Hatchery Scientific Review Group
Review and Recommendations

Upper Yakima Summer Steelhead
Population and Related Hatchery Programs

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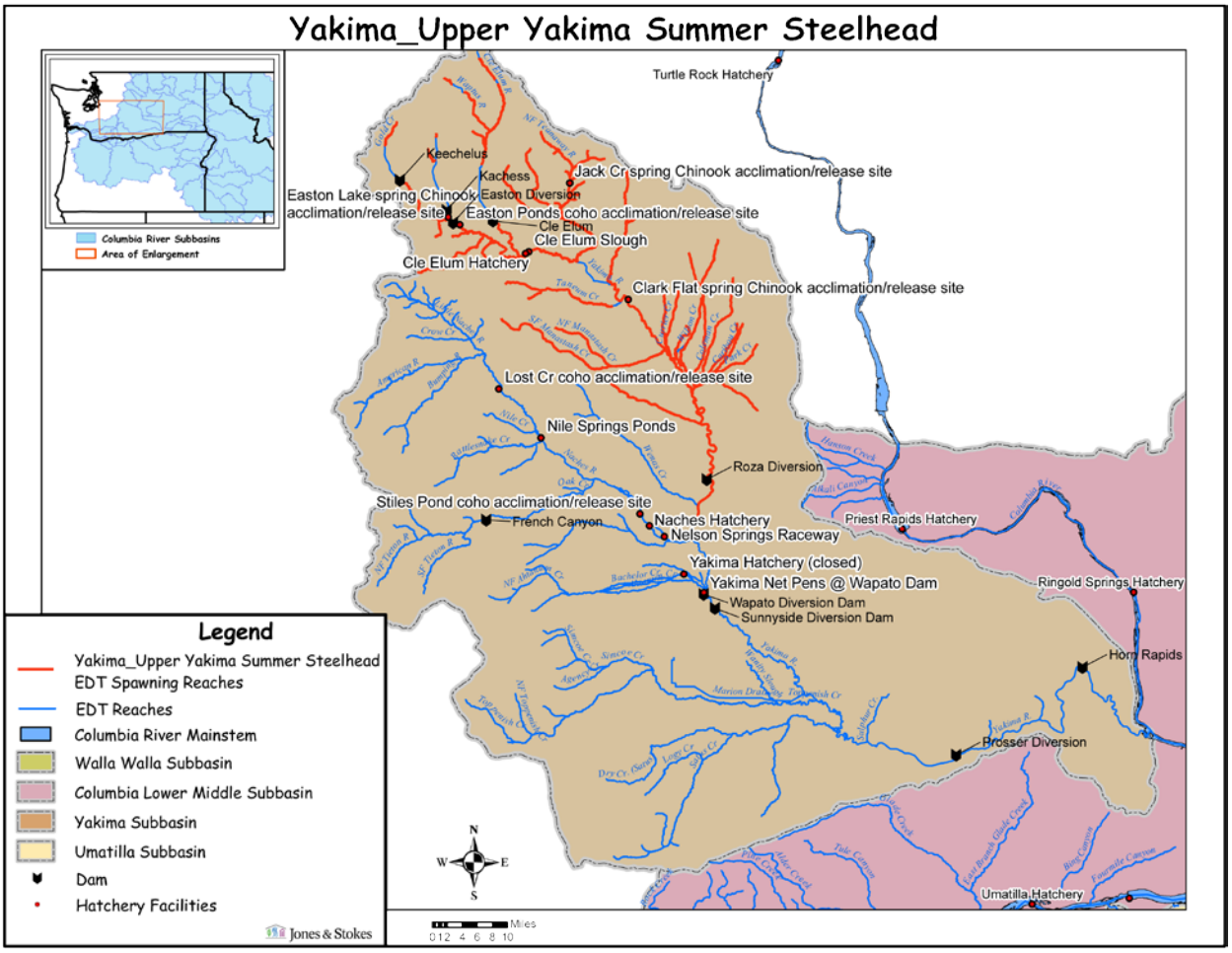

