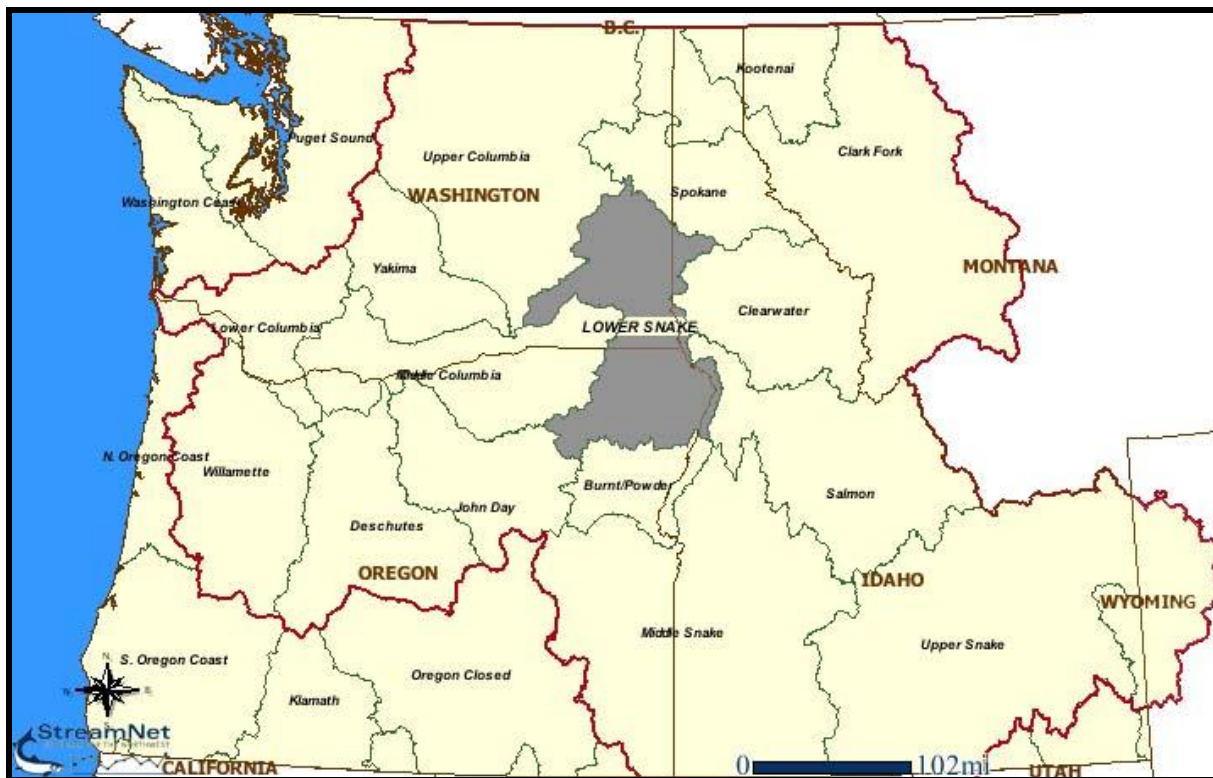




U.S. Fish and Wildlife Service Pacific Region

Columbia River Basin Hatchery Review Team

Columbia River Basin, Lower Snake River Region
Grande Ronde and Imnaha River Watersheds



**Oregon Lower Snake River Compensation Plan State
Operated Hatcheries**

Irrigon, Lookingglass, and Wallowa Fish Hatcheries

Assessments and Recommendations

Final Report, Appendix B:
Briefing Document; Summary of Background Information

April 2011

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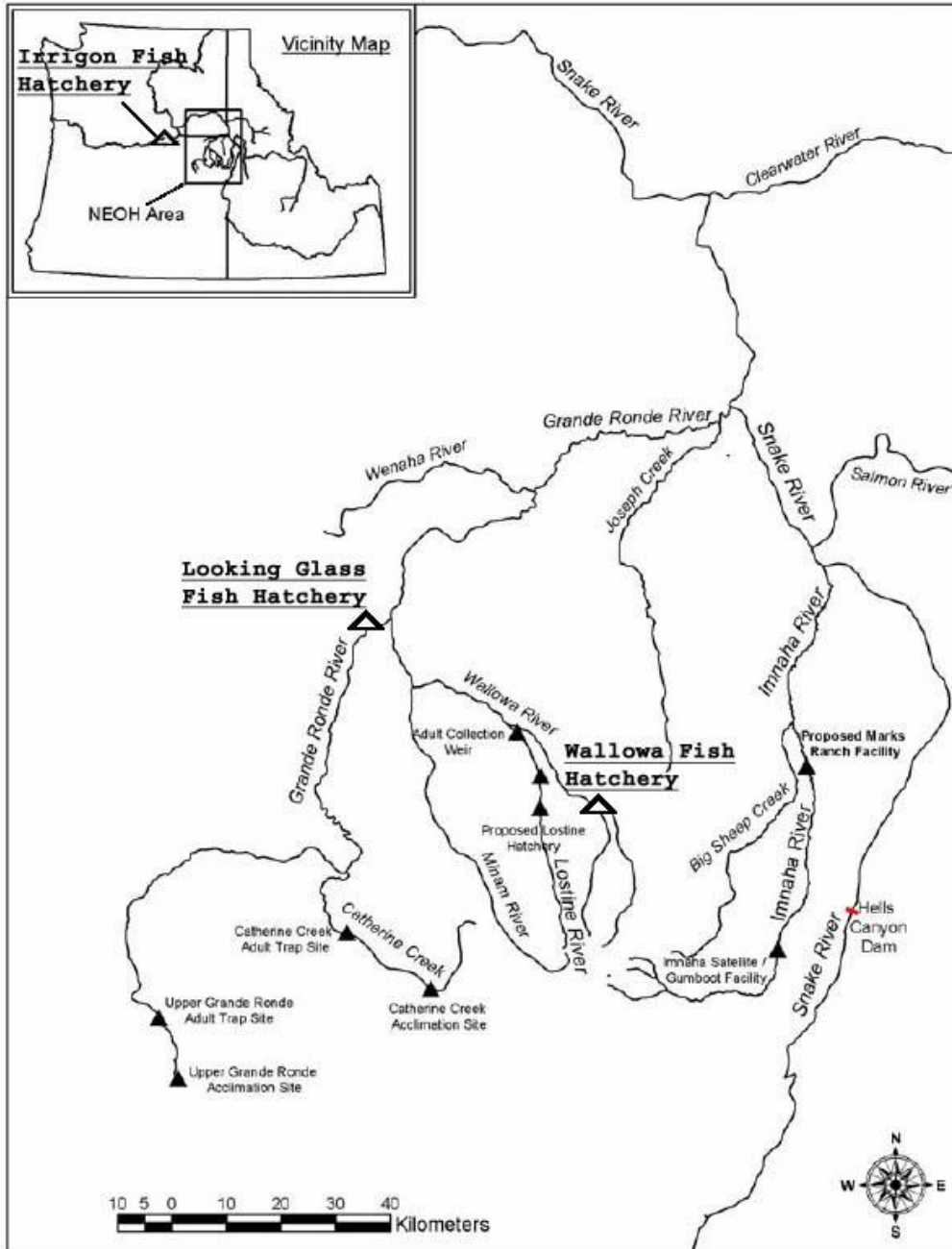


Figure 1. LSRCP Fish Hatcheries in Oregon¹

¹ Modified figure. From 2004 Grande Ronde Subbasin Plan, NPCC.

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I. Introduction to the Lower Snake Region

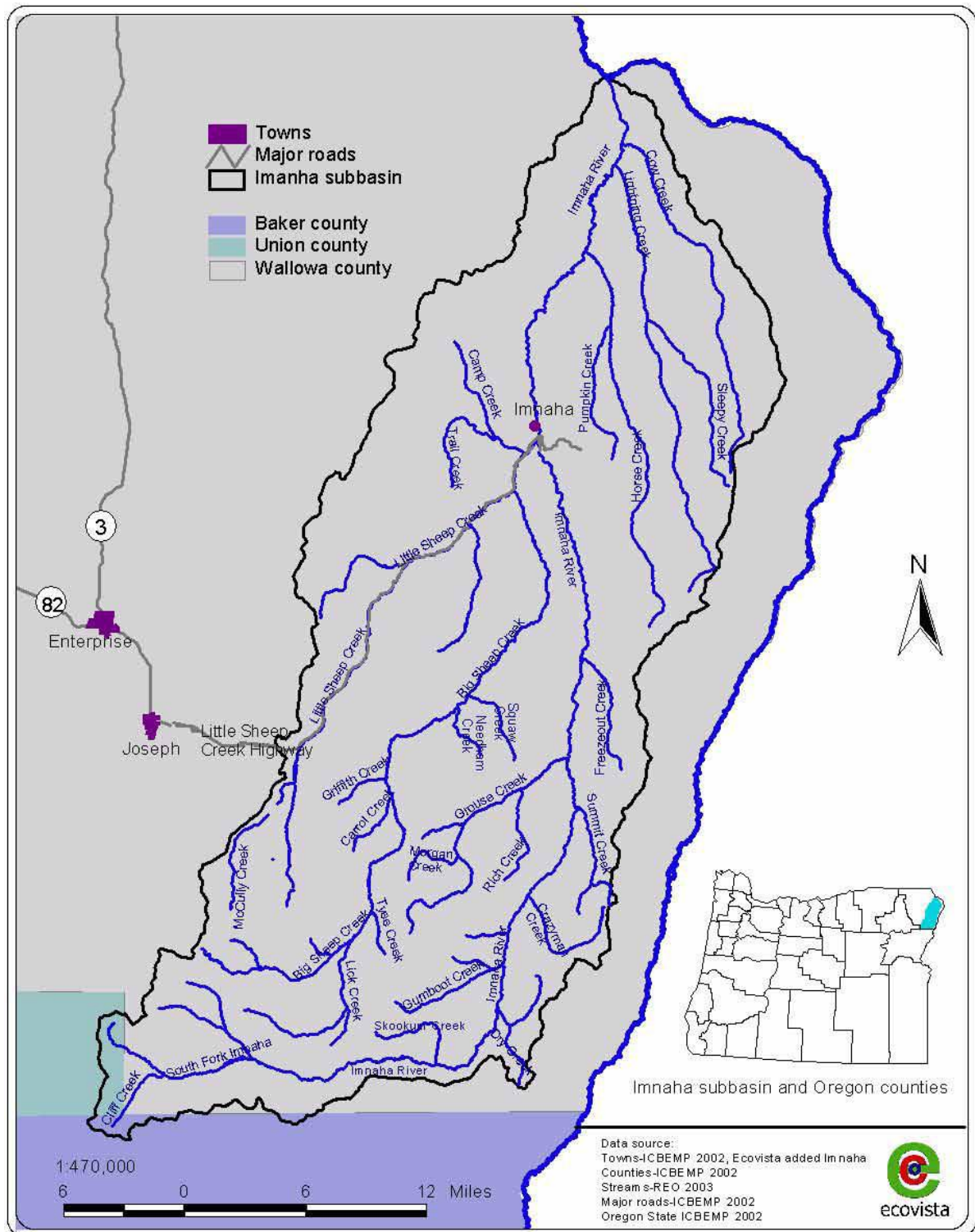
A. Watersheds and geographic description

The **Imnaha subbasin** is located in the farthest northeastern corner of Oregon near the center of the Columbia Basin. The Imnaha River flows in a northerly direction and is a direct tributary to the Snake River. The drainage joins the Snake River at river mile (RM) 191.7, approximately 48 river miles upstream of Lewiston, Idaho, and 3.4 miles upstream of the Salmon River confluence. The headwaters of the Imnaha River drain the eastern escarpment of the Wallowa Mountains and originate within the Eagle Cap Wilderness. At lower elevations, the Imnaha obtains flow from streams draining an adjacent plateau, which is located between the Wallowa River drainage to the west and Hells Canyon of the Snake River to the east. Ninety-eight percent of the subbasin lies within Wallowa County, with the remaining 2% split between Baker and Union counties. The subbasin is sparsely populated and contains only the small town of Imnaha (population 25) within its boundaries (Figure 1).

The Imnaha subbasin drains an area of 850 square miles (2,202 square kilometers or 549,600 acres). The subbasin is commonly divided in half at the town of Imnaha, which marks the confluence of the mainstem Imnaha and its largest tributary, Big Sheep Creek. The total area of the mainstem Imnaha, including all tributaries but Big Sheep Creek, is 508 square miles, while the total area of the Big Sheep Creek watershed is approximately 350 square miles. (NWPPC Imnaha Subbasin Plan, May 2004, p. 1-2)

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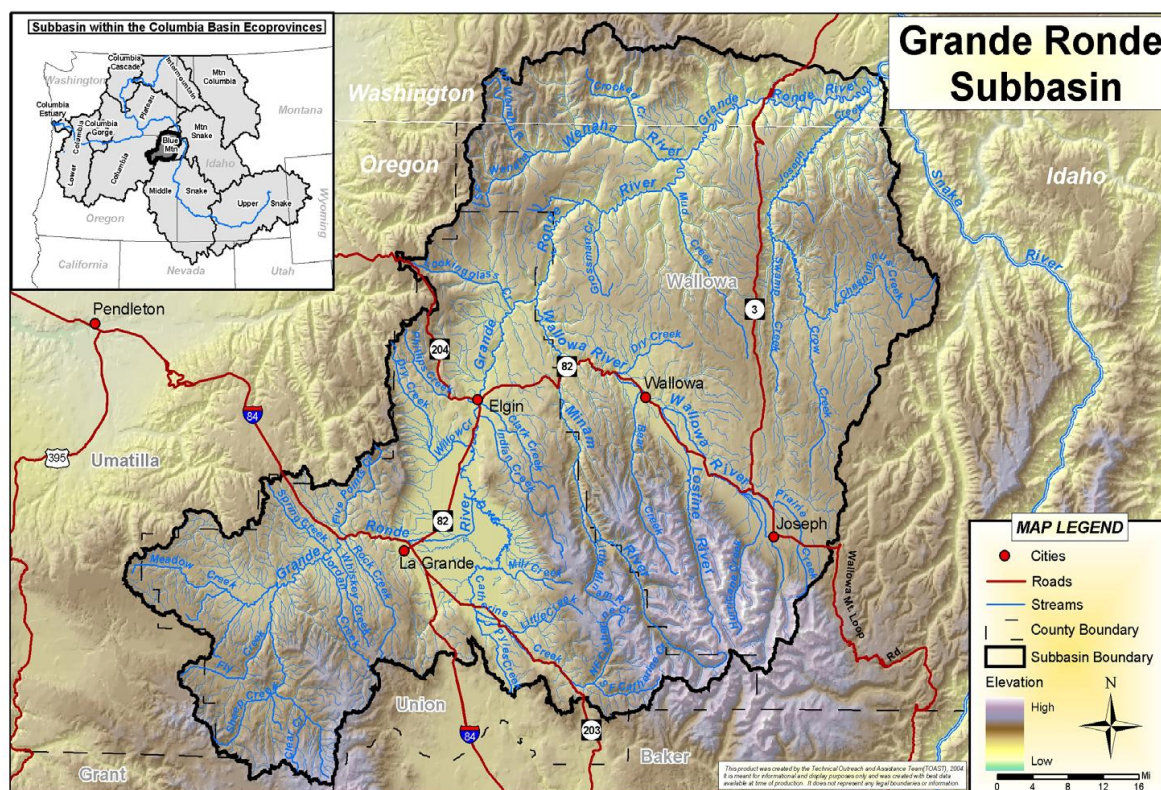
Figure 1: *Imnaha River Subbasin* (NWPPC Imnaha River Subbasin Plan, May 2004, P.2)



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The **Grande Ronde subbasin** encompasses an area of about 4,000 mi² in northeastern Oregon and southeastern Washington. The Grande Ronde subbasin drains much of the extreme northeast corner of Oregon as well as 341 mi² of southeast Washington. The subbasin includes large portions of Union and Wallowa Counties and a small portion of Umatilla County in Oregon as well as about a third of Asotin County and small portions of Columbia, and Garfield counties in Washington (Figure 2). Major streams flowing into the Grande Ronde are Catherine and Joseph creeks and the Wallowa and Wenaha rivers. Catherine Creek originates in the Eagle Cap Wilderness Area of the Wallowa Mountains and flows northwest, passing through the town of Union, then turns northeast to join the Grande Ronde at RM 140. The Wallowa River originates in the Lakes Basin area of the Eagle Cap Wilderness Area at elevations over 8,000 feet. The Wallowa River flows north into Wallowa Lake, the only large lake in the subbasin, then through the towns of Joseph, Enterprise and Wallowa before joining the Grande Ronde at RM 82. The Wenaha River begins in the Wenaha-Tucannon Wilderness Area and flows east to its confluence with the Grande Ronde River at the town of Troy (RM 46). (NWPPC Grande Ronde Subbasin Plan, May 2004, p. 15-16)

Figure 2: Grande Ronde River Subbasin (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.18)



B. Historical distribution of salmon and steelhead throughout region

1. Imnaha River Subbasin

The Imnaha subbasin provides a substantial component of the total spawning and rearing habitat available to imperiled fish species in the Snake River Basin. Because of this, the Imnaha represents one of the most productive subbasins in the Snake River ESU and Blue Mountain ecological province with relation to summer steelhead, spring/summer Chinook, and bull trout. According to StreamNet fish distribution data, although the Imnaha subbasin comprises only 0.4% of the area of the U.S. portion of the Columbia Basin it contains 2.7% of reaches used by steelhead for spawning and rearing. It also possesses a disproportionate amount of the reaches used for spawning and rearing habitat by spring/summer and fall Chinook. Although distribution information for bull trout is not available from StreamNet across the entire U.S. portion of the subbasin the Imnaha provides a disproportionate amount of the habitat in the Blue Mountain Province. The Imnaha subbasin comprises almost 14% of the Blue Mountain Province, yet contributes almost 26% of the reaches used by bull trout for spawning and rearing in the province. (NWPPC Imnaha Subbasin Plan, May 2004, p. 101)

Spring Chinook salmon (threatened, Snake River ESU, 6/05)

Historically, the Imnaha subbasin supported one of the largest runs of spring/summer Chinook salmon in Wallowa County. Prior to the construction of the four lower Snake River dams, the estimated maximum escapement of adult Chinook salmon to the subbasin was 6,700 fish. Annual adult escapement of adult Chinook salmon has been indirectly quantified since 1982. Returns of natural origin Chinook salmon (not including jacks) have declined to levels below 150 individuals during some years, which is notable because it is estimated that up to 10% of the annual escapement of wild/natural Snake River spring/summer Chinook salmon are of Imnaha origin. In the past four years (2000-2003), returns have increased to 2,364 – 6,543 individuals. This escapement total represents both natural and hatchery origin adults. (NWPPC Imnaha Subbasin Plan, May 2004, p. 131)

Fall Chinook salmon (threatened, Snake River ESU, 6/05)

