early winter and summer) and continue a significantly smaller integrated program (approximately 30,000 smolts) with current broodstock protocols (using upper river component).

Primary Designation: Should it be determined to manage the lower river component consistent with a primary designation, two alternatives are also available:

- 1) Maintain the current segregated programs and eliminate the current integrated program; or,
- 2) Eliminate the current segregated programs and develop an integrated program using brood stock collected in the lower river of approximately 80,000 smolts to replace the existing integrated program.

All of the above-listed management options for the lower river component will continue to meet the standards for a Primary designation for the steelhead population as a whole because of the viability and abundance of the upper river component.

Recommendations

The HSRG's recommendations for the Lower River component are captured in the alternative strategies identified above. Selecting a specific strategy will depend on the goals of the Oregon component of the Lower Columbia Recovery Plan that is currently under development.

In order to increase long-term survival of the segregated summer steelhead population, develop within basin broodstock of South Santiam origin. Because the program uses over 100 breeders annually, under this segregated option, a local broodstock with a sufficiently high effective population size could be developed from fish returning to the Clackamas River.

The ecological effect (and potential genetic effect) of introduced summer steelhead on natural populations of winter steelhead in the lower river however is a concern (Kostow 2004, Kostow and Zhou 2006). All of the options proposed above represent a reduced genetic and ecological risk to natural populations. After specific program options are selected, the HSRG recommends periodical assessments of the ecological risks under those updated programs. In any case, manage acclimation and release to reduce residualism and recapture unharvested adults to the extent possible.

Upper River Population Component: Current management of the upper river component is consistent with a primary population designation and the HSRG sees no conservation need for direct hatchery intervention in the upper watershed at this time. If the long-term management goal is to treat natural populations of steelhead in the Clackamas River as one genetic stock, then managers should consider collecting broodstock from areas in the lower river to augment current collections from the upper river at

North Fork Dam (integrated program). These expanded collections would ensure the current integrated hatchery program at the Clackamas Hatchery more accurately represents the spawning aggregates found throughout the basin.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Clackamas Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

Alternative	Type and Purpose	Prog Size (/1000)	HOR Recapture	Additional Weir Efficiency	Effective pHOS	PNI	NOS Esc	Adj Prod	Harvest	Hatchery Surplus
Current	Upper Clackamas None None	-	90%	95%	0%	1.00	3,222	9.7	116	-
	Lower Clackamas Int Harv	164.9	80%	0%	37%	0.00	527	1.5	2,273	1,370
	Eagle Creek Seg Harv	151.0	90%						1,016	647
	Summer Stlhd Seg Harv	174.8	90%						724	712
No Hatchery	Upper Clackamas None None	-	0%	95%	0%	1.00	3,223	9.7	116	-
	Lower Clackamas Int Harv	-	0%	0%	0%	1.00	800	3.0	33	-
HSRG Solution	Upper Clackamas None None	-	90%	95%	0%	1.00	3,223	9.7	116	0
	Lower Clackamas Int Harv	80.4	80%	0%	17%	0.70	743	2.5	1,130	693
	Eagle Creek Seg Harv	151.0	90%						1,016	647
	Summer Stlhd Seg Harv	174.8	90%						724	712
HSRG Solution w/ Improved Habitat	Upper Clackamas None None	-	90%	95%	0%	1.00	3,582	10.7	129	0
	Lower Clackamas Int Harv	80.4	80%	0%	15%	0.72	864	2.9	1,135	693
	Eagle Creek Seg Harv	151.0	90%						1,016	647
	Summer Stlhd Seg Harv	174.8	90%						724	712