1 Upper Yakima Summer Steelhead

The Yakima Subbasin supports four genetically and demographically distinct stocks of summer steelhead, the Satus Creek stock, the Toppenish Creek stock, the Naches River stock and the upper Yakima stock. Hockersmith et al (1995) successfully monitored 105 radio tagged steelhead to spawning over brood years 1990 through 1992. Because high flow and turbidity in the Naches River and Yakima mainstem precludes visual redd counts during steelhead spawning, this radio tagging data has been the only means of determining the overall stock composition of the run. Over all three years, the mean percent of radio-tagged fish that spawned in Satus Creek, the Naches River watershed, Toppenish Creek, and the upper Yakima was 48.0%, 31.6%, 13.3% and 7.1%, respectively.

Estimates of the size of the historical steelhead run range from 20,800 (Kreeger and McNeil 1993) to 100,000 (Smoker 1956). Although the upper Yakima population now represents only about 7% of Yakima subbasin steelhead production, it is likely that historically it was the dominant producer. This is because it is much larger than any of the other watersheds (~75% of the wetted area of the subbasin occurs in the upper Yakima watershed) and because it contains many moderate gradient tributaries suitable for steelhead spawning and rearing. Several factors have reduced production in the upper Yakima River. These include early damming of spawning tributaries favored by steelhead; closing the fish ladder at Roza Dam during much of the steelhead spawning run (mid-October to mid-March) from 1941 through 1959[1]; and the presence of four large diversion dams downstream of Roza Dam, each imposing a significant mortality (20% at Prosser Dam alone) on bypassed smolts. All of these factors reduce the productivity of anadromous *O. mykiss* more than resident life history types, and impose a selective pressure in favor of the resident life history type (Yakima Subbasin Summary). These factors and perhaps others have combined to produce an upper Yakima *O. mykiss* population that is genetically homogenous (Busack and Phelps 1991), abundant and overwhelmingly resident. Available data on juvenile *O. mykiss* densities in upper Yakima tributaries and the mainstem indicate that the number of adult resident *O. mykiss* is at least 15,000 (Watson 2008). By contrast, the number of adult steelhead counted at the Roza Dam fish ladder between 1990 and 2007 ranged from 14 to 238 with a mean of 92. Like all populations of Yakima steelhead, the upper Yakima population has grown somewhat since 2000. The mean abundance of upper Yakima steelhead from 1990 (the first year of complete Roza Dam counts) through 2000 was 47; mean abundance from 2001 through 2007 was 161.

Many hatchery *O. mykiss* have been released in the Yakima subbasin. Three million hatchery trout (primarily South Tacoma and Goldendale stock) were planted in the upper Yakima and Naches rivers between 1950 and 1987, and 1.6 million hatchery steelhead (primarily Skamania stock) were planted in these same systems between 1961 and 1987. After 1987, no out-of-basin hatchery steelhead were released in the Yakima subbasin, although experimental releases (40,000 – 100,000) of hatchery-reared Yakima stock steelhead were made between 1987 and 1994. The 1991 – 1994 releases occurred in the North Fork Teanaway River, an upper Yakima tributary. Between 1995 and 1999, no hatchery steelhead programs of any kind operated in the Yakima subbasin. A kelt reconditioning program at Prosser Hatchery on the lower Yakima River (RM 47) began on a test basis in 1999 and moved into full production in 2001. This is the only steelhead artificial production program currently in operation in the Yakima subbasin (see below).

[1] Unfettered, year-round adult passage was not restored to the upper Yakima until 1989 when a ladder was retrofitted.

Although the entire Yakima subbasin was closed to steelhead fishing in 1994, considerable illegal and/or inadvertent steelhead harvest is believed to occur during the winter whitefish fishery, especially in steelhead staging areas off the mouths of Satus and Toppenish creeks. A terminal harvest rate of 8 percent has been estimated (C. Frederickson, Yakama Nation, personal communication 2007).