Fall chinook salmon are present in the Imnaha subbasin; however, their abundance has likely been reduced from historical levels. Prehistoric and early historic run sizes are unknown. Some estimate that as many as 300 fall Chinook salmon may have entered the Imnaha subbasin annually prior to construction of the four lower Snake River dams but this is uncertain. Fall Chinook redd surveys, which have occurred periodically since 1964, document the occurrence of spawners along the lower 21 miles of the Imnaha. Current (1993 to present) redd survey efforts involve the use of helicopters and are conducted on an annual basis through cooperation between the USFWS, Washington Department of Fisheries, USFS, ODFW, Idaho Power, Idaho Department of Fish and Game, and Nez Perce Fisheries. Fall chinook redd counts have recently increased, during 2001 –2003 a total of 38, 72, and 41 redds, respectively, were observed. Due to the low escapement, the contribution of spawning

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to brood-year recruitment has not been demonstrated, and it is likely that some of the spawners represent hatchery strays, or Snake River fish using the Imnaha for temporary refugia. (NWPPC Imnaha Subbasin Plan, May 2004, p. 163)

Accounts from Nez Perce tribal elders suggest that fall chinook historically used the lower 19.5 miles of the Imnaha mainstem (from the confluence to the town of Imnaha) for spawning, and generally did not occur above the town of Imnaha. Others contend that fall chinook spawning occurred as far upstream as the confluence of Freezeout Creek. Fall chinook have never been reported to occur in the Big Sheep watershed. It is possible that fall chinook were once exclusively reliant on the mainstem Snake River for spawning and rearing and historically never occurred in tributary habitat. As reported in Mundy and Witty (1998), the blockage of Snake River habitat by the construction of Brownlee, Oxbow, and Hells Canyon dams during the late 1950s and early 1960s may have caused upper Snake River fall chinook to seek alternative spawning habitats, the majority of which occurred in primary tributaries to the Snake River. Connor et al. (2002) support this theory and point out that historical evidence documenting tributary spawning is not conclusive. (NWPPC Imnaha Subbasin Plan, May 2004, p. 167)

Steelhead (threatened, Snake River ESU, 1/06)

The Imnaha subbasin contains wild and natural populations of A-run Snake River summer steelhead (*O. mykiss*). Unlike the larger B-run fish, which average 5-8 kg (11-18 lbs.) and enter the Snake River later in the fall, A-run fish average 2-4 kg (4.4-8.8 lbs.) and begin to enter the river in August. Natural fish are hatchery-derived fish which spawn in the natural environment. Only the native Imnaha stock is used for the hatchery program and wild/natural fish are still being added to the hatchery broodstock. The summer steelhead occurring in the mainstem Imnaha and all its tributaries represent a single, independent population within the Snake River ESU. Given a lack of clear genetic or geographic delineation, the TRT defined a single population in the subbasin rather than differentiating between the geographically proximal spawning aggregates that occur throughout the Imnaha. (NWPPC Imnaha Subbasin Plan, May 2004, p. 170)

According to the U.S. Army Corps of Engineers, historical peak escapement of A-run summer steelhead to the Imnaha subbasin was estimated to be 4,000 fish, based on the maximum count over McNary Dam of 172,600 in 1962–1963. Seven years of data are available from McNary prior to completion of Ice Harbor Dam in 1961. Steelhead counts for those seven years ranged from 40,660 to 111,288 (all lower than the 1962–1963 count). If LSRCP methods are applied to apportion these runs, the range of escapement into the Imnaha would have been 946 to 2,590 per year for the seven-year period.

Current trends in escapement are based on redd counts in Camp Creek, a tributary to Big Sheep Creek. Camp Creek, a spring-fed stream, is used for annual redd surveys due to its accessibility, flows, and water clarity during survey periods and its early spawning group of fish. peak counts in Camp Creek occurred in 1966 and 1967 when 18.0 redds per mile were observed. Over the next decade (1968–1978), average counts declined significantly to 2.9 redds per mile, reaching a low point in 1975 and 1976 of 0.7 and 0.6 redds per mile, respectively. From 1979 to 1989, the counts averaged 6.2 redds per mile. The increase in the number of redds observed from 1985 to 1987 was consistent with trends observed during the same period throughout the Columbia Basin but may also be related to the Lower Snake River Compensation Program (LSRCP) facility constructed on Little Sheep Creek in 1982. From

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1990 to 2003, the average count was 6.5 redds per mile, an increase due in large part to the returns recorded from 2000-2003. Steelhead redd counts can not be conducted in a representative manner throughout the subbasin due to physical conditions (high turbidity and limited access). In addition, the accuracy and precision of existing counts is unknown. Adult steelhead abundance information for the Imnaha subbasin represents a critical data gap. It is unknown if the redd count trend data or escapement information from Cow, Lightning, and/or Little Sheep is representative/suitable as an index for the subbasin. (NWPPC Imnaha Subbasin Plan, May 2004, p. 170-1)

Historical (pre-1900) distributions of steelhead in Little Sheep and Big Sheep creeks were likely similar to current distributions, with the exception of fish occurring above the Wallowa Valley Irrigation District Canal, which eliminated access to approximately 12.5 miles of habitat upon its construction. Habitat that was eliminated includes that (above the canal) in McCully, Ferguson, Redmont, Salt, Big Sheep, South Fork Big Sheep, and North Fork Big Sheep Creeks, much of which is characterized by unfavorable steelhead habitat (i.e. high gradients, high elevation, large substrate with little gravel and low stream temperatures).

Landuse activities in the mainstem Imnaha (upper and lower) are considered to have modified flow regimes in perennial tributaries from historical conditions. Current steelhead distributions in tributary habitats may have included additional streams than presently identified, but more likely distributions extended further upstream in streams currently containing habitat. The extent of habitat may have been greater due to the more perennial nature of streams prior to intensive management such as logging, road building, and grazing. It could also be due to the competition for food and space that would have occurred when greater fish numbers were present. This competition may have forced steelhead further upstream to escape competition. In the absence of historical distribution data, it is difficult to determine specifically which streams were inhabited by summer steelhead; however, based on the lack of residual rainbow trout above Imnaha Falls (RM 73), it is likely that steelhead have always been restricted to accessible areas downstream from this probable migration barrier. (NWPPC Imnaha Subbasin Plan, May 2004, p. 184)

Bull trout (threatened, 1998)

Bull trout (*Salvelinus confluentus*) occurring in the Imnaha subbasin belong to the Imnaha-Snake Rivers Recovery Unity, which is a part of the Columbia River DPS, which includes bull trout residing in portions of Oregon, Washington, Idaho, and Montana. Bull trout are estimated to have occupied about 60% of the Columbia River Basin, and presently occur in 45% of the estimated historical range. The Columbia River Basin DPS has declined in overall range and numbers of fish. The population segment is composed of 141 subpopulations indicating habitat fragmentation, isolation, and barriers that limit bull trout distribution and migration within the basin.

Bull trout occupy portions of 14 major tributaries in the Snake River Basin of Idaho, Oregon, and Washington. The USFWS identified 34 bull trout subpopulations in the Snake River basin, four of which occur in the Imnaha subbasin. These subpopulations are the Imnaha River, Big Sheep Creek, Little Sheep Creek, and McCully Creek and include both resident and migratory fish. Bull trout have also been found throughout the Wallowa Valley Improvement Canal. Because resident fish found within the canal have no downstream passage opportunities and could originate from the Big Sheep, Little Sheep, or McCully creek subpopulations, bull trout found here have not been recognized as a distinct subpopulation.

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The status of the bull trout was first assessed in 1991, and all subpopulations within the Imnaha subbasin except the Imnaha River were rated of “special concern” because of passage barriers, downstream losses of migrants, and in Big Sheep and Little Sheep creeks, habitat degradation. The Imnaha River subpopulation was rated at “low risk”. Additional monitoring led to a downgrading of the Little Sheep Creek subpopulation to “high risk of extinction”. McCully Creek was downgraded to “moderate risk of extinction” because of the isolation of this population caused by the canal.

Based on sampling of bull trout densities ODFW believes there are greater than 2,000 bull trout in the upper Imnaha River and Big Sheep Creek and fewer than 500 in Little Sheep Creek. The resident population in Big Sheep Creek, estimated at less than 2,000 individuals, exists above and below the Wallowa Valley Improvement Canal in both the North and South forks of Big Sheep Creek, Salt Creek and Lick Creek. (NWPPC Imnaha Subbasin Plan, May 2004, p. 189-190)

Historical accounts of bull trout populations in the Imnaha are limited. Short segments of historical resident bull trout spawning and rearing habitat have been identified in upper Little Sheep Creek and Cabin Creek. Unlike other salmonids, it is doubtful that bull trout occupied all accessible streams at any one time, due to their current patchy distribution in even pristine “stronghold” habitat types. In the Imnaha, historical distribution likely was similar to current distribution. (NWPPC Imnaha Subbasin Plan, May 2004, p. 196)

Pacific lamprey

Population and status information documenting Pacific lamprey (*Lampetra tridentata*) in the Imnaha subbasin is limited. Descriptions of species, sex, length, weight, or life history stage are generally not available. The following discussions are based on empirical, historical, and/or anecdotal information. Throughout their range in the Columbia River Basin, Pacific lampreys have declined to only a remnant of their pre-1940s populations. Lower Snake Dam counts numbered over 30,000 in the late 1960s but have declined to less than 500 fish in recent years. As early as the 1980s, “a lot” of adult Pacific lamprey could be seen clinging to fish-viewing windows in Columbia River dams. Devices were installed at the ladders to keep them away from fishcounting windows, as they were often abundant enough to obscure counting of salmon. Currently, an estimated 3% of the lamprey that pass Bonneville Dam are counted at Lower Granite Dam. Based on adult lamprey observations at Lower Granite Dam, the current status in the Imnaha subbasin is thought to be extremely depressed. (NWPPC Imnaha Subbasin Plan, May 2004, p. 198)

2. Grande Ronde River Subbasin

There were seven species of fish considered for use as aquatic focal species. These were; spring Chinook (*Oncorhynchus tshawytscha*), summer steelhead (*Oncorhynchus mykiss*), bull trout (*Salvelinus confluentus*), coho (*Oncorhynchus kisutch*), sockeye (*Oncorhynchus nerka*), fall Chinook (*Oncorhynchus tshawytscha*) and pacific lamprey (*Lampetra tridentata*). Fall Chinook were eliminated from consideration because the fish utilizing the Grande Ronde Subbasin are a part of the broader Snake River fall Chinook population. The fall Chinook have a limited distribution in the Grande Ronde; they occur only in the mainstem river. Sockeye and coho were eliminated as focal species because they are extinct in the Subbasin. The anadromous form of sockeye has been extinct since 1920 and only kokanee persist in Wallowa

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Lake. Coho salmon were extirpated from the subbasin in the 1980's. Pacific lamprey occurred historically in the Grande Ronde River subbasin. Remnant populations may persist in the subbasin but their distribution and abundance are unknown making assessment of this species distribution and habitat conditions difficult. The final focal species selected for consideration in this analysis are spring Chinook, summer steelhead and bull trout. This was based on their current presence and broad distribution in the basin, as well as, their biological, economic and cultural significance. (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.47-48)

Spring Chinook salmon (threatened, Snake River ESU, 6/05)

Spring Chinook salmon are indigenous to the Grande Ronde River subbasin and were historically distributed throughout the river system. Twenty-one tributaries supported spring Chinook runs, contributing to large documented runs in the subbasin. Spring Chinook spawning escapement in the subbasin was estimated at 12,200 fish in 1957. Recent escapement levels have numbered fewer than 1,000 fish. Snake River spring Chinook salmon were listed as threatened under the ESA in 1992. On the basis of potential dispersal distances, genetic information, and life-history traits the Interior Columbia Technical Review Team identified and described six independent populations within the Grande Ronde Subbasin.

Most Grande Ronde adult spring Chinook salmon pass Bonneville Dam and enter the Columbia Basin in April and May. By June or July, the adults are holding in the Grande Ronde River subbasin near spawning tributaries. Spawning usually occurs in August and September. Eggs incubate in the gravel over the winter and fry emerge between March and May. Spring Chinook salmon juveniles usually rear in the Grande Ronde River subbasin for one year before migrating to the ocean as smolts from March through May. Some juveniles begin their downstream migrations June through October of their first year. Chinook salmon continue to rear in fresh water prior to smolting the following spring. Adult spring Chinook salmon return to spawn at ages 3 to 6 (after 1-4 years in the ocean), although age 4 is the dominant age class among spawners. (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.48-50)

Fall Chinook salmon (threatened, Snake River ESU, 6/05)

The fall Chinook have a limited distribution in the Grande Ronde; they occur only in the mainstem river. (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.47-48)

Steelhead (threatened, Snake River ESU, 1/06)

Summer steelhead are native to the Grande Ronde River subbasin. The Grande Ronde subbasin historically produced large runs of summer steelhead. The size of those runs is unknown but an estimate of 15,900 to the mouth of the Grande Ronde River was given for 1957, prior to construction of lower Snake River dams. Grande Ronde summer steelhead are part of the Snake River ESU and were federally listed as threatened in 1997. The abundance of returning adults is uncertain because there is a paucity of data for adult spawners. However, dam counts are currently 28% of the interim recovery target for the Snake River Basin (52,000 natural spawners). In addition, Joseph Creek exceeds the interim recovery target. Within the Grande Ronde, the four populations of summer steelhead identified by the Interior Columbia River basin TRT.

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Summer steelhead are presently distributed throughout the Grande Ronde subbasin. Steelhead can occupy some of the smallest tributaries and will also use seasonal streams. Changes in steelhead distribution from historic to current are also somewhat subtle and difficult to map. There appear to be changes in how habitat is utilized due to human modification of the habitat which limits its use for spawning. (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.66)

Coho Salmon (extirpated)

Coho were eliminated as focal species because they are extinct in the Subbasin. (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.47-48)

Pacific lamprey

Pacific lamprey occurred historically in the Grande Ronde River subbasin. Remnant populations may persist in the subbasin but their distribution and abundance are unknown making assessment of this species distribution and habitat conditions difficult. (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.47-48)

Bull trout (threatened, 1998)

There is limited information on the bull trout population productivity and abundance in the Grande Ronde subbasin. Historically, bull trout were distributed throughout the subbasin, and although they were never as abundant as other salmonids, they were certainly more abundant and more widely distributed than they are today. Current redd counts and captures of adult fish provide the best data on population status, trends and movement within and outside of the subbasin. Spawning ground surveys have recently been collected on four tributaries: Little Minam River, Lostine River, Wenaha River, and Lookingglass Creek. Standard redd counts have not been collected on the other streams with bull trout populations, although there is some scattered information. For example, survey information from the mid-1990s on Deer Creek found 18 fish per 100 square meters and four miles of habitat supporting that density. Presence and absence data from Catherine Creek suggest low population densities. Based on preliminary spawning ground survey data and other information, there is not a sufficient interval of time to accurately assess trends for Grande Ronde bull trout population abundance and productivity.

Based on geographical, physical, and thermal isolation of the spawning populations, two core areas – Little Minam and Grande Ronde – and nine unique Bull Trout population units have been designated in the Grande Ronde subbasin. For recovery planning, the local bull trout population units are based on the potential to reestablish connectivity and reduce threats. There is no information on whether these local populations are genetically distinct. There are anecdotal reports of bull trout in Wenatchee Creek, but additional inventories are necessary to determine if a local population exists and the relative risk of extinction. Wenatchee Creek is potentially a Core Area but lacks sufficient survey data to justify Core Area status. The historic Wallowa River/Lake Complex local population appears to be extinct. Imnaha River bull trout were introduced into this complex, but the status of the population is unknown. (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.80)

C. Historical anthropogenic impacts to salmonid populations in the region

Imnaha River Subbasin

In 1878 the first permanent white settlers in the Imnaha established residence just south of the present town of Imnaha. Homesteaders and associated livestock production were soon to follow, especially along the gentler slopes and benchland areas. These regions, which coincided with many of the areas previously occupied by the Nez Perce, were primarily public domain lands. The use of natural resources and associated population of lands within the Imnaha subbasin has been relatively minimal, when compared with that which has taken place in similar sized subbasins throughout the Columbia Basin. Peak periods of land use in the Imnaha coincide with the introduction of domestic livestock, establishment of a transportation infrastructure, and advancements in industrial technology. The relative remoteness and ruggedness of the subbasin has precluded it from much of the development and/or population common to similar subbasins. Land use activities most commonly cited as producing a measurable impact on fish and wildlife communities in the Imnaha subbasin include grazing, roads and road building, timber harvest, agriculture, and to a lesser extent, water development and mining. (NWPPC Imnaha Subbasin Plan, May 2004, p.36)

Grande Ronde River Subbasin

Until the mid-1800's, the Grande Ronde subbasin was utilized solely by the Cayuse, Umatilla, Walla Walla and Nez Perce Tribes (James 1984). The Confederated Tribes of the Umatilla Indian Reservation ceded all of their lands in northeast Oregon and southeast Washington to the federal government under the Treaty of 1855. As European settlers moved into the area, significant timber harvest, livestock grazing and agricultural production began. Settlers arrived in Union and Wallawa Counties to stay in 1861, many returning from the Willamette Valley after passing through the Grande Ronde Valley on the Oregon Trail. From 1840 through the 1870's an estimated 300,000 emigrants passed through the Grande Ronde Valley. The railroad came to the Grande Ronde Valley in 1884.

Agriculture, including crop production, livestock and forestry play a significant land use role in the subbasin. Major crops in Union County include wheat, hay and forage, grass and legume seeds, peppermint, potatoes and specialty crops such as canola. The subbasin's economy has become more diversified in recent years but is still heavily dependent either directly or indirectly on agriculture and timber resources. These natural resource based activities have the potential to be most directly affected by watershed protection and restoration, or regulatory activities. (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.19-20)

1. History of hatcheries in the region

Imnaha River Subbasin

Historical artificial production of spring/summer chinook in the Imnaha subbasin dates back to 1949 when the Oregon Game Commission initiated a spring/summer chinook egg-take program in an effort to supplement Imnaha chinook into the Umpqua subbasin in southwest Oregon. Between July and August 1951, 152 male and 6 female chinook were collected from spawning beds in the mainstem Imnaha and from a weir constructed at Coverdale. Fifteen

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years later, 119 adult spring/summer chinook collected from Hells Canyon Dam were outplanted into the Imnaha. The LSRCP was authorized by Congress in 1976 to mitigate for losses of Chinook salmon and steelhead resulting from construction of dams in the lower Snake River. Hatchery and satellite facilities were developed under LSRCP to provide “in-kind, in-place” mitigation for lost Chinook and steelhead production. The program is administered by US Fish and Wildlife Service and was expected to provide adult returns for sport and tribal harvest, hatchery broodstocks, and supplementation of natural production. (NWPPC Imnaha Subbasin Plan, May 2004, p.159-160)

Lookingglass Fish Hatchery was built as part of the LSRCP to produce spring Chinook salmon for release in the Imnaha and Grande Ronde rivers. Lookingglass Fish Hatchery was constructed by the COE in 1982 and turned over to the U.S. Fish and Wildlife Service for operation. Oregon Department of Fish and Wildlife (ODFW) currently operates the facility. Lookingglass Fish Hatchery was initially designed and constructed to produce two stocks of fish; Imnaha stock for the Imnaha subbasin (490,000 smolts) and Lookingglass Creek stock for the Grande Ronde subbasin (900,000 smolts). Beginning in the early 1990’s, co-managers of the LSRCP program (ODFW, NPT, and the CTUIR recognized that these populations were at imminent risk of extirpation and immediate action was necessary. In 1992, Snake River spring/summer Chinook salmon were listed as threatened under the Endangered Species Act. The LFH mitigation program was redirected to a conservation and recovery program. This program is authorized by NOAA-Fisheries under a Section 10 permit and is referred to as the Currently Permitted Program (CPP). The current goals of the CPP are to produce:

- 490,000 smolts of Imnaha River population origin
- 250,000 smolts of Upper Grande Ronde River population origin
- 250,000 smolts of Catherine Creek population origin
- 250,000 smolts of Lostine River population origin
- 150,000 smolts for Lookingglass Creek of Catherine Creek population origin

Because the total number of fish produced at Lookingglass Fish Hatchery did not change with the CPP, an assumption was made that the existing facility, with minor modifications, would be sufficient to meet the CPP needs. However, each of these programs has associated fish health and monitoring/evaluation needs that require additional space and water. LFH was not designed to meet the CPP requirements. Co-managers determined that without additional facilities and significant modifications to LFH, production would be reduced under the conservation and recovery programs. To alleviate the burden at Lookingglass Fish Hatchery and correct facility problems, comanagers proposed new production facilities and modifications at Lookingglass in the Grande Ronde and Imnaha Spring Chinook Master Plan submitted to the NPPC in April, 2000 (Northeast Oregon Hatchery). The NPPC approved the master plan and authorized preliminary design and NEPA analysis of the proposed alternative in September 2000. (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.86-87)

Lookingglass FH The LSRCP supplementation program was initiated using only adult salmon returning to the Imnaha River and each year naturally produced fish are incorporated into the hatchery broodstock. Until recently, two facilities were used for the chinook production program; the Imnaha River satellite facility (located near Gumboot Creek) for adult collection, adult holding, and smolt acclimation, and Lookingglass Fish Hatchery (LFH), located on Lookingglass Creek, for incubation and rearing of juveniles. The LFH, operated by the

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ODFW, was originally designed to produce 1.4 million spring/summer Chinook salmon smolts weighing 69,000 pounds; however, based on recent agreements between co-managing entities, the facility has reduced its fish rearing densities. (NWPPC Imnaha Subbasin Plan, May 2004, p.160-161)

Northeast Oregon Hatchery project is designing new facilities and identifying modifications to LFH and new facilities necessary to get production back up to 490,000 fish – the original LSRCP goal. The LSRCP Program is also addressing disease-free water issues at Lookingglass Hatchery and methods to meet chinook compensation goals. Artificial propagation of chinook salmon from the Imnaha River will be supported by adult collection, holding and spawning at the Imnaha Satellite Facility. Eggs will be incubated at this site until eye-up then transferred to Lookingglass Fish Hatchery and Lostine Hatchery location(s) for final incubation and early rearing. Transportation of smolts from Lookingglass Fish Hatchery and the Lostine Hatchery to the Imnaha Satellite Facility (Gumboot) will occur in mid- March for acclimation and release. (NWPPC Imnaha Subbasin Plan, May 2004, p.162)

Irrigon FH In 1976, Congress authorized the production of hatchery steelhead under the auspices of the Lower Snake River Compensation Plan (LSRCP). Summer steelhead production efforts in the Imnaha subbasin have occurred through the LSRCP since 1982. The preferred stock for hatchery use is Little Sheep stock and no outside introductions are planned. Three facilities are used for the steelhead production program. The Little Sheep Creek adult collection/smolt acclimation facility is located in the Imnaha River subbasin on the Little Sheep Creek. Adults are collected and spawned at Little Sheep Creek. Embryos are initially incubated at Wallowa Hatchery and then transported to Irrigon Hatchery. Final incubation and rearing to the smolt stage occurs at Irrigon FH. Following 10 to 13 months of rearing, smolts are transferred back to the acclimation facility for 30 days of acclimation prior to release in April and May. The Little Sheep Creek facility is designed to accommodate up to approximately 250,000 smolts. Prior to 1998, releases had only occurred at the Little Sheep Creek facility and in the mainstem Imnaha River. In 1998, fry were planted in other tributaries, and since 1999, adults have been outplanted in Big Sheep Creek. (NWPPC Imnaha Subbasin Plan, May 2004, p.187-188)

Harvest

Program are all designed to maintain harvest opportunity at the highest possible level while reducing impacts to listed species, especially Deschutes River and Snake River summer steelhead. Reductions in program smolt releases may result in fewer fish harvested if harvest rates remain at recently observed levels. Direct mortality to wild/natural fish shall remain below 15% for group-A steelhead runs of 75,000 or less. All steelhead released into Imnaha basin for harvest purposes are adipose clipped, such that they are externally distinguishable from naturally produced fish and those designated for supplementation in the Imnaha Basin. Further, only adipose fin clipped steelhead may be retained in the sport fishery. (Draft Little Sheep Creek Summer Steelhead HGMP, ODFW, February 2010, P. 27)

Grande Ronde River Subbasin

The LSRCP was authorized by Congress in 1976 to mitigate for losses of Chinook salmon and steelhead resulting from construction of dams in the lower Snake River. Hatchery and satellite facilities were developed under LSRCP to provide “in-kind, in-place” mitigation for lost Chinook and steelhead production. The program is administered by US Fish and Wildlife

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Service and was expected to provide adult returns for sport and tribal harvest, hatchery broodstocks, and supplementation of natural production. In 1978 the first eggs were taken from Rapid River stock (Idaho) and smolts were released in Lookingglass Creek in 1980. Due to egg availability and disease concerns, Carson stock replaced the Rapid River in the mid 1980's. Rapid River stock was imported through out the late 1980's and early 1990's. In the early 1990's, two major policy rulings influenced the Grande Ronde spring Chinook salmon hatchery program. In 1990, ODFW adopted the Wild Fish Management Policy, which established guidelines for the maximum acceptable level of non-local origin hatchery fish that would spawn in nature with local populations. In 1992, naturally produced Grande Ronde Basin spring Chinook were listed as endangered by the National Marine Fisheries Service (NMFS) under the ESA. The hatchery operations were inconsistent with conservation and recovery opinions.

The Grande Ronde Endemic Spring Chinook Supplementation Program (GRESPP) began in 1995 with the development of the captive broodstock component in Catherine Creek, Lostine River, and upper Grande Ronde River. In 1997, the conventional component was initiated and integrated with the ongoing captive component. The GRESPP, has captive broodstock and conventional supplementation components. Collections of juveniles for the captive component of the program began as an emergency measure in 1995. Collection of adults for the conventional component began in 1997. These two programs are integrated. The captive brood portion serves in an experimental role while the conventional production component provides the production backbone. A dual broodstock strategy is used for supplementation in the Grande Ronde river subbasin (captive broodstock and conventional programs). Progeny resulting from both broodstock methods are acclimated and released back into their stream of origin as smolts. Co-managers intend to shift to a conventional broodstock-only supplementation program as run strength increases. (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.90-93)

Lookingglass Fish Hatchery was built as part of the LSRCP to produce spring Chinook salmon for release in the Imnaha and Grande Ronde rivers. Lookingglass Fish Hatchery was constructed by the COE in 1982 and turned over to the U.S. Fish and Wildlife Service for operation. Oregon Department of Fish and Wildlife (ODFW) currently operates the facility. Lookingglass Fish Hatchery was initially designed and constructed to produce two stocks of fish; Imnaha stock for the Imnaha subbasin (490,000 smolts) and Lookingglass Creek stock for the Grande Ronde subbasin (900,000 smolts). Beginning in the early 1990's, co-managers of the LSRCP program (ODFW, NPT, and the CTUIR recognized that these populations were at imminent risk of extirpation and immediate action was necessary. In 1992, Snake River spring/summer Chinook salmon were listed as threatened under the Endangered Species Act. The LFH mitigation program was redirected to a conservation and recovery program. This program is authorized by NOAA-Fisheries under a Section 10 permit and is referred to as the Currently Permitted Program (CPP). The current goals of the CPP are to produce:

- 490,000 smolts of Imnaha River population origin
- 250,000 smolts of Upper Grande Ronde River population origin
- 250,000 smolts of Catherine Creek population origin
- 250,000 smolts of Lostine River population origin
- 150,000 smolts for Lookingglass Creek of Catherine Creek population origin

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Because the total number of fish produced at Lookingglass Fish Hatchery did not change with the CPP, an assumption was made that the existing facility, with minor modifications, would be sufficient to meet the CPP needs. However, each of these programs has associated fish health and monitoring/evaluation needs that require additional space and water. LFH was not designed to meet the CPP requirements. Co-managers determined that without additional facilities and significant modifications to LFH, production would be reduced under the conservation and recovery programs. To alleviate the burden at Lookingglass Fish Hatchery and correct facility problems, comanagers proposed new production facilities and modifications at Lookingglass in the Grande Ronde and Imnaha Spring Chinook Master Plan submitted to the NPPC in April, 2000 (Northeast Oregon Hatchery). The NPPC approved the master plan to outline construction, operation, and management of additional production and release facilities to supplement natural production in the target basins. Plans are to be developed cooperatively by fish and wildlife agencies and Tribes and authorized preliminary design and NEPA analysis of the proposed alternative in September 2000. (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.86-87)

Adults for the spring/summer Chinook programs are collected at Lookingglass FH, Upper Grande Ronde River facility, Catherine Creek facility, and Lostine River facility.

Harvest

Wallowa stock hatchery fish are intercepted in fisheries from the ocean to headwater tributaries of the Grande Ronde system. Averaged from 1987 to 2006, Columbia River tribal and sport fisheries (including the Deschutes River) account for 30.8% of Wallowa stock harvest. Sport harvest in the Snake and Grande Ronde rivers averaged 28.4%. Escapement to hatchery facilities and strays make up an average of 40.6% of the reconstructed runs. (Draft Grande Ronde Basin Summer Steelhead Hatchery Program HGMP, Wallowa Stock, ODFW, Jan 2010, P 28)

D. ESUs identified by NMFS and current ESA status

- Snake River Spring/Summer Chinook - threatened, 6/05
- Snake River Fall Chinook - threatened, 6/05
- Snake River Steelhead - threatened, 1/06
- Snake River Sockeye – endangered, 6/05

E. Salmonid stocks in the region

Stocks identified by state and tribal comanagers

- Catherine Creek spring/summer Chinook.
- Upper Grande Ronde River spring/summer Chinook.
- Catherine Creek spring/summer Chinook.
- Lostine River spring/summer Chinook.

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- Imnaha River spring/summer Chinook.
- Lookingglass Creek spring/summer Chinook.
- Imnaha "A" steelhead.
- Wallowa "A" steelhead.
- Snake River fall Chinook.

F. “Independent populations” and “major population groups identified by NMFS

1. Snake River Steelhead³

The Snake River Steelhead ESU includes both resident and anadromous *Oncorhynchus mykiss* that spawn in the Snake River and its tributaries. These fish are genetically differentiated from other interior Columbia steelhead populations; they spawn at higher altitudes (up to 2,000 m) and after longer freshwater migrations (up to 1,500 km). Like other ESUs in the Snake River basin, these populations have been affected by a wide variety of impacts, from the development of the hydropower corridor to habitat degradation and loss to inadvertent negative effects of hatchery practices. Although total abundance is relatively high, the large majority of these fish are of hatchery origin. In addition, the ESU has suffered dramatic declines in at least the last 20 years. As a result of these factors, this ESU was listed as threatened in 1999.

Like steelhead in other areas, fish in this ESU exhibit a wide range of life-history strategies, including varying times of freshwater rearing or ocean residence, or elimination of an ocean residence altogether. Traditionally, two prominent life-history strategies have been recognized in this area. A-run fish are smaller, on average have a shorter freshwater and ocean residence, and apparently begin their up-river migration earlier in the year. B-run fish are larger, spend more time rearing in both fresh and salt water, and appear to begin their up-river migration later in the year. The TRT identified 24 populations in 5 major groupings in this ESU. (ICTRT, July 2003, p.56-63)

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Snake River Basin Steelhead populations and Future Hatchery influence

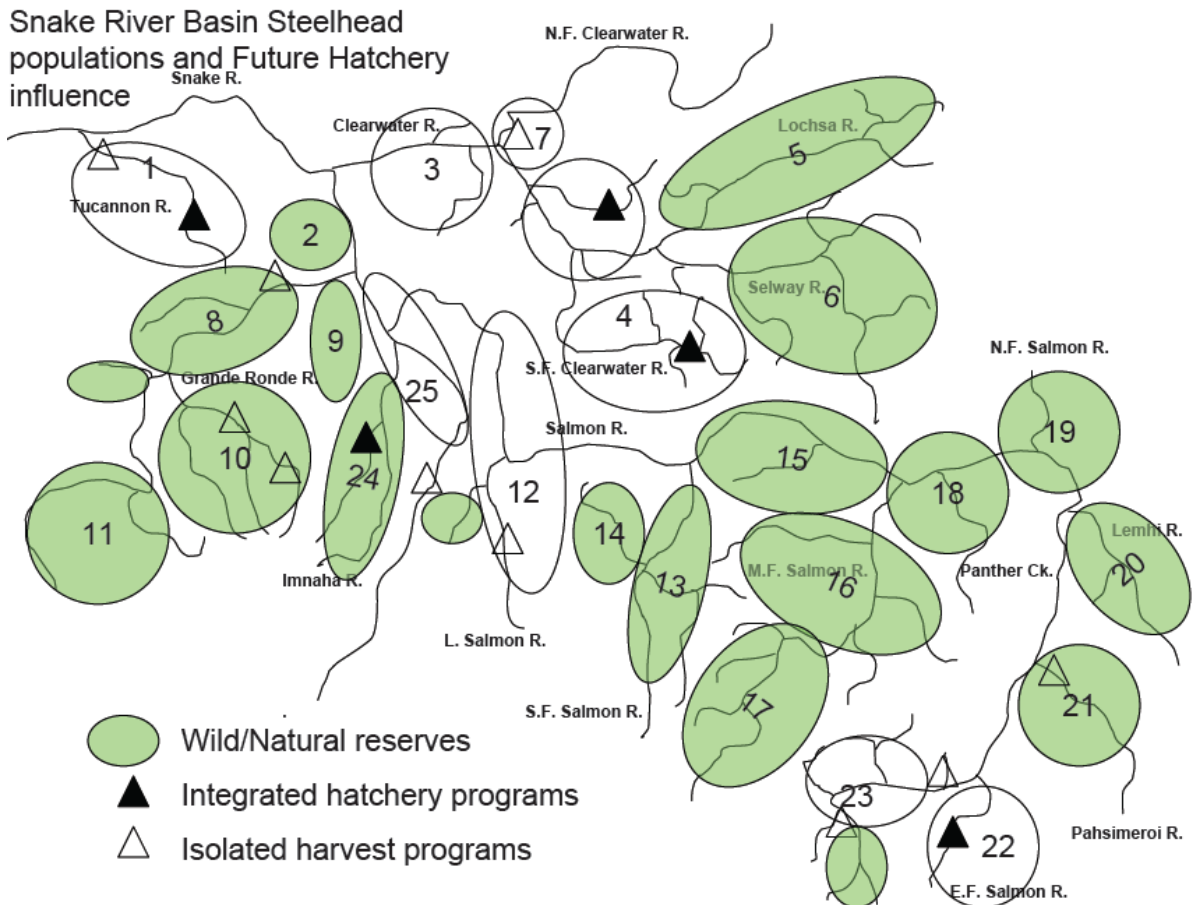


Figure: Snake River Basin Steelhead Populations and Hatchery Influence (Pollard 2003)

Snake River Steelhead Major Population Groups (MPG)²

Grande Ronde MPG

- Lower Grande Ronde. This population includes the mainstem Grande Ronde River and all tributaries (including the outlier Mudd Creek) upstream to the confluence of the Wallowa River, except the Joseph Creek drainage.
- Joseph Creek. Spawning areas in Joseph Creek are well separated (67 km) from other spawning aggregations. In addition, samples from the tributaries to Joseph Creek (Chesnimnus and Elk Creeks) form a distinct group in a cluster analysis.
- Wallowa River. The Wallowa River population, includes the Minam River, the Lostine River and several smaller tributaries as an independent population. This population includes the outlier Prairie Creek.

² Section text from *Independent Populations of Chinook, Steelhead, and Sockeye for Listed Evolutionarily Significant Units Within the Interior Columbia River Domain, Working Draft, July 2003, Interior Columbia Basin Technical Recovery Team, p.56-63*

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- Upper Grande Ronde. The remainder of the Grande Ronde drainage, including the mainstem upper Grande Ronde and tributaries Lookingglass Creek, Catherine Creek, and Indian Creek we designate as an independent population.

Imnaha MPG

- Imnaha River. This population includes steelhead spawning in the mainstem Imnaha River and all its tributaries.

Current Status of Snake River Steelhead

Grande Ronde River MPG

The Grande Ronde River Major Population Group (MPG) currently does not meet MPG-level viability criteria set by the Interior Columbia Basin Technical Recovery Team (ICTRT). The ICTRT recommend a minimum of two Grande Ronde basin populations be at ‘viable’ status for the MPG to be viable, and at least one of them must be rated as ‘highly viable’. Because of the unique historic intrinsic potential classification in the MPG (classified as large in size and complexity), the upper Grande Ronde River population must also achieve ‘viable’ status. At least one of the other three populations (all rated as intermediate in size and complexity) also must be ‘viable’. The Joseph Creek population is rated ‘highly viable’, while the upper Grande Ronde and Wallowa river populations received a ‘maintained’ rating. (ICTRTa, *in prep.*). To achieve a ‘viable rating’, the Upper Grande Ronde and Wallowa river populations must improve in abundance/productivity criteria.

Observed steelhead spawner abundance within the basin reached a low in the late- 1970s, gradually increased to peak in the mid-1980s, and declined to another low in the late-1990s. Spawner abundance has recovered in the current decade. Average abundance over the last 6 years for the Joseph Creek population has exceeded the viable threshold identified in Table 4, whereas the upper Grande Ronde population has not.

Table 4. List of the natural steelhead populations, “Viable Population” thresholds, and associated hatchery stocks within the Grande Ronde basin (ICTRTa, in prep.).

Management Units	Critical Thresholds (Abundance ^a , R/S ^b)	Current Values (Abundance ^a , R/S ^b)	Associated hatchery stock
Lower Grande Ronde	Abundance: 1,000 R/S = 1.15	Abundance: unknown R/S = 2.29-2.62	Wallowa stock summer steelhead (#56) – Cottonwood Facility
Joseph Creek	Abundance: 500 R/S = 1.27	Abundance: 2,132 R/S = 2.58	
Wallowa River	Abundance: 1,000 R/S = 1.15	Abundance: 172 ^c R/S = 1.73	Wallowa stock summer steelhead

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			(#56)
Upper Grande Ronde	Abundance: 1,500 R/S = 2.29	Abundance: 1,226 R/S = 1.22	

^a 10-year geometric mean abundance of natural origin spawners.