Summer steelhead spawn in most of the accessible tributaries in the upper Yakima, but especially in the Teanaway River and its tributaries, Taneum Creek, Swauk Creek and Umtanum Creek. Spawning also occurs in the mainstem, especially in side channels with abundant cover. Spawning occurs over a fairly wide period, given the range of elevations and seasonal water temperatures in the watershed. At the lowest elevations, spawning can begin as early as March, while at the highest elevations, spawning can continue into June (Yakima Subbasin Plan).

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: Native upper Yakima summer steelhead are part of the Middle Columbia Steelhead DPS, which were listed as a threatened species on March 25, 1999.
- Population Designation: Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette arrives at a designation of Contributing.
- Current Viability Rating: High risk of extinction (Yakima Subbasin Salmon Recovery Plan)
- Recovery Goal for Abundance: 2,000
- Productivity Improvement Expectation: 1.75 (C. Frederickson, Yakama Nation, personal communication).
- Habitat Productivity and Capacity (from EDT): Productivity: 1.32; Capacity: 1,750

2.2 Current Hatchery Programs Affecting this Population

The Prosser Hatchery kelt reconditioning program is the only steelhead artificial production program in the basin. The Yakima Basin Steelhead Reconditioning Project HGMP (2005) summarized the program as follows. Steelhead kelts are collected at the Chandler smolt trap at Prosser Dam (RM 47) and subjected to short- and long-term reconditioning and release. Because Prosser Dam lies below all four steelhead populations, the kelts collected and reconditioned presumably represent a sample of all of the stocks in the basin. Under long-term reconditioning, kelts are captured at the Chandler smolt trap between March and June, reconditioned on-site for 6 to 8 months, and released back into the Yakima River at Prosser Dam the following December. Mean weight gain for surviving long-term kelts was approximately 70% over collection weight in 2000-2001, and many fish more than doubled their weight. Collection procedures are identical for short-term reconditioning, but fish are held only 1-2 months and are released below Bonneville Dam. Short-term kelts gain very little weight during their brief reconditioning period, and are expected to recondition naturally in the estuary and/or ocean and eventually return to the Yakima subbasin. Six short-term kelts released below Bonneville Dam in May of 2002 returned in the fall of 2002 and were recaptured in the Denil ladder at Prosser Dam. The mean weight gain of these fish after 5-6 months of natural reconditioning was about 46%.

A total of 867 steelhead kelts were captured from 2002 to 2004 and subjected to short-term reconditioning, and 2,147 kelts were collected from 2001 to 2004 and subjected to long-term reconditioning. Kelts are collected throughout the migration period for both the short and long-term programs. Based on Prosser Dam counts from July 1, 2000 to March 7, 2005, reconditioned kelts represented about 24% of the entire Yakima River population. Program managers anticipate reconditioning no more than 1,000 to 1,200 kelts per year or, given recent returns, about 25-35 % of the natural run.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 4 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 0.6 to 1.1. Average abundance of natural-origin spawners (NOS) would increase from 11 to 175. Harvest contribution of the natural and hatchery populations would increase from two to 28 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

Steelhead productivity in the upper Yakima is limited by adult access to tributaries, poor juvenile passage at Roza Dam, and competition between resident and anadromous *O. mykiss*. The low productivity creates a situation where upper Yakima steelhead are sensitive to hatchery strays and their effect on fitness. Hence, the long-term projection of population productivity and abundance under current conditions is due to loss of fitness from effects of hatchery strays. Population productivity and abundance absent hatchery effects are more indicative of current population abundance.

There is an experimental kelt (post-spawned steelhead) reconditioning program that may affect steelhead in the Yakima subbasin.

Recommendations

Continue to monitor for spawning success of reconditioned kelts. We have no other specific recommendations for this program.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Upper Yakima Summer 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	None None	0.0	0%	0%	23%	0.00	11	0.6	2	0
No Hatchery	None None	0.0	0%	0%	0%	0.00	175	1.1	28	-
HSRG Solution	None None	0.0	0%	0%	0%	0.00	151	1.1	24	0
HSRG Solution w/ Improved Habitat	None None	0.0	0%	0%	0%	0.00	331	1.2	54	0