^b Recruits per spawner.

^c Abundance estimate from three index areas. Actual Wallowa River steelhead abundance.

(Draft Grande Ronde Basin Summer Steelhead Hatchery Program HGMP, Wallowa Stock, ODFW, Jan 2010, P 18-19)

Imnaha River MPG

Abundance trends for the Imnaha River population cannot be determined, as no data or expansion methods exist to create whole-population estimates. Estimates of abundance and productivity for a six-mile section of a tributary, Camp Creek (Zumwalt Unit), are the only source of long-term estimates in this population. Camp Creek abundance in recent years has been moderately variable (Appendix Table 1). The 10-year (1996-2005) geometric mean abundance of natural-origin spawners was 68. During the period 1980-1999, Camp Creek steelhead productivity (measured as Recruits per Spawner) ranged from 0.22 in 1988 to 7.40 in 1982. If the productivity estimate from Camp Creek represents the total population, the abundance/productivity risk of extinction for the Imnaha River population is between moderate and low. However, the ICTRTa (*in prep*) concluded that the Imnaha River population warranted a “maintained” viability level due primarily to uncertain population abundance. (Draft Little Sheep Creek Summer Steelhead HGMP, ODFW, February 2010, P. 20-21)

Abundance and Productivity of Snake River Steelhead

Estimates of annual returns to specific production areas are not available for most of the Snake River Basin steelhead ESU. Estimates are available for two tributaries below Lower Granite Dam (Tucannon and Asotin creeks). Annual ladder counts at the dam, and associated sampling information, allow for an estimate of aggregate returns to the Snake River basin.

In addition, area-specific estimates are available for the Imnaha River and two major sections of the Grande Ronde River system. Returns to Lower Granite Dam remained at relatively low levels through the 1990s; the 2001 run size at Lower Granite Dam was substantially higher relative to the 1990s. The recent geometric mean abundance was down for the Tucannon River relative to the last BRT status review. Returns to the Imnaha and Grande Ronde river survey areas were generally higher relative to the early 1990s. Quantitative estimates of summer steelhead productivity at the subbasin scale are not available. (Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.177-182)

Spatial Structure and Diversity of Snake River Steelhead

In order to determine the distance between spawning aggregates, the ICTRT used spawning areas as identified in Streamnet (2003), modified in a few cases by local data. Real data on the

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current spatial and temporal distribution of steelhead spawners is sorely lacking, and is fundamental to determining population structure.

Very little life-history information has been collected that would allow comparison of fish from different streams or basins. Of particular interest is information distinguishing A-run and B-run streams; however, all life-history characteristics, from age structure to juvenile migration patterns, are of interest. (ICTRT, July 2003, p.69)

Habitat of Snake River Steelhead

Tributary habitat conditions vary widely among the various drainages of the Snake River basin. Habitat is degraded in many areas of the basin, reflecting the impacts of forest, grazing, and mining practices. Impacts relative to anadromous fish include lack of pools, higher water temperatures, low water flows, poor overwintering conditions, and high sediment loads. Substantial portions of the Salmon River drainage, particularly in the middle fork, are protected in wilderness areas. (Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.44)

Hatchery Production of Snake River Steelhead 3

Almost all artificial production of steelhead in the Snake River Basin ESU has been associated with three major mitigation initiatives—the Lower Snake River Compensation Program (LSRCP), Idaho Power, and the mitigation program for Dworshak Dam on the North Fork Clearwater River. LSRCP is administered by the USFWS and was established as compensation for losses incurred as a result of the construction and operation of the four lower Snake River hydroelectric dams. Production under this initiative generally began in the mid-1980s. The Dworshak mitigation program provides for artificial production as compensation for the loss of access to the North Fork Clearwater, a major historical production area. Dworshak Hatchery, completed in 1969, is the focus for that production.

There are LSRCP steelhead hatchery mitigation releases in the Grande Ronde and Imnaha river systems. The LSRCP compensation objective for Grande Ronde steelhead returns is 9,200. Trapping facilities for adult broodstock are located at Big Canyon Creek acclimation site. The original program used outside broodstock (including Skamania Hatchery stock) from 1979 to 1982 before switching to the Wallowa broodstock. Smolts are acclimated and released at two sites—one within the Wallowa drainage, the other at Big Canyon Creek. Oregon manages the Minam River, Joseph Creek, and Wenaha River drainages for natural production. Other sections of the Grande Ronde River have been outplanted to supplement natural production.

LSRCP program releases into the Imnaha River come from a satellite facility on Little Sheep Creek after primary rearing at Wallowa Hatchery.

Current regional management objectives for Snake River Steelhead

Facilities presently in use for the Grande Ronde subbasin summer steelhead program are Wallowa Hatchery near Wallowa, Oregon, used for adult collection, holding and spawning;

³ Section text from *Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead*, June 2005, p.187-191.

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Big Canyon acclimation facility near Minam, Oregon, for adult collection and holding and acclimation; and Irrigon Hatchery, near Irrigon, Oregon, for rearing, and Cottonwood acclimation facility, a short distance downstream of the Oregon border, for rearing. Historically, Wallowa stock production has targeted 1.6M smolts released into the Wallowa River, Catherine Creek, upper Grande Ronde River and lower Grande Ronde River. Wallowa stock releases have been reduced to 890,000 smolts in Oregon and 200,000 in Washington (at Cottonwood). These programs may be further reduced in the future.

Agencies and Tribes are reviewing how to modify LSRCP Wallowa Hatchery summer steelhead broodstocks for mitigation and enhancement programs in the Grande Ronde basin. The Wallowa Hatchery stock is a Snake River conglomerate stock (Wallowa stock) used by both Oregon and Washington. The LSRCP steelhead programs in Oregon and Washington portions of the Grande Ronde basin have been successful in reestablishing sport and tribal fisheries. It is important, however, to insure that the existing Wallowa and Lyons Ferry hatchery programs do not place wild stocks in jeopardy. Comanagers of the Grande Ronde basin will be working to redevelop hatchery broodstocks and programs as necessary to meet natural production and harvest augmentation objectives and meet NMFS requirements. This effort will require a thorough review of available information on steelhead status and stock structure in the basin as well as a review of existing and needed facilities for endemic steelhead programs. (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.93-94)

2. Snake River Spring/Summer Chinook 4

The Snake River Spring/Summer Chinook Salmon Evolutionarily Significant Unit (ESU) includes those fish that spawn in the Snake River drainage and its major tributaries, including the Grande Ronde River and the Salmon River, and that complete their adult, upstream migration (passing Bonneville Dam) between March and July. These stream-type fish rear in freshwater for slightly more than a year before smoltification and seaward migration. Since the late 1800s, the ESU has suffered dramatic declines as a result of heavy harvest pressures, habitat modification and loss, and likely inadvertent negative effects of hatchery practices. More recent declines, since the 1950s, have occurred with the construction of the hydropower system on the Snake and Columbia Rivers. As a result of these declines in abundance, this ESU was listed as threatened under the Endangered Species Act in 1992. Based on genetic and geographic considerations, we established five major groupings in this ESU.

Snake River Spring/summer Chinook Major Population Groups (MPG)⁵

Grande Ronde Imnaha Rivers MPG

- Wenaha River. The Wenaha River fish are genetically and geographically distinct from all other Grande Ronde samples, and are also highly differentiated from other potential northeastern Oregon populations based on timing of smolt migrations.

⁴ Section text from *Independent Populations of Chinook, Steelhead, and Sockeye for Listed Evolutionarily Significant Units Within the Interior Columbia River Domain, Working Draft, July 2003, Interior Columbia Basin Technical Recovery Team, p.11-25*

⁵ Section text from *Independent Populations of Chinook, Steelhead, and Sockeye for Listed Evolutionarily Significant Units Within the Interior Columbia River Domain, Working Draft, July 2003, Interior Columbia Basin Technical Recovery Team, p.56-63*

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- Wallowa–Lostine River. This population includes the Wallowa River, the Lostine River, Bear Creek and Hurricane Creek.
- Minam River. This group is well-separated from most northeastern Oregon tributaries, both genetically and spatially. It is genetically closest to Catherine Creek, but the two areas are isolated by distance.
- Catherine Creek. This population includes Catherine and Indian Creeks. Samples from Catherine Creek are well differentiated genetically from other within-basin populations, except for the Minam River, from which it is distinguished by distance (165 km) and timing of juveniles through the main stem.
- Upper Grande Ronde. This population includes the upper Grande Ronde River and Sheep Creek. Genetic analysis indicates that fish spawning in this area were likely influenced by earlier outplantings of Rapid River stock (which have been discontinued).
- Imnaha mainstem. Hatchery and wild collections from the mainstem Imnaha River were genetically indistinguishable. These samples fell within the cluster containing most of the Grande Ronde collections, and were distinct from all but the most closely aligned Lostine River samples.
- Big Sheep Creek. This grouping is based on the distance between Big Sheep Creek and Imnaha River primary spawning areas (48 km) and the historically poor demographic correlation between these groups.
- The Grande Ronde-Imnaha grouping also includes an historically extirpated population.
- Lookingglass Creek. The endemic Chinook in Lookingglass Creek are considered extinct as a result of adult collection of natural fish during the early years of Lookingglass Hatchery operations and extensive and continued natural spawning of Rapid River Hatchery stock in Lookingglass Creek. However, this creek is geographically separated from other spawning areas, and likely had the capacity to support an independent population historically.

Current Status Of Snake River Spring/Summer Chinook

Grande Ronde/Imnaha Spring/Summer MPG

The Grande Ronde basin once supported large runs of chinook salmon with estimated escapements in excess of 10,000 as recently as the late 1950's. Natural escapement declines in the Grande Ronde basin have paralleled those of other Snake River stocks. Reduced numbers of spawners combined with human manipulation of previously important spawning habitat have resulted in decreased spawning distribution and population fragmentation. The Interior Columbia Technical Recovery Team established biological viability criteria to monitor recovery efforts in the ESUs for salmon and steelhead listed under the Endangered Species Act. All Grande Ronde River/Imnaha River MPG populations were assessed at high risk (>5%) of extinction in the next 100 year period. Two populations are extinct. (Draft Lostine River Spring/Summer Chinook HGMP, NPT, April 2010, P. 41-42)

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The decline in the Grande Ronde spring Chinook salmon population has been primarily attributed to passage problems at Columbia and Snake River dams. Grande Ronde River anadromous fish must pass a total of 8 dams, 4 on the Columbia River and 4 on the Snake River, during up- and downstream migrations. Out-of-subbasin harvest and both in-and out-of-subbasin habitat degradation have also contributed to the population decline. Within the Grande Ronde River subbasin, riparian and instream habitat degradation has severely affected spring Chinook salmon production potential. Water withdrawals for irrigated agriculture, human residential development, livestock overgrazing, mining, mountain pine beetle damage, channelization, low stream flows, poor water quality, logging activity and road construction are major problems affecting salmon production. Many of these impacts have been reduced in recent years with management practices becoming more sensitive to fish and aquatic habitats. However, the effects of some past management activities remain. (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.50-52)

Abundance and Productivity of Grande Ronde/Imnaha Spring Chinook

Aggregate returns of spring-run Chinook salmon (as measured at Lower Granite Dam) showed a large increase over recent year abundances. The 1997–2001 geometric mean return of natural-origin Chinook salmon exceeded 3,700. The increase was largely driven by the 2001 return—estimated to have exceeded 17,000 naturally produced spring-run Chinook salmon—however, a large proportion of the run in 2001 was estimated to be of hatchery origin (88%). The summer run over Lower Granite Dam has increased as well. The 1997–2001 geometric mean total return was slightly more than 6,000. The geometric mean return for the broodyears for recent returns (1987–1996) was 3,076. (Note: This figure does not address hatchery versus wild breakdowns of the aggregate run.). The lowest 5-year geometric mean returns for almost all individual Snake River spring/summer run Chinook salmon production areas were in the 1990s. Sulphur Creek and Poverty Flat production areas had low 5-year geometric mean returns in the early 1980s. Many, but not all, production areas had large increases in return year 2001. (Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.39-41)

Overall the Wenaha and Minam populations show the smallest decrease in abundance and have the highest % life history diversity. Both of these watersheds are in Wilderness areas with minimal land use and intact habitat conditions. The Wallowa-Lostine, Lookingglass and Upper Grande Ronde populations all show a 90% decrease in abundance due to a reduction in habitat capacity. Catherine Creek Chinook have an estimated 100% decrease in abundance. According to the EDT model results the population in Catherine Creek is just barely sustainable. This has been a difficult result to explain and there was not adequate time to properly calibrate the EDT model attributes. In general the Catherine Creek Chinook have shown reasonable resilience, rebounding when the ocean conditions turned. (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.55)

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Spatial Structure and Diversity of Grande Ronde/Imnaha Spring Chinook

Dispersal and stray rate information. Since dispersal rates and distance underlie true population boundaries, more data about wild Chinook homing behavior would be extremely useful. In particular, dispersal information collected at relatively small distances (e.g., 10–50 km) would fill a critical data gap. Spring and summer Chinook are distinguished on the basis of their adult run-timing. However, few data exist to determine whether these fish represent distinct spawning units based on spawn timing or spawn over a continuous and overlapping time period. This information would help refine the boundaries of populations in areas that include both spring and summer runs. (ICTRT, July 2003, p.72)

Overall the Wenaha and Minam populations show the smallest decrease in abundance and have the highest % life history diversity. Both of these watersheds are in Wilderness areas with minimal land use and intact habitat conditions. The Wallowa-Lostine, Lookingglass and Upper Grande Ronde populations all show a 90% decrease in abundance due to a reduction in habitat capacity. Catherine Creek Chinook have an estimated 100% decrease in abundance. According to the EDT model results the population in Catherine Creek is just barely sustainable. This has been a difficult result to explain and there was not adequate time to properly calibrate the EDT model attributes. In general the Catherine Creek Chinook have shown reasonable resilience, rebounding when the ocean conditions turned. (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.55)

Habitat of Grande Ronde/Imnaha Spring Chinook

Human development and land management impacts consistent with those identified across the Columbia Basin affect Chinook production in the Grande Ronde River Basin. Loss of channel diversity, sedimentation, reduced stream flows, habitat constriction due to effects of irrigation withdrawal, water temperature and fragmentation of habitat all affect productivity of natural Chinook populations within the watershed. State programs in place through the Department of Environmental Quality, Department of Forestry and Division of State Lands along with federal Clean Water Act and Corps of Engineers 404 regulations provide standards for activities on private land that might otherwise contribute to the problems listed above. Activities on public lands or those that are federally funded must additionally meet Endangered Species Act listed species protection criteria developed through consultation with US Fish and Wildlife Service and National Marine Fisheries Service as well as National Environmental Policy Act (NEPA) review.

These habitat protection programs in conjunction with ongoing private and publicly funded restoration efforts have resulted in an improvement in Chinook and steelhead habitat in many Grande Ronde River Basin tributaries. Most watershed restoration/improvement projects are funded through the Grande Ronde Model Watershed Program, Oregon Watershed Enhancement Board, Bonneville Power Administration funded Northwest Power Conservation Council's Fish and Wildlife Program, Mitchell Act Program and Natural Resource Conservation Service's (NRCS) Conservation Reserve Enhancement Program (CREP). Efforts include fencing streamside corridors to promote riparian vegetative recovery, improved fish passage at road crossings and diversions, reduced sediment production from roads and cropland and screening of irrigation diversions. Some programs like the Mitchell Act screening program began almost 50 years ago, while others like CREP are very recent. Taken together, habitat protection and improvement measures are (and will continue to be)

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improving habitat, and productivity, for the basin's wild spring/summer Chinook. (Draft Lostine River Spring/Summer Chinook HGMP, NPT, April 2010, P. 62-63)

Hatchery Production of Snake River Spring/Summer Chinook

Lookingglass Fish Hatchery was built as part of the LSRCP to produce spring Chinook salmon for release in the Imnaha and Grande Ronde rivers. Lookingglass Fish Hatchery was constructed by the COE in 1982 and turned over to the U.S. Fish and Wildlife Service for operation. Oregon Department of Fish and Wildlife (ODFW) currently operates the facility. Lookingglass Fish Hatchery was initially designed and constructed to produce two stocks of fish; Imnaha stock for the Imnaha subbasin (490,000 smolts) and Lookingglass Creek stock for the Grande Ronde subbasin (900,000 smolts). Beginning in the early 1990's, co-managers of the LSRCP program (ODFW, NPT, and the CTUIR recognized that these populations were at imminent risk of extirpation and immediate action was necessary. In 1992, Snake River spring/summer Chinook salmon were listed as threatened under the Endangered Species Act. The LFH mitigation program was redirected to a conservation and recovery program. This program is authorized by NOAA-Fisheries under a Section 10 permit and is referred to as the Currently Permitted Program (CPP). The current goals of the CPP are to produce:

- 490,000 smolts of Imnaha River population origin
- 250,000 smolts of Upper Grande Ronde River population origin
- 250,000 smolts of Catherine Creek population origin
- 250,000 smolts of Lostine River population origin
- 150,000 smolts for Lookingglass Creek of Catherine Creek population origin

Because the total number of fish produced at Lookingglass Fish Hatchery did not change with the CPP, an assumption was made that the existing facility, with minor modifications, would be sufficient to meet the CPP needs. However, each of these programs has associated fish health and monitoring/evaluation needs that require additional space and water. LFH was not designed to meet the CPP requirements. Co-managers determined that without additional facilities and significant modifications to LFH, production would be reduced under the conservation and recovery programs. To alleviate the burden at Lookingglass Fish Hatchery and correct facility problems, comanagers proposed new production facilities and modifications at Lookingglass in the Grande Ronde and Imnaha Spring Chinook Master Plan submitted to the NPPC in April, 2000 (Northeast Oregon Hatchery). The NPPC approved the master plan to outline construction, operation, and management of additional production and release facilities to supplement natural production in the target basins. Plans are to be developed cooperatively by fish and wildlife agencies and Tribes and authorized preliminary design and NEPA analysis of the proposed alternative in September 2000. (NWPPC Grande Ronde River Subbasin Plan, May 2004, P.86-87)

Adults for the spring/summer Chinook programs are collected at Lookingglass FH, Upper Grande Ronde River facility, Catherine Creek facility, and Lostine River facility.

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Harvest

Harvest impacts on Snake River spring-run Chinook salmon are generally low. Ocean harvest rates are also low. Historical harvest estimates reflect the impact of mainstem and tributary in-river fisheries. In response to initial declines in returns, in-river harvests of both spring- and summer-run Chinook salmon were restricted beginning in the early 1970s. Fishery impacts were further reduced following ESA listing in 1991, with lower harvest rates from 1991 to 1999. In response to the large increase in returns of spring-run Chinook salmon, additional impacts were allowed beginning in 2000. The management agreement providing for increased impacts as a function of abundance also calls for additional reductions if and when runs drop below prescribed thresholds. (Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.44)

Current regional management objectives for Snake River Spring/Summer Chinook

Grande Ronde/Imnaha River Subbasins

Table 37. Summary of Chinook salmon production proposed for NEOH Facilities:

Stock	Brood Source	Treatment	Release Number	Spawning Location	Incubation Location	Early Rearing Location	Number of Early Rearing Containers	Final Rearing	Number of Rearing Containers	Acclimation	Number of Acclimation Ponds
Imnaha	Gumboot Weir	Conventional	370,000	Gumboot	Gumboot	Lostine	4	Lostine	4	Gumboot	1
		Out-of-Basin	120,000	Lookingglass	Lookingglass	Lookingglass	4	Lookingglass	2	Gumboot	
Lostine River	Captive Brood	Set	60,000	Bonnetville	Lostine	Lostine	4	Lostine	2	Lostine	NA
		Fresh	60,000	Bonnetville	Lostine	Lostine	4	Lostine	2	Lostine	NA
	Lostine Weir	Conventional	120,000	Lostine	Lostine	Lostine	4	Lostine	4	Lostine	NA
Catherine Creek	Captive Brood	Set	60,000	Bonnetville	Lookingglass	Lookingglass		Lookingglass	2	Catherine Creek	
		Fresh	60,000	Bonnetville	Lookingglass	Lookingglass		Lookingglass	2	Catherine Creek	4
	Catherine Creek Weir	Conventional	120,000	Lookingglass	Lookingglass	Lookingglass		Lookingglass	4	Catherine Creek	
Grande Ronde River	Captive Brood	Set	60,000	Bonnetville	Lookingglass	Lookingglass		Lookingglass	2	Upper Grande Ronde River	
		Fresh	60,000	Bonnetville	Lookingglass	Lookingglass		Lookingglass	2	Upper Grande Ronde River	4
	UGR Weir	Conventional	120,000	Lookingglass	Lookingglass	Lookingglass		Lookingglass	4	Upper Grande Ronde River	
Lookingglass Creek	Catherine Creek Weir	Conventional	150,000	Lookingglass	Lookingglass	Lookingglass		Lookingglass	2	Lookingglass	NA

(NWPPC Grande Ronde Subbasin Plan, May 2004, p. 88)

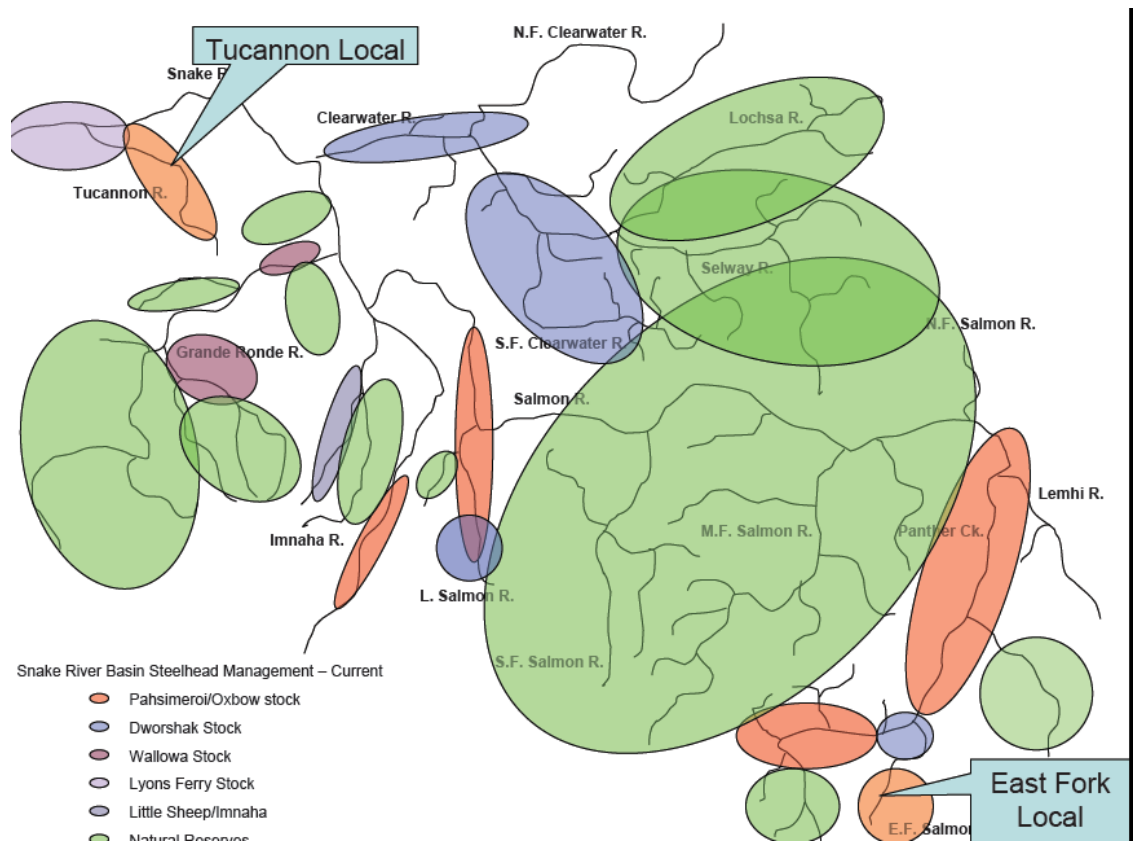
The LSRCP, NEOH, GRESP and Captive Broodstock programs have been integrated together in the Grande Ronde subbasin and have undergone many changes since their respective inception. ESA listings, continued declines in natural production, poor performance of hatchery programs (especially for spring Chinook), and increasing concerns about hatchery/wild interactions have contributed to changes in hatchery mitigation programs. Although agencies and Tribes are continuing to pursue mitigation goals in the long-term, they are placing increasing short-term emphasis on use of hatcheries for conservation and recovery of ESA listed species. (NWPPC Grande Ronde Subbasin Plan, May 2004, p. 93)

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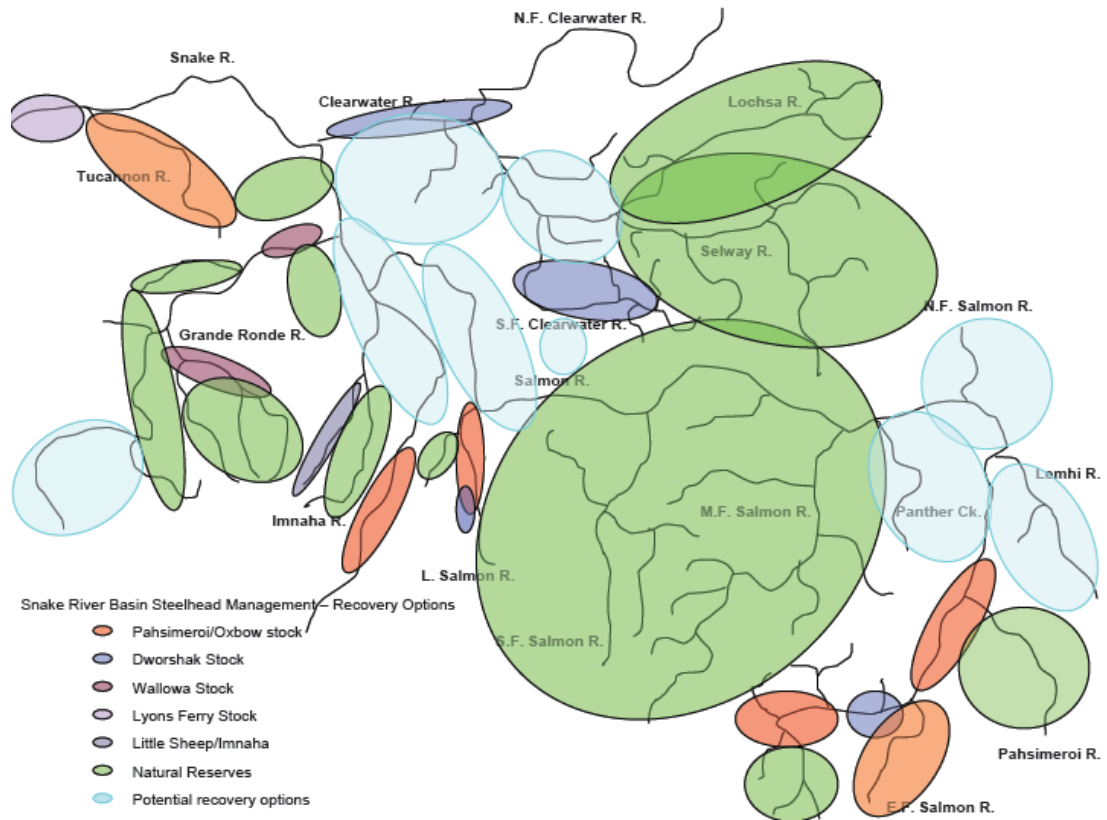
Examples of management and recovery options for salmonid resources in the region⁶

Snake River Basin Steelhead



⁶ Figures in section from Pollard, December 2003.

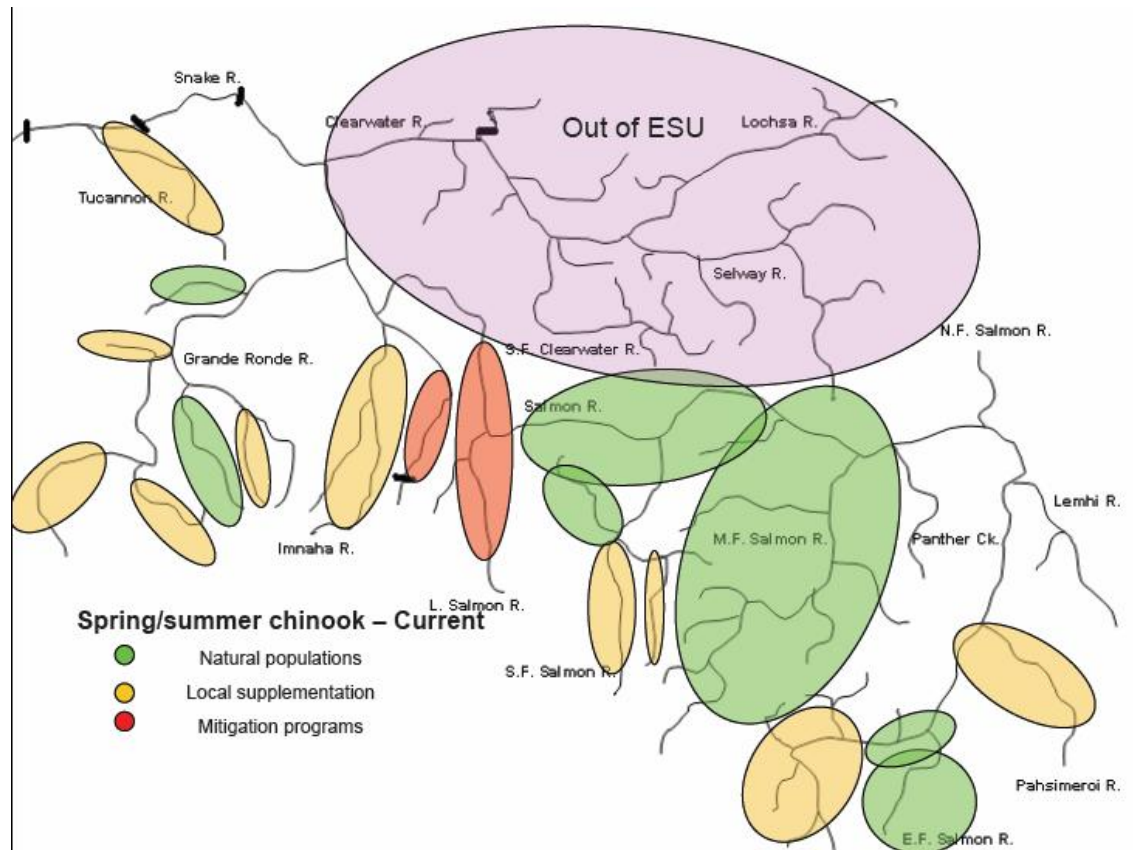
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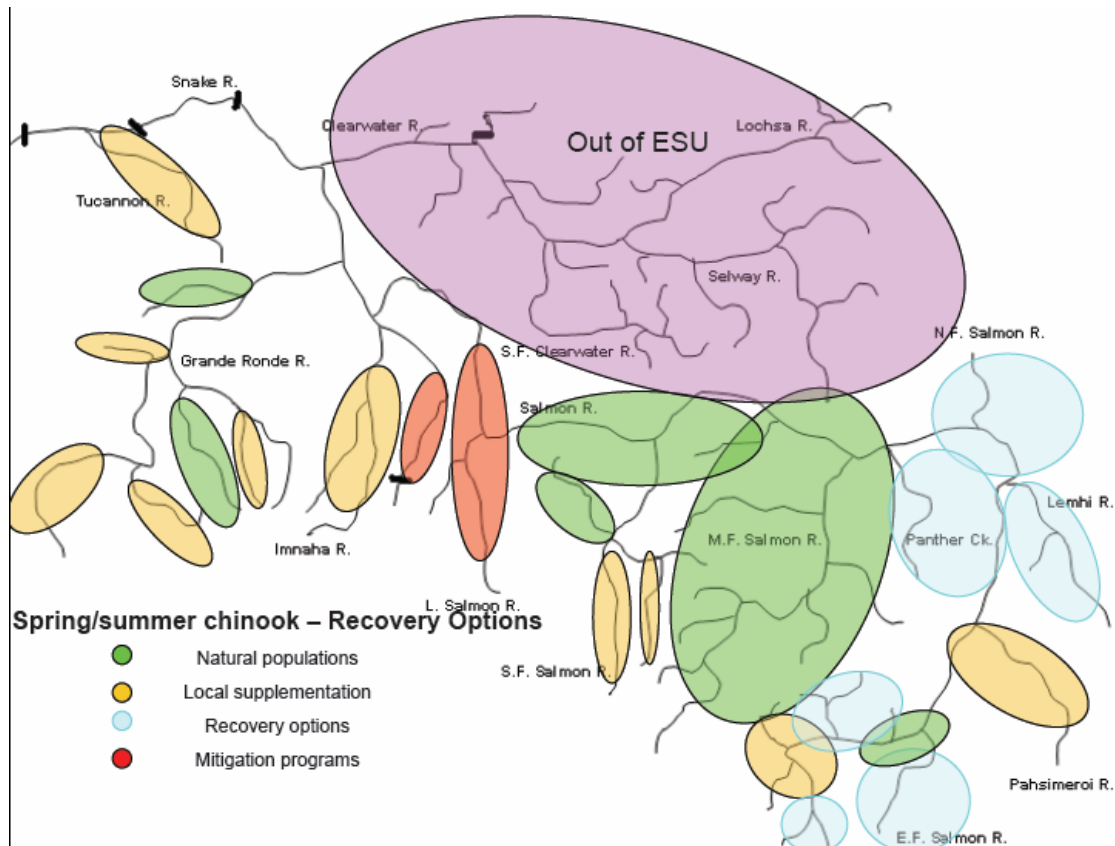


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Snake River Basin Spring/Summer Chinook





G. Current state, federal, and tribal hatchery programs/ facilities in the region

1. Federally Owned, State Operated

Lookingglass FH

When Lookingglass Creek Fish Hatchery was first designed and constructed, it was operated as a mitigation program to provide fish for harvest. Goals included producing 900,000 smolts for release in the Grande Ronde River to return 5,820 hatchery-origin adults to the LSRCP project area upstream of Lower Granite Dam and 490,000 smolts for release into the Imnaha River to return 3,210 adults. Lookingglass hatchery is located 18 miles north of the town of Elgin, Oregon adjacent to Lookingglass Creek (ODFW watershed code 080440000) 2.2 miles above its confluence with the Grande Ronde River at about river mile 86.

When broodstock development options were considered in the late 1970s, it was thought that too few natural fish remained in Lookingglass Creek to develop adequate broodstock. In order to achieve smolt production goals, out-of-basin stocks were imported. The primary stock used was Rapid River Chinook along with Carson hatchery spring Chinook. No adult Chinook

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salmon were allowed to pass the barrier weir in Lookingglass Creek to reduce the likelihood that infectious pathogens would be incorporated in the hatchery water supply. As a result, the remnant indigenous Chinook population of Lookingglass Creek was extirpated. Although most of the 900,000 smolt production was released at Lookingglass Creek Fish Hatchery, smolts, pre-smolts and adults were released in other portions of the Grande Ronde basin periodically from 1980 to 1990 (LSRCP Status review). In 1990, ODFW adopted a Wild Fish Management Policy that limited the acceptable proportion of non-local hatchery origin fish, and in 1992, NOAA Fisheries listed the natural populations of Snake River spring/summer Chinook as threatened under the endangered species act.

After Snake River spring/summer Chinook were listed as threatened in 1992, the mitigation program at Lookingglass Creek Fish Hatchery began to evolve into conservation programs. The use of composite, out-of-basin stocks (Rapid River and Carson) was phased out, and local indigenous broodstocks were developed for Upper Grande Ronde, Catherine Creek, and Lostine River based on a combination of captive broodstocks and anadromous adult collections in each tributary. In the 1990s, co-managers and the Federal agencies began to discuss logistical and biological considerations for reintroducing Chinook into the Lookingglass Creek drainage upstream from the hatchery weir. In 2001, an experimental program to reestablish a naturally spawning population into Lookingglass Creek by releasing hatchery-reared smolts was initiated. Catherine Creek stock was selected because it was a listed stock, indigenous to the Grande Ronde River Basin, occupied similar habitat, and excess embryos from the captive rearing program were available.

Hatchery mitigation goal (Currently Permitted Program) for the Grande Ronde spring/summer chinook salmon is 900,000 smolts. Production is based on prioritization process outlined in the Grande Ronde Spring Chinook Hatchery Management Plan (Zimmerman et al 2002). Expected program size includes:

1. Up to 250,000 smolts released into Catherine Creek.
 - Captive number based on juvenile sliding scale.
 - Up to 150,000 from captive brood stock production.
 - Long term reduce to 150,000.
2. Up to 250,000 smolts released into Lostine River.
 - Up to 150,000 from captive brood stock production
3. Up to 250,000 smolts released into Upper Grande Ronde River.
4. Up to 150,000 smolts released into Lookingglass Creek.
 - Long term increase to 250,000.

Imnaha Facility

Imnaha adult collection and smolt acclimation facility is located approximately 30 miles south from the town of Imnaha, Oregon adjacent to the Imnaha River at river mile 45.5. Facilities consist of an adult trap, spawning area and one pond (13,000 ft³). The pond can be used for adult holding in the summer and juvenile acclimation and release in the spring. Capacity for juveniles is about 19,500 pounds (390,000 fish at 20 fpp).

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Irrigon FH

Irrigon FH was constructed in 1985 under the LSRCP Program, as authorized by the Water Resources Development Act of 1976, Public Law 94-587, to offset losses caused by the four Lower Snake River dam and navigation locks projects. Irrigon FH was designed to rear 280,000 pounds (1,600,000 smolts) of steelhead (6 fpp) for both the Grande Ronde and Imnaha river programs for release off station. All adults for the Grande Ronde program were to be trapped at Wallowa FH or the Big Canyon Satellite Facility. Each facility includes adult trapping/holding facilities, and acclimation ponds. Wallowa FH also provides early incubation for the program. The adult return goals for the Grande Ronde program is 9,000 steelhead back to the Grande Ronde River. Irrigon Hatchery is located along the Columbia River above John Day Dam 3 miles west of Irrigon, Oregon.

Wallowa FH

Wallowa Hatchery is located along Spring Creek, a tributary of the Wallowa River (Grande Ronde River Subbasin), 1 mile west of Enterprise, Oregon. The majority of fish production at this facility consists of summer steelhead. Big Canyon and Little Sheep acclimation facilities are operated as satellites.

Big Canyon Facility

The Big Canyon acclimation facility is located at the junction of Deer Creek and the Wallowa River, just east of the town of Minam, Oregon. This facility consists of three acclimation ponds and one adult holding pond.

Little Sheep Creek Facility

Little Sheep Creek acclimation facility is located along Little Sheep Creek, a tributary of the Imnaha River. This facility consists of one acclimation pond and one adult holding pond.

2. Federally Owned, Tribal Operated (NWCCP, Fish and Wildlife Program)

Upper Grande Ronde facility

The Upper Grande Ronde Acclimation Facility (UGRAF) is located at rm 170.5 of the Grande Ronde River and consists of 4 portable raceways lined with vinyl fabric. The Upper Grande Ronde Adult Collection Facility (UGRACF) is located at rm 153.5 of the Grande Ronde River. The facility consists of a floating weir that spans the entire stream effectively blocking upstream passage. The designed adult spring Chinook salmon holding capacities for these facilities is 28 at UGRACF using 10 ft³/adult.

Catherine Creek facility

The Catherine Creek Acclimation Facility (CCAF) is located at river mile (rm) 52.5 of Catherine Creek and is similar in design and operation to the UGRAF, consisting of 4 portable raceways lined with vinyl fabric). The Catherine Creek Adult Collection Facility (CCACF) is

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located at rm 43.5 of Catherine Creek. The facility consists of a hydraulic weir which is attached at the bottom sill of a full channel width pool and chute type ladder. The designed adult spring Chinook salmon holding capacities for these facilities is 90 at CCACF using 10 ft³/adult.

Lostine River Facility

The Lostine River acclimation facility is located at on the Lostine River at rivermile 10.2, near the town of Lostine, Oregon, and is similar in design and operation to the UGRAF and CCAF, consisting of 4 portable raceways lined with vinyl fabric). The Lostine River adult trap consists of a temporary picket weir and trap box located in the Lostine River at rivermile 1.

3. Overview of Hatchery Production in the Grande Ronde and Imnaha River Basins⁷

Adult Collection	Adult Holding	Adult Spawning	Incubation	Rearing	Acclimation	Release Site	Release Numbers	Size at Release
(Imnaha STH) Little Sheep Ck.	Little Sheep Ck.	Little Sheep Ck.	Wallowa FH Irrigon FH	Irrigon FH	Little Sheep Ck.	Little Sheep Ck. Big Sheep Ck.	330,000	Smolts
(Wallowa STH) Wallowa FH Big Canyon	Wallowa FH	Wallowa FH	Wallowa FH Irrigon FH	Irrigon FH	Wallowa FH Big Canyon	Wallowa FH Big Canyon	800,000	Smolts
(Imnaha SPCH) Imnaha	Imnaha Lookingglass FH	Lookingglass FH	Lookingglass FH	Lookingglass FH	Imnaha	Imnaha R.	490,000	Smolts
(Lookingglass SPCH) Lookingglass Ck. Catherine Ck.	Lookingglass FH	Lookingglass FH	Lookingglass FH	Lookingglass FH	Direct release	Lookingglass Ck.	150,000	Smolts
(Lostine SPCH) Lostine R.	Lookingglass FH	Lookingglass FH	Lookingglass FH	Lookingglass FH	Lostine R.	Lostine R.	250,000	Smolts
(upper Grande Ronde SPCH) Upper Grande Ronde	Lookingglass FH	Lookingglass FH	Lookingglass FH	Lookingglass FH	Upper Grande Ronde	Upper Grande Ronde R.	250,000	Smolts

⁷ Unless otherwise cited, tables and maps in this section were created by J. Krakker, USFWS Hatchery Review Team

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(Catherine Ck. SPCH) Catherine Ck.	Lookingglass FH	Lookingglass FH	Lookingglass FH	Lookingglass FH	Catherine Ck.	Catherine Ck.	250,000	Smolts
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H. Special considerations in region (e.g., ESA listings, Habitat Conservation Plans, Fishery Management Plans, FERC relicensing, etc.)

- Snake River Spring/Summer Chinook - threatened, 6/05.
- Snake River Fall Chinook - threatened, 6/05
- Snake River Steelhead - threatened, 1/06
- Snake River Sockeye – endangered, 6/05

II. Irrigon Fish Hatchery, Wallowa FH and Satellite Facilities

A. Description of hatchery

Site Overview – Irrigon hatchery consists of a hatchery building with incubation and early rearing containers, a shop/storage building, a mechanical building, an aeration facility, five pumping stations, 6 residences, storage shed, fenced-in outside storage area, settling pond, hatchery outfall, tanker filling station, domestic water system, 32 outdoor rearing ponds (16 - 20' x 17' upper raceways and 16 - 20' x 100' lower raceways), and a public fishing pier.

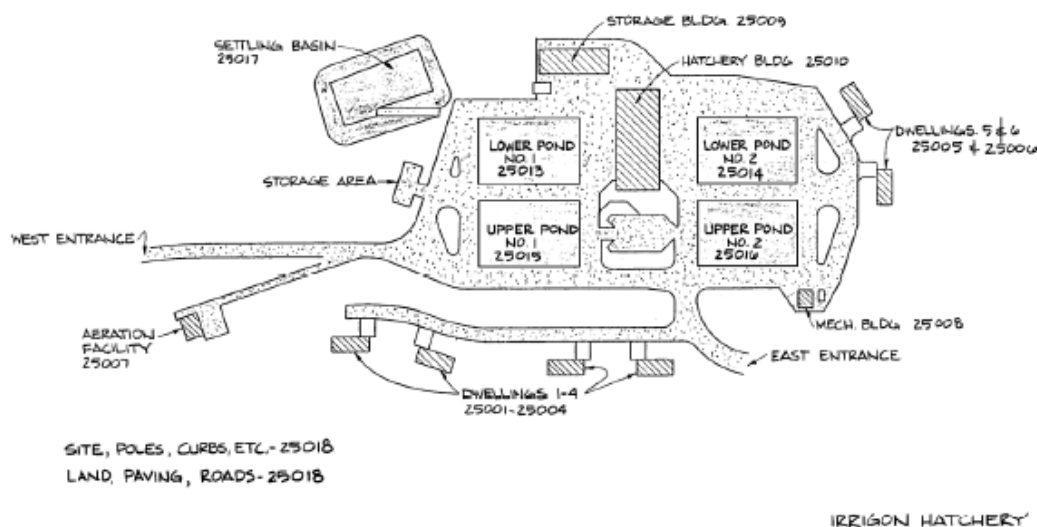
There are three facilities associated with Irrigon FH steelhead programs and used for adult trapping, holding, spawning, early incubation, and acclimation including Wallowa FH, Big Canyon Satellite Facility, and Little Sheep Creek Satellite Facility.

- Irrigon Hatchery is located along the Columbia River above John Day Dam 3 miles west of Irrigon, Oregon. The facility is at an elevation of 277 feet above sea level, at latitude 45° 54' 33" N (45.9090) and longitude 119° 32' 39" W (119.5453). The area of the site is 33 acres, owned by the USFWS. The facility was completed in 1985 and is the primary LSRCP steelhead rearing facility in Oregon. The facility was designed to rear steelhead smolts for release into the Grande Ronde and Imnaha River systems. Irrigon FH receives eyed steelhead eggs from Wallowa Hatchery and rears them prior to transfer for release or acclimation (Irrigon FH 2009 Operations Plan, p2).
- Wallowa Hatchery is located along Spring Creek, a tributary of the Wallowa River (Grande Ronde River Subbasin), 1 mile west of Enterprise, Oregon. The site is at an elevation is 3,700 feet above sea level, at latitude 45° 27' 30" N (45.4176) and longitude 117° 17' 36" W (117.3013). The site area is 11 acres. The majority of fish production at this facility consists of summer steelhead. Water rights for the entire hatchery total 23,813 gpm from several sources. The acclimation ponds receive water from Spring Creek. The hatchery is staffed with 3 FTE's. Big Canyon and Little Sheep acclimation facilities are operated as satellites (Wallowa FH 2009 Operations Plan, p2).
- The Big Canyon acclimation facility is located at the junction of Deer Creek and the Wallowa River, just east of the town of Minam, Oregon. The site is at an elevation of 2,590 feet above sea level, at latitude 45° 37' 12" N (45.62000) and longitude 117° 41' 50" W (117.69722). The site area is 48 acres. This facility consists of three acclimation ponds and one adult holding pond. Water rights total 5,835 gpm from Deer Creek. The facility is staffed by Wallowa Hatchery personnel from February through May (Wallowa FH 2009 Operations Plan, p2).
- Little Sheep Creek acclimation facility is located along Little Sheep Creek, a tributary of the Imnaha River. The site is at an elevation of 2,768 feet above sea level, at latitude 45° 28' 57" N (45.48250) and longitude 116° 55' 38" W (116.92722). This facility consists of one acclimation pond and one adult holding pond. Water rights total 8,797 gpm from Little Sheep Creek. The facility is staffed by Wallowa Hatchery personnel from March through May (Wallowa FH 2009 Operations Plan, p2).

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Irrigon Hatchery

- Irrigon FH was constructed in 1985 by the U.S. Army Corps of Engineers under the LSRCP. The main hatchery building includes an incubation area, lab, offices, visitor area, chillers, freezers, and an information kiosk. The shop/storage building includes vehicle storage bays, vehicle work bays, shop areas, break areas, and a loft area. The mechanical building includes generators and controls for the domestic water and fire systems. The five pumping stations include; (pump station #1) a ranney collector well, 5 pumps, distribution appurtenances, generator, electrical equipment, and fuel tank, (pump station #2) a ranney collector well, 5 pumps, distribution appurtenances, generator, electrical equipment, and fuel tank, (pump station #3) a production well, pump, distribution appurtenances, generator, electrical equipment, and fuel tank, (pump station #4) a production well, pump, distribution appurtenances, generator, electrical equipment, and fuel tank, (well house #5) a well and pump. The facility has 6 permanent single family residences, storage shed for equipment and vehicles, aeration facility, fenced in outside storage area, settling pond and hatchery water supply outfall, tanker filling station, domestic water supply system, parking areas, irrigation system for residences and hatchery grounds, display pond, domestic water tank, and a public fishing pier (pers. comm. LSRCP Office, 2009 - LSRCP property inventory).



- The hatchery water supply is provided from two wells that can deliver a total of approximately 21,000 gpm. Water rights and design capacity is about 25,000 gpm. The 21,000 gpm is available year round with actual low water use occurring in June when only 2,400 gpm is needed. Water flows from an upper series of raceways and is re-used in the lower series prior to discharge (ODFW 2009 Irrigon FH Operation Plan, p2).

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- ## Wallowa FH

-
- 32304 UPPER WELL PUMP
- 32305 REARING POND
- 32306 REG. 32278
- 32307 REARING PONDS
- 32308 REARING PONDS
- 32309 POND
- 32310 POND
- 32311 POND
- 32312 REARING PONDS
- 32313 ADULT HOLDING POND
- 32314 BARN
- 32315 REC. AREA
- 32316 POND
- 32317 DAM
- 32318 INTAKE
- 32319 FISHWAY
- 32320 DIVERSION DAM
- 32321 INTAKE HOUSE
- 32322 STORAGE BLDG.
- 32323 FISH BARRIER
- 32324 FISH LADDER
- 32325 MECH. BLDG.
- 32326 HATCHERY BLDG.
- 32327 REG. 32297
- 32328 VEHICLE STORAGE SHED
- 32329 FISH LADDER
- 32330 UPPER SPRING
- 32331 LOWER WELL PUMP
- 32332 SPRING CREEK
- 32333 DAM
- 32334 INTAKE
- 32335 HEAD GATE @ SPR. CREEK
- 32336 BYPASS OVERFLOW
- 32337 FILLING AREA
- 32338 INTAKE HOUSE
- 32339 PRIVATE RES.
- 32340 O.D.N. PROPERTY FENCE
- 32341 PINEMENT
- 32342 GRAVEL
- 32343 BUILDING
- WALLOWA RIVER HATCHERY
- APRIL, 1987
- SHEET 1 of 1

- ## Appendix B – II. Irrigon Fish Hatchery

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- The main hatchery building includes 288 plastic vertical incubators (24 stacks of 12 trays) and twelve 14' x 4' x 2.75' (154 cubic feet volume) starter tanks (only 6 are currently plumbed). The building also includes twelve 4' diameter x 2.5' depth (31.4 cubic feet volume each and a total of 376.8 cubic feet volume) circular fiberglass tanks that are used for the spring Chinook captive broodstock program (Wallowa FH 2009 Operation Plan, p3).
- The outside raceways include five 100' x 20' x 4.50' (9,000 cubic feet volume) concrete raceways (there are another set of five 100' x 20' x 4.50' raceways that have no water available for rearing). There are also six concrete oval raceways 47.2' x 20' x 3.50' (3,000 cubic feet volume) in a 3 x 2 series. (There are two circular concrete ponds 19' diameter x 2.50' depth (708 cubic feet volume) that are not being used due to water needs for incubation) (Wallowa FH 2009 Operations Plan, p3).
- The one adult concrete trap is 25' x 8.6' x 5.0' (931 cubic feet volume). The adult concrete holding pond is 80' x 20' x 4.0' (7,200 cubic feet volume) (Wallowa FH 2009 Operations Plan, p3).
- There are two concrete acclimation ponds 300' x 42' x 3.50' (44,100 cubic feet volume) (Wallowa FH 2009 Operations Plan, p3).

Big Canyon Satellite Facility

- Big Canyon Satellite Facility was completed in 1987 by the U.S. Army Corps of Engineers under the LSRCP. The facility includes a diversion dam, intake structure, three acclimation ponds, an adult holding pond, spawning shelter, fish barrier and ladder, intake building, mechanical building, office and residence, shop, RV pad, domestic water well, above ground diesel fuel storage, and security fencing (pers. comm. LSRCP Office, 2009 - LSRCP property inventory).
- There are two concrete acclimation ponds 150' x 30' x 3.50' (15,750 cubic feet volume). A third concrete acclimation pond 70' x 30' x 3.50' (7,350 cubic feet volume) is not currently used (Wallowa FH 2009 Operations Plan, p3).
- The adult concrete holding pond is 30' x 10' x 4.50' (1,350 cubic feet volume) (Wallowa FH 2009 Operations Plan, p3).
- Water rights total 5,835 gpm from Deer Creek (Wallowa FH 2009 Operations Plan, p2).

Little Sheep Creek Satellite Facility

- Little Sheep Satellite Facility was completed in 1987 by the U.S. Army Corps of Engineers under the LSRCP. The facility includes a domestic water system, an acclimation pond, an in-stream weir with radial gates, fish ladder and finger weir, an adult trap and sorting area, an adult holding pond, intake structure, support and dormitory building, equipment storage area, spawning shed, and security fencing (pers. comm. LSRCP Office, 2009 - LSRCP property inventory).
- The adult concrete holding pond is 40' x 20' x 4.00' (3,200 cubic feet volume) (Wallowa FH 2009 Operations Plan, p3).

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- The acclimation pond is 195' x 50' x 3.50' (34,125 cubic feet volume) (Wallowa FH 2009 Operations Plan, p3).
- Water rights total 8,797 gpm from Little Sheep Creek (Wallowa FH 2009 Operations Plan, p2).

B. Hatchery water sources

Irrigon Fish Hatchery - The hatchery water supply is provided from two collector wells with pump stations and three conventional wells that can deliver a total of approximately 21,000 gpm. Water rights and design capacity is about 25,000 gpm. The 21,000 gpm is available year round with actual low water use occurring in June when only 2,400 gpm is needed. A main transmission line carries water from the pump stations to the aeration facility at the head of the hatchery water supply piping. The aeration facility provides for gravity flow through packed columns of all incoming water to raise oxygen and lower nitrogen content. The aeration equipment is enclosed in a 28' x36' building constructed over the concrete head tank. The entire facility is elevated to provide the required head for the hatchery water supply. A LOX system is available and used December to March to increase the available dissolved oxygen to the raceways. Water flows from an upper series of raceways and is re-used in the lower series prior to discharge (ODFW 2009 Irrigon FH Operation Plan, p2).

Wallowa Fish Hatchery - Water rights for the entire hatchery total 23,813 gpm from several sources (Spring Creek, well water, springs, Clear Creek). The acclimation ponds receive water from Spring Creek (Wallowa FH 2009 Operations Plan, p2).

Big Canyon Satellite Facility - Water rights total 5,835 gpm from Deer Creek (Wallowa FH 2009 Operations Plan, p2).

Little Sheep Creek Satellite Facility - Water rights total 8,797 gpm from Little Sheep Creek (Wallowa FH 2009 Operations Plan, p2).

C. Adult broodstock collection facilities

Irrigon Fish Hatchery – This facility serves only as an egg incubation and rearing facility.

Wallowa Fish Hatchery – The Wallowa stock originated from collections of adults during the spring at Ice Harbor (1976) and Little Goose (1977, 1978) dams as well as embryos from Pahsimeroi Fish Hatchery (ID) (1979). Since 1979 only Wallowa stock adults returning to Wallowa Hatchery, Big Canyon, and Cottonwood traps have been utilized as broodstock (Grande Ronde Summer Steelhead HGMP p27).

Beginning in 2003, to assess the straying issue of Wallowa stock steelhead, ODFW initiated adult hatchery origin Wallowa stock steelhead collections via hook and line in the lower Grande Ronde River, from late September through November, with a portion (20%) of the Wallowa stock program in an attempt to modify Wallowa stock hatchery steelhead adult return timing to emphasize fall entry into the Grande Ronde and reduce straying into other

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areas. If successful, production from the "new" broodstock may be utilized to replace the original Wallowa stock over time (Wallowa FH 2009 Operations Plan, p8-9).

During recent years adequate numbers of adult Wallowa stock steelhead have returned to Wallowa Hatchery to meet production goals. When or if adult returns to Wallowa hatchery are below production goals fish will be transferred from the Big Canyon facility to supplement spawning (Wallowa FH 2009 Operations Plan, p9).

Big Canyon Satellite Facility – During recent years adequate numbers of adult Wallowa stock steelhead have returned to Wallowa Hatchery to meet production goals. When or if adult returns to Wallowa hatchery are below production goals fish (adults or eggs) will be transferred from the Big Canyon facility to supplement spawning (Wallowa FH 2009 Operations Plan, p9).

Little Sheep Creek Satellite Facility – Broodstock is indigenous to Little Sheep Creek and has been collected at Little Sheep Creek facility annually since the start of the program in 1982 (Imnaha Summer Steelhead HGMP, p25).

D. Broodstock holding and spawning facilities

Irrigon Fish Hatchery – This facility serves only as an egg incubation and rearing facility.

Wallowa Fish Hatchery – Wallowa FH has a weir and fish ladder located on Spring Creek, an adult holding pond, and spawning facility. The adult holding pond is 80' x 20' x 4.0' (7,200 cubic feet volume) (Wallowa FH 2009 Operations Plan, p3).

Adults collected at Wallowa Hatchery include a fish ladder leading from the base of a concrete and steel grate weir to a finger weir trap at the upper end. Flow from Wallowa River is diverted through the trap and ladder at Wallowa. Adults are held at maximum densities of 2.5 ft³/fish or 2lbs/ cubic ft. and 2-2.5 gpm per fish (Grande Ronde Summer Steelhead HGMP, p25-26).

All Wallowa stock steelhead adults are spawned, fertilized, and green eggs incubated at Wallowa FH until eye-up prior to transfer to Irrigon FH (ODFW AOP 2008, p5).

Big Canyon Satellite Facility – Big Canyon Satellite Facility has a fish barrier and fish ladder located on Deer Creek, an adult holding pond, and spawning shelter. The adult holding pond is 30' x 10' x 4.50' (1,350 cubic feet volume). During recent years adequate numbers of adult Wallowa stock steelhead have returned to Wallowa Hatchery to meet production goals. When or if adult returns to Wallowa hatchery are below production goals fish (adults or eggs) will be transferred from the Big Canyon facility to Wallowa FH to supplement spawning (Wallowa FH 2009 Operations Plan, p9).

Little Sheep Creek Satellite Facility – Little Sheep Creek Satellite Facility has an in-stream weir with radial gates and fish ladder located on Little Sheep Creek, an adult holding pond, and spawning shed. The adult holding pond is 40' x 20' x 4.0' (3,200 cubic feet volume) (Wallowa FH 2009 Operations Plan, p3).

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The Little Sheep Creek adult trap consists of a fish ladder leading from the base of a concrete and steel grate weir to a finger weir at the upper end. Flow from Little Sheep Creek is diverted through the trap and ladder. The weir excludes all migration upstream past the facility except through the ladder and trap. Adults are held at maximum densities of 2.5 ft³/fish and 2 gpm per fish (Imnaha Spring/Summer Chinook HGMP, p21).

All Imnaha stock steelhead adults are spawned, fertilized, and green eggs shipped to Wallowa FH for incubation until eye-up prior to transfer to Irrigon FH (2008 AOP, p7).

E. Incubation facilities

Irrigon Fish Hatchery – Irrigon FH incubation facilities consist of 288 vertical trays (24 – 12 tray units). Wallowa and Imnaha stock eggs are incubated on well water with a D.O. of 10.0 and temperatures between 42-55 F. Water temperature is continuously monitored via recording thermograph or set via chillers. Dissolved oxygen is monitored. Eggs are incubated from the eyed to emerging fry stage. The 24 – 12 tray incubator units have a maximum number of eggs per 12-tray incubator unit at 120,000 eggs and approximate water use per 12-tray unit at 5gpm. Water use for the incubation is 120 gpm, with maximum eggs per gpm at 24,000 (Grande Ronde Summer Steelhead HGMP, p34)].

Wallowa Fish Hatchery – Wallowa FH incubation facilities consist of 216 vertical incubation trays. Wallowa and Imnaha stock eggs are incubated on a mixture of well (56 F and 8.4 D.O.) and spring water (42-53 F and 9.8 D.O.) at 5,000-15,000 eggs per tray and 4.0 GPM. Eggs are incubated to eyed stage when they are transferred to Irrigon Hatchery. Water temperature is continuously monitored via Stow Away Tidbit temperature loggers. Dissolved oxygen is monitored. Eggs are cooled with ice and transferred in coolers via truck (Grande Ronde Summer Steelhead HGMP, p34).

Loading density, dissolved oxygen and temperature criteria follow those outlined in the Oregon State Liberation Manual, section 7 (Grande Ronde Summer Steelhead HGMP, p25).

F. Indoor rearing facilities

Irrigon Fish Hatchery – Fry are initially reared in 68 indoor starter tanks. Tanks are 6' diameter x 3' deep circular fiberglass with a water capacity at 2' depth of 423 gallons. Water exchanges per hour is 2.27, flow per tank is 25 gpm, maximum pounds per gpm is 3.42, maximum pounds per cubic foot is 1.52, and total flow required is 910 gpm. Approximately 2,797 pounds of fry are loaded into 68 tanks at 400 fish per pound. Maximum pounds of fish per tank at 400 fish per pound is 85.5 lbs (Grande Ronde Summer Steelhead HGMP, p 21, 30).

G. Outdoor rearing facilities

After initial rearing fish are transferred to the outside concrete raceways include thirty two 20' x 100' x 3.75' (57,350 gal each) configured into 16 upper and lower raceway series. Water flows from the upper series of raceways and is re-used in the lower series prior to discharge. Exchanges per hour is 1.77, velocity is 0.05 fps, flow per pond is 1,543 gpm (3.44 cfs), pounds of fish per

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gpm is 5.67, pounds of fish per cubic foot is 1.2, and total flow is 24,688 gpm (40cfs). Density and loading goals are 5.67 lbs/gpm and 1.20 lbs/cubic feet. Actual densities and loading criteria at the end of the rearing cycle are 35,000 @4.1/lb (8,500lbs/pond), 1,500gpm/pond (5.66 lbs/gpm), and 7,000 cuft/pond (1.21lbs/cubic feet). During peak loading liquid oxygen is used to maintain the dissolved oxygen in all ponds at a minimum DO concentration of 6 mg/l. Fish are reared in well water (seasonal variations 50° F-62° F). Dissolved oxygen levels are monitored during peak production and maintained at a minimum of 6 mg/l. Raceways are cleaned weekly and mortalities are picked daily (Grande Ronde Summer Steelhead HGMP, p 31).

H. Release locations and facilities

Wallowa Fish Hatchery – Wallowa FH has two 300' x 42' x 3.50' concrete acclimation ponds for a total of 88,200 cubic feet. Steelhead are acclimated in two groups

Big Canyon Satellite Facility – Big Canyon Satellite Facility has two 150' x 30' x 3.50' concrete acclimation ponds for a total of 31,500 cubic feet. Steelhead are acclimated in two groups.

Little Sheep Creek Satellite Facility – Little Sheep Satellite Facility has one 195' x 50' x 3.50' concrete acclimation pond for a total of 34,125 cubic feet.

Big Sheep Creek – All releases into Big Sheep Creek are direct stream releases.

I. Outmigrant monitoring facilities

Monitoring occurs at dams in the Lower Snake/Columbia River basin downstream of each release location.

J. Additional or special facilities

None

K. Outreach and public education facilities/programs

None referenced here.

L. Special issues or problems (e.g. water and property rights issues, law suits, etc.)

None referenced.

IIA. Wallowa Hatchery Summer Steelhead, Irrigon FH

A. General information

Irrigon FH was constructed in 1985 under the LSRCP Program, as authorized by the Water Resources Development Act of 1976, Public Law 94-587, to offset losses caused by the four Lower Snake River dam and navigation locks projects. Irrigon FH was designed to rear 280,000 pounds (1,600,000 smolts) of steelhead (6 fpp) for both the Grande Ronde and Imnaha river programs for release off station. All adults for the Grande Ronde program were to be trapped at Wallowa FH or the Big Canyon Satellite Facility. Each facility includes adult trapping/holding facilities, and acclimation ponds. Wallowa FH also provides early incubation for the program. The adult return goals for the Grande Ronde program is 9,000 steelhead back to the Grande Ronde River. (Herrig 1990, p25)

B. Stock/Habitat/Harvest Program Goals and Purpose

1. Purpose and justification of program

Irrigon FH was constructed in 1985 under the LSRCP Program, as authorized by the Water Resources Development Act of 1976, Public Law 94-587, to offset losses caused by the four Lower Snake River dam and navigation locks projects. Irrigon FH was designed to rear 280,000 pounds (1,600,000 smolts) of steelhead (6 fpp) for release off station.

2. Goals of program

The goal of this program is to return 9,184 steelhead to the Grande Ronde Basin to mitigate for survival reductions resulting from construction and operation of the four lower Snake River dams. (Herrig 1990, p25)

3. Objectives of program

- Spawn 450 adults (180 production and 45 fall returning females). Pre-spawning mortality for spring-collected production steelhead is typically 1% for females and 2% for males. (2008 AOP, p 3-5)
- Collect 1,133,242 green eggs to produce 1,016,520 eyed eggs (89.7% green egg to eyed egg survival). Transfer 1,016,520 eyed eggs to Irrigon FH to produce 800,000 smolts (78.7% eyed egg to smolt survival). Smolt goal include 640,000 production and 160,000 fall returning brood. (2008 AOP, p 3-5)

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- Release 480,000 smolts at Wallowa FH (320,000 production and 160,000 fall returning smolts) and 320,000 smolts at Big Canyon Satellite Facility (160,000 production and 160,000 fall returning smolts). (2008 AOP, p 3-5)
- The adult return goal for the program is 9,184 steelhead to the Grande Ronde River. (Herrig 1990, p25)

4. *Type of program (Integrated or Segregated)*

Mitigation and isolated harvest program to mitigate for summer steelhead harvest opportunity lost as a result of the construction of four Lower Snake River dams while minimizing impacts to listed populations. (Grande Ronde Summer Steelhead HGMP, p 3)

5. *Alignment of program with ESU-wide plans*

Program modifications, including shifts in broodstock return timing, reductions in smolt numbers and increased smolt size are all designed to maintain harvest opportunity at the highest possible level while reducing impacts to listed species, especially Deschutes River and Snake River summer steelhead. However, reductions in program smolt releases will likely result in fewer fish harvested if harvest rates remain at the level of those recently observed. The Grande Ronde steelhead hatchery program has been successful in reestablishing a fishery within the Grande Ronde basin with catch rates, and harvest and effort levels similar to historic, pre-dam levels. The program has been less successful in returning the goal of 9,184 to the compensation area as a whole. Proposed program modifications will likely shift harvest from Deschutes and Columbia rivers to the Snake and Grande Ronde rivers compensation area. As a result, impact to program compensation area harvest is expected to be small. (Grande Ronde Summer Steelhead HGMP, p 19)

6. *Habitat description and status where fish are released.*

Human development and land management impacts consistent with those identified across the Columbia basin affects steelhead production in the Grande Ronde basin. Loss of channel diversity, sedimentation, reduced stream flows, habitat constriction due to effects of water temperature and fragmentation of habitat all affect productivity of natural steelhead populations within the watershed. State programs in place through the Department of Environmental Quality, Department of Forestry and Division of State Lands provide standards for activities on private land that might otherwise contribute to the problems listed above. While activities on public lands must meet listed species protection criteria developed through consultation with US Fish and Wildlife Service and National Marine Fisheries Service. These protection programs in conjunction with ongoing private and publicly funded restoration efforts have resulted in an upward trend in steelhead habitat in many Grande Ronde basin streams. Most of these restoration projects funded through the Grande Ronde Model Watershed and Oregon Watershed Enhancement Board programs produce both short and long term improvements in habitat. Taken together these habitat protection and improvement measures are and will continue to improve habitat for and productivity of the basin's wild summer steelhead populations. (Grande Ronde Summer Steelhead HGMP, p 20-21)

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7. Size of program and production goals (No. of spawners and smolt release goals)

- Approximately 225 females and 225 males (180 production and 45 fall returning females) are needed for the Grande Ronde steelhead program at a 1:1 male to female ratio. (2008 AOP, p 3-5)
- 480,000 smolts released at Wallowa FH (320,000 production and 160,000 fall returning smolts) and 320,000 smolts released at Big Canyon Satellite Facility (160,000 production and 160,000 fall returning smolts). (2008 OAOP, p 3-5)

C. Description of program and operations

1. Broodstock goal and source

- The Wallowa stock originated from collections of adults during the spring at Ice Harbor (1976) and Little Goose (1977, 1978) dams as well as embryos from Pahsimeroi Fish Hatchery (ID) (1979). Since 1979 Wallowa stock adults returning to Wallowa Hatchery, Big Canyon, and Cottonwood traps have been utilized as broodstock. ODFW has attempted to maintain hatchery return timing characteristics through incorporation of adults from across the run. (Grande Ronde Summer Steelhead HGMP, p 27)
- The current broodstock consists of approximately 80% production brood and 20% fall returning brood fish collected from the Lower Grande Ronde River during the early fall and at existing trapping facilities. (2008 AOP, p 4)
- During recent years adequate numbers of adult Wallowa stock steelhead have returned to Wallowa Hatchery to meet production goals. When or if adult returns to Wallowa hatchery are below production goals fish (adults or eggs) will be transferred from the Big Canyon facility to supplement spawning. (Wallowa FH 2009 Operations Plan, p9)

2. Adult collection procedures and holding

Wallowa FH

- Wallowa FH trap is installed when winter conditions allow, typically in February. Collections continue until no fish are caught for 10 consecutive days. Sorting will occur on Wednesdays. All Wallowa steelhead are held in the adult holding pond and spawned at Wallowa Hatchery. (2008 AOP, p 4-5)
- The majority of surplus fish will be distributed to food banks or stocked into fishing ponds. Stocking should occur by April 11th. Stocked fish will be identified by a missing adipose fin and 2-left opercle punches (2-LOP). Fish not out planted or given to Food Banks will be buried at Wallowa Hatchery. (2008 AOP, p 4-5)

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- Unmarked fish will be transported to the Fish Hatchery Lane Bridge and released. Samples include genetic (from opercle punch), sex, length. (2008 AOP, p 4-5)

Big Canyon Satellite Facility

- No broodstock will be required from Big Canyon. The Big Canyon trap will be installed when winter conditions allow which is typically in early-February. Collections will continue until no fish are caught for 10 consecutive days. (2008 AOP, p 4-5)
- From initial start-up through April 14, the ladder will be operated from 5 pm Monday through Friday morning. After sorting on Fridays, the ladder will remain closed through Monday 5 pm to keep hatchery fish more available to the angler. On April 14 the ladder will remain open throughout the trapping operation. Work trap on Friday's. Pass all unmarked fish above the weir in Deer Creek. All released fish will be measured and marked with a 1-LOP. (2008 AOP, p 4-5)
- No marked fish will be passed. All adults marked AdLV or AdRV will not be released and sampled for CWT recovery. Surplus hatchery fish will be outplanted, recycled or transferred to Wallowa Hatchery for disposition. (2008 AOP, p 4-5)
- Starting in late February and continuing through 11 April, approximately 100 fish will be re-cycled in the fishery. Fish will be uniquely marked with OP punch and outplanted at the Minam boat ramp. Recorded data should include fish checked in creel surveys, release location, OP punch, number of weeks to return to Big Canyon, number fish unaccounted, number that returned to Wallowa Hatchery (stray). Re-captures will be processed to food banks or landfill. (Wallowa FH 2009 Operations Plan, p3-4)

3. *Adult spawning*

a) Spawning protocols

- 1:1 male to female ratio and incubate 1 female per tray. Segregate the eggs collected from fall returning broodstock. Males from fall-collected brood may be used twice in the spawning protocols. (2008 AOP, p 4-5)
- A total of 450 adults should be spawned to meet production goals. Males – 225 (includes 180 production and 45 fall returning). Females – spawn 225 (180 production and 45 fall returning).
- Pre-spawning mortality of spring-collected adults is estimated at 1 % for females and 2.0% for males. (2008 AOP, p 4-5)
- The five-year average fecundity is 5,080 eggs/female. (ODFW AOP 2008, p 4-5)
- Spawning Dates – Wednesday.
March 12 – 19 females (15 Ad and 4 RV)

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March 19 – 33 females (27 Ad and 6 RV)

March 26 -- 42 females (33 Ad and 9 RV)

April 2 -- 42 females (33 Ad and 9 RV)

April 9 -- 41 females (33Ad and 8 RV)

April 16 -- 31 females (25 Ad and 6 RV)

April 23 – 17 females (14 Ad and 3 RV)

- If 9 females not ripe on March 12, no fish will be spawned for production. The first spawning day will be postponed until March 19 and production will be comprised from only six egg takes. The total of 225 females will be spawned. (ODFW AOP 2008, p 4-5)
- During recent years adequate numbers of adult Wallowa stock steelhead have returned to Wallowa Hatchery to meet production goals. When or if adult returns to Wallowa hatchery are below production goals fish (adults or eggs) will be transferred from the Big Canyon facility to supplement spawning. (Wallowa FH 2009 Operations Plan, p9)

b) No. of males and females spawned each year over past 10 years (table)
(Wallowa FH Annual Reports, 2008-1999)

BY	Females	Males
2008 * includes fall brood	225	215
2007 * includes fall brood	217	218
2006 * includes fall brood	233	222
2005 * include fall brood	284	282
2004 * includes fall brood	186	191
2003	222	226
2002	226	377
2001	227	232
2000	414	400
1999	485	460

4. Fertilization

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a) Protocols

- Spawners are selected randomly from ripe fish sorted on spawning day. Extra males are not used to increase fertilization rates of green eggs; however, occasional reuse of males occurs when male broodstock numbers are low. Target equal sex ratio 1 male to 1 female. Crosses are individual mating. In 2002, 2 males were used per females due to low motility observed in males; however, the results indicated that there was no survival advantage to the eyed egg stage. Eggs are water hardened in iodophor. (Grande Ronde Summer Steelhead HGMP, p 32)
- During spawnings at Wallowa Hatchery ovarian fluid is drained, eggs are fertilized and then water hardened in 100 ppm iodophor for 15 minutes. Green eggs are treated with formalin at target dose of 1667 ppm (1:600) for 15 minutes. Treatments occur two times per week have shown to prevent excessive fungus problems. (Grande Ronde Summer Steelhead HGMP, p 35)

b) Number of eggs collected and fertilized each year over past 10 years (table)

Table. Number of eggs collected and fertilized each year over past 10 years (Irrigon FH Annual Reports, ODFW steelhead annual reports 2008-1999)

BY	Green Eggs	Eyed Eggs	% Eye-up
2008 * include fall brood	1,185,685	1,084,100	91.14
2007 * include fall brood	1,177,850	1,080,180	91.71
2006 * include fall brood	1,322,780	1,158,150	87.76
2005 * include fall brood	1,510,600	1,122,900	74.33
2004 * include fall brood	1,133,750	994,600	87.73
2003	1,206,310	1,074,200	89.05
2002	1,331,551	1,206,728	90.63
2001	1,155,905	1,000,335	86.54
2000	2,046,530	1,822,100	89.03
1999	2,482,381	2,241,150	90.28

5. Incubation

- Incubator flow, eggs/tray, egg size and effluent dissolved oxygen for steelhead eggs incubated at Wallowa Hatchery, 1988-2002

Year	GPM per tray	Eggs per tray	Egg Size (eggs/gram)	Effluent D.O. (PPM)
1988	3.0	11,500-16,000		7.2 - 8.6
1989	3.0	11,500-16,000		7.2 - 8.6

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1990	3.0	11,500-16,000	7.94 - 7.20	7.2 - 8.6
1991	3.5	11,500-16,000	8.40 - 6.81	7.2 - 8.6
1992	4.0	11,500-16,000	10.23 - 7.20	7.2 - 8.6
1993	4.0	11,500-16,000	10.23 - 7.62	7.2 - 8.6
1994	4.0	11,500-16,000	8.32 - 6.46	7.2 - 8.6
1995	4.0	11,500-16,000	10.44 - 7.55	7.2 - 8.6
1996	3.5	11,500-16,000	10.08 - 8.82	7.2 - 8.6
1997	4.0	11,500-16,000	11.63 - 9.4	7.2 - 8.6
1998	4.0	11,500-16,000	11.63 - 9.35	7.2 - 8.6
1999	4.0	11,500-16,000	12.93 - 9.68	7.2 - 8.6
2000	4.0	11,500-16,000	13.0 - 9.3	7.2 - 8.6
2001	4.0	11,500-16,000	12.3 - 9.7	7.2 - 8.6
2002	4.0	11,500-16,200	10.8 - 9.6	7.2 - 9.0

- Incubation water parameters at Wallowa FH

Hatchery	Source	D.O.	Temp. (F)	Conditions
Wallowa	Well	8.4	56° Avg.	Clear and silt free
Wallowa	Spring	9.8	42°-53°	Clear and silt free

- Water temperature is continuously monitored via recording thermograph or set via chillers. Dissolved oxygen is monitored, but has never presented a problem for egg survival (Grande Ronde Summer Steelhead HGMP, p 34)
- Eyed eggs are transferred to Irrigon Hatchery. Incubation occurs on spring, well and temperature controlled well water.
- Irrigon FH receives approximately 1,027,000 Wallowa stock eyed eggs from Wallowa FH. Eggs are loaded into 20, 12-tray incubator units with a maximum number of eggs per 12-tray incubator unit at 120,000 eggs and approximate water use per 12-tray unit at 5gpm. Water use for the Wallowa incubation is 100 gpm, with maximum eggs per gpm at 24,000. Period of incubation is April and May. (Irrigon hatchery production criteria memo, incubation section)

6. Ponding

a) Protocols

Fry are initially reared in indoor starter tanks. Tanks are 6' diameter x 3' deep circular fiberglass with a water capacity at 2' depth of 423 gallons. Water exchanges per hour is 2.27, flow per tank is 25 gpm, maximum pounds per gpm is 3.42, maximum pounds per cubic foot is 1.52, and total flow required is 910 gpm. Approximately 975,650 Wallowa fry are loaded into 56 tanks at 400 fish per pound (2,195 lbs). Maximum pounds of fish per tank at 400 fish per pound is 85.5 lbs. Period of indoor rearing is June through mid-July. (Irrigon hatchery production criteria memo, indoor rearing section)

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b) Number of fry ponded each year, including % hatch each year

BY	Eyed Eggs	Smolts	% Eyed-eggs to smolts
2008 * include fall brood	1,025,250		
2007 * include fall brood	1,044,830	857,289	82.1
2006 * include fall brood	1,018,300	843,788	82.9
2005 * include fall brood	1,121,100	876,140	78.2
2004 * include fall brood	996,000	712,890	87.9
2003	1,075,400	783,822	89.1
2002	1,206,728	827,403	90.6
2001	1,000,335	843,809	86.5
2000	1,822,100	848,947	89.0
1999	2,241,150		90.28

- (Irrigon FH Annual Reports, ODFW steelhead annual reports 2008-1999)

7. Rearing/feeding protocols

- In mid-July through the end of April steelhead are transferred into 32 outdoor concrete raceways. Raceways are 100' x 20' x 5' with a capacity (at 3.5' water depth) of 52,367 cubic feet. Exchanges per hour is 1.77, velocity is 0.05 fps, flow per pond is 1,543 gpm (3.44 cfs), pounds of fish per gpm is 5.67, pounds of fish per cubic foot is 1.2, and total flow is 24,688 gpm (40cfs). (Irrigon hatchery production criteria memo, pond rearing section)
- Fish are reared in well water (seasonal temperature variations 50°F to 62°F).
- Dissolved oxygen levels are monitored during peak production and maintained above 6ppm. Raceways are cleaned weekly and mortalities are picked daily. (Grande Ronde Summer Steelhead HGMP, p 35)
- Fish are started on Bio Diet Starter then switched to Silver Cup Salmon from 800 fpp to smolt.
- Feed rate:
 - Start - 5.0% B.W./day
 - End - 0.9% B.W./day
 - The feed is distributed to the raceways with Garon feeders.
 - Food conversions are 1:1

(Grande Ronde Summer Steelhead HGMP, p 36)

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8. Fish growth profiles

BY 99 End of Month samples:

Month	Fish /Pound
June	1982
July	415
Aug	118
Sept	65
Oct	28
Nov	15
Dec	10
Jan	6
Feb ¹	5
Mar ¹	5
Apr	5

¹ Larger fish are transferred to acclimation ponds beginning in February, Growth is fairly constant. In October fish are programmed for size at release and fed no less than 70% AGR.. (Grande Ronde Summer Steelhead HGMP, p 36)

9. Fish health protocols and issues

- Disease treatments for Wallowa steelhead eggs are given at Wallowa and Irrigon Hatcheries. During spawnings at Wallowa Hatchery ovarian fluid is drained, eggs are fertilized and then water hardened in 100 ppm iodophor for 15 minutes. Green eggs are treated with formalin at target dose of 1667 ppm (1:600) for 15 minutes. Treatments three times per week have shown to prevent excessive fungus problems. Eyed eggs are transferred to Irrigon Hatchery and upon arrival are disinfected in 75 ppm iodophor for 10 minutes. Formalin treatments @ 1667 ppm are continued two times per week until hatch, which is usually no more than two weeks after arrival to Irrigon Hatchery. Juvenile fish are treated for bacterial infections if necessary with oxytetracycline under an Investigational New Animal Drug Permit (INAD). (Grande Ronde Summer Steelhead HGMP, p 34-36)

- **Wallowa Hatchery**

Adult Spawner Examinations, Wallowa 5608 StS – Two of 67 individual ovarian fluid samples collected in March are suspect positives for infectious hematopoietic necrosis virus (IHNV). Confirmation is pending.

Irrigon Hatchery

Pretransfer Monitoring, Wallowa 5607 StS – Two of six (33.3%) mort/moribund fish had APS bacteria. Two of five (40%) moribund fish examined for parasites had a low level of *Gyrodactylus* sp.

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(ODFW Fish Health March 2008 Monthly Report)

- **Wallowa Hatchery**

Adult Spawner Examinations, Wallowa 5608 StS – Infectious hematopoietic necrosis virus (IHNV) was confirmed in this stock. Ten of 156 (6.4%) females sampled through the end of April have been positive for IHNV.

Preliberation Examination, Wallowa 5607 StS – One of 12 (8.3%) mort/moribund fish had a low level of *F. psychrophilum*. No parasites were detected.

Big Canyon

Preliberation Examination, Wallowa 5607 StS – Two of 10 (20%) mort/moribund fish had heavy levels of *F. psychrophilum* and 1/10 (10%) had a low level of internal fungus. All had various sized open sores mostly between the pectoral fins on the ventral surface. Overall mortality was reported to be low this year.

(ODFW Fish Health April 2008 Monthly Report)

- **Irrigon**

Monthly Monitoring/Increased Loss, Wallowa 5608 StS – There was increased loss with this stock due to cold water disease bacteria, CWD. Twelve of 16 (75%) mort/moribund fish had *Flavobacterium psychrophilum* detected systemically. Fish Health recommended these be treated with Florfenicol for 10 days under a veterinary prescription.

(ODFW Fish Health June 2008 Monthly Report)

- **Irrigon**

Monthly Monitoring/Increased Loss, Wallowa 5608 StS – There was increased loss with this stock in some tanks due to cold water disease bacteria, CWD. Fourteen of 16 (87.5%) mort/moribund fish had *Flavobacterium psychrophilum* detected systemically. A 10 day Florfenicol treatment was given July 1-10 under a veterinary prescription and was recommended to be repeated if losses did not subside.

(ODFW Fish Health July 2008 Monthly Report)

- **Irrigon Hatchery**

Monthly Monitoring/Increased Loss, Wallowa 5608 StS – Early in August the losses went up again due to cold water disease bacteria, CWD. Florfenicol treatments were repeated under a veterinary prescription and losses came down. An examination later in August showed only low levels of CWD bacteria in 3/10 (30%) mortalities. In September 4/10 (40%) mort/moribund fish had moderate to heavy levels of APS bacteria.

(ODFW Fish Health August/September 2008 Monthly Report)

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- **Irrigon Hatchery**

Monthly Monitoring, Wallowa 5608 StS – Two of 10 (20%) mort/moribund fish had low levels of APS bacteria.

(ODFW Fish Health October 2008 Monthly Report)

- **Irrigon Hatchery**

Monthly Monitoring, Wallowa 5608 StS – Two of 10 (20%) mort/moribund fish had low levels of APS bacteria.

(ODFW Fish Health November 2008 Monthly Report)

- **Irrigon Hatchery**

Monthly Monitoring, Wallowa 5608 StS – Eight of 10 (80%) mort/moribund fish had APS bacteria. One moribund fish had a low level of *Gyrodactylus* sp. on skin scrapings.

(ODFW Fish Health December 2008 Monthly Report)

- **Irrigon Hatchery**

Monthly Monitoring, Wallowa 5608 StS – Seven of 10 (70%) mort/moribund fish had heavy levels of APS bacteria. No parasites were detected on skin scrapings.

(ODFW Fish Health January 2009 Monthly Report)

- **Irrigon Hatchery**

Monthly Monitoring/Pre-transfer Examination, Wallowa 5608 StS – No significant levels of systemic bacteria were detected. No parasites were detected on skin scrapings. We completed collections of heads for annual *Myxobolus cerebralis* examinations – results are pending.

Big Canyon Acclimation Facility

Increased Loss Examination, Wallowa 5608 StS – We examined post-hauling mortality and found no significant levels of systemic bacteria or pathogens to account for losses. Post-hauling stress caused by transfer to extremely cold water temperatures and lower flows into the acclimation ponds due to icing conditions made the adjustment of these fish to Big Canyon acclimation difficult.

(ODFW Fish Health February 2009 Monthly Report)

- **Irrigon Hatchery**

Pre-liberation Examination, Wallowa 5608 StS – Four of 10 (40%) mort/moribund fish had APS bacteria and four had moderate to heavy levels of mixed bacterial growth. One of four (25%) live fish examined for external parasites had a low level of *Gyrodactylus*.

Wallowa Hatchery

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Adult Spawner Examinations, Wallowa 5600 StS – We sampled 67 females in March. So far there is no evidence of any virus in samples from the first three spawns spawns. Viral assays are ongoing.

(ODFW Fish Health March 2009 Monthly Report)

10. Chemotherapeutant use

Coldwater disease has required antibiotic treatment in six of the last eight years. When needed, juvenile fish are treated with florfenicol (Aquaflor) to control coldwater disease while in the circular tanks. Prior to 2008, florfenicol used at 15 mg/kg for ten days (on fish pills) had been effective in controlling disease before the fish were moved into the outdoor raceways. In June 2008, there was an outbreak of coldwater disease in both the Wallowa and Little Sheep Creek stock steelhead and in accordance with new regulatory mandates, fish were treated with a lower dosage of florfenicol (10 mg/kg) beginning July 1st & 8th for 10 days. A repeat antibiotic treatment was required to control the disease in August after fish were moved into the raceways.

11. Tagging and marking of juveniles

Both Wallowa and Big Canyon releases are used for Comparative Survival Studies (CSS).

Current tagging regimes are as follows:

a. Wallowa

- 100,000 Ad, RV, CWT (fall-returning/experimental)
- 100,000 Ad, LV, CWT (production)
- 60,000 Ad, RV (fall-returning/experimental)
- 220,000 Ad only
- 12,700 PIT

b. Big Canyon marks include:

- 50,000 Ad, LV, CWT
- 270,000 Ad only
- 10,000 PIT

(ODFW AOP 2008, p 2, 31)

Number (/1)	Lbs	fpp	Location	In Facility	In River	Release Method (/3)	Marks
180,000	45,000	4.0	Wallowa Lower Acc	Feb 19-22	Apr 6-7	Forced	75K AdRVCWT; 75K AdLVCWT; 210K Ad only,
180,000	45,000	4.0	Wallowa Upper Acc	Feb 22-28	Apr 7-8	Forced	
80,000	20,000	4.0	Big Canyon Lower	Feb.29 – Mar 3	Apr 9-10	Forced	25K AdLVCWT; 55K Ad
80,000	20,000	4.0	Big Canyon Upper	Mar. 3-5	Apr 10-11	Forced	80K Ad
120,000	30,000	4.0	Wallowa Lower Acc	Apr. 14-17	Apr 26-May 8	Volitional	25K AdLVCWT; 25KAdRVCWT; 70K Ad
80,000	20,000	4.0	Big Canyon Lower Acc	Apr 16-17	Apr.29-May 12	Volitional	25K AdLVCWT; 55K Ad

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80,000 20,000 4.0 Big Canyon Upper Acc Apr 17-18 Apr 30-May 12 Volitional 80K Ad

12. Fish Release

a) Protocols⁸

Wallowa Acclimation: Approximately 480,000 smolts will be released from the Wallowa acclimation site, 360,000 in the early group and 120,000 in the late group.

Early Group: Approximately 360,000 smolts will be released after 5 to 7 weeks of acclimation			
Location	Transfer in date	<i>Release dates</i>	<i>Comments</i>
Lower Acclimation Pond	February 19-22	<i>April 6-Su</i>	The screens in the lower sections will be pulled on April 6 allowing fish to leave for 24 hours. On April 7, the remaining fish will be forced out of the lower section
		April 7-M	
Upper Acclimation Pond	February 22-28	April 7-M	The screens in the upper sections will be pulled on Monday allowing fish to leave for 24 hours. On April 8, the remaining fish will be forced out of the lower section
		April 8-T	
Note: Approximately 75,000 smolts released will be used for fall collected brood evaluations.			

Late Group: Approximately 120,000 smolts will be released after 1 to 3 weeks of acclimation.			
Location	Transfer in date	<i>Release dates</i>	<i>Comments</i>
Lower Acclimation Pond	April 14-17	April 26-Sa	The screens in the lower section will be pulled on April 26 allowing fish to leave for 12 days. On May 8, the remaining fish will be forced out of the upper and lower sections
		May 8-Th	
Note: Approximately 25,000 smolts released will be used for fall collected brood evaluations			

⁸ (2008 ODFW AOP, p 1-2)

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Big Canyon Acclimation: Approximately 320,000 smolts will be released from the Big Canyon acclimation site, 160,000 in the early group and 160,000 in the late group.

Early Group: Approximately 160,000 smolts will be released after 5 to 7 weeks of acclimation.			
Location	Transfer in date	<i>Release dates</i>	<i>Comments</i>
Lower Acclimation Pond	Feb. 29 to March 3	<i>April 9-W</i>	The screens in the lower sections will be pulled on April 9 allowing fish to leave for 24 hours. On April 10, the remaining fish will be forced out of the lower section
		<i>April 10-Th</i>	
Upper Acclimation Pond	March 3-5	April 10-Th	The screens in the upper sections will be pulled on April 10 allowing fish to leave for 24 hours. On April 11, the remaining fish will be forced out of the lower section
		April 11-F	

Late Group: Approximately 160,000 smolts will be released after 2 to 3 weeks of acclimation.			
Location	Transfer in date	<i>Release dates</i>	<i>Comments</i>
Lower Acclimation Pond	April 16-17	April 29 -T	The screens in the lower section will be pulled on April 29 allowing fish to leave for 13 days. On May 12, the remaining fish will be forced out.
		May 12 - M	
Upper Acclimation Pond	April 17-18	April 30-W	The screens in the upper section will be pulled on April 30 allowing fish to leave for 12 days. On May 12, the remaining fish will be forced out.
		May 12 - M	
Note: Prior to May 12 ODFW Fish Research will sample smolts in the acclimation pond. If >70% of the sample contains males, fish will be enumerated and up to 2,000 released in Wallowa Wildlife pond and 500 in Victor. If out planted, Fish Research will scan for PIT tags.			

b) Number of fish released each year (yearlings)

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800,000 Wallowa steelhead smolts are released into the Grande Ronde River at Wallowa FH (480,000) and Big Canyon Satellite Facility (320,000).

D. Program benefits and performance

1. Grande Ronde basin steelhead production contributes to fulfilling tribal trust responsibility mandates and treaty rights

1.1 Estimated number of program steelhead harvested in tribal fisheries by run year

1.2 Proportion of program harvest by tribal fisheries by run year

1.3 Estimated number of Grande Ronde basin wild steelhead harvested in tribal fisheries by run year

2. Program contributes to mitigation requirements

2.1 LSRCP compensation area harvest estimate by run year

2.2 Estimated recreational angler days in the Grande Ronde basin by run year

2.3 Estimated total hatchery adult harvest and escapement

3. Fish are produced in a manner enabling effective harvest while avoiding over-harvest of non-target fish

3.1 Run year harvest estimate by fishery

3.2 Estimated run year catch of listed species in associated fisheries

3.3 Run year recreational angler days in the Grande Ronde basin fishery

3.4 Annual escapement trend of wild steelhead as determined by key area spawning ground survey

4. Release groups are marked to enable determination of impacts and benefits in fisheries

4.1 Number of recovered marked fish reported in each by fishery produces accurate estimates of harvest

5. Efficiency of hatchery program in producing smolts

5.1 Survival by life stage for hatchery progeny

6. Hatchery program achieves sustainability

6.1 Number of broodstock collected

6.2 Number of smolts released

7. Broodstock collection does not reduce potential juvenile production in natural rearing areas

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7.1 Number of wild spawners passing to natural spawning areas

7.2 Number of wild fish handled during broodstock collection

7.3 Observed mortality of wild adults at trapping locations

8. Releases are marked to allow evaluation of effects on local natural populations

8.1 Visible mark ratio in hatchery release groups

9. Release numbers do not exceed habitat capacity for spawning, rearing, migration corridor, and estuarine and near-shore rearing.

9.1 Annual smolt release numbers in basin

9.2 Location and timing of releases

9.3 Proportion of residual hatchery smolts in key natural rearing areas

9.4 Outmigration behavior of hatchery smolts

9.5 Proportion of hatchery fish spawning in key natural spawning areas

9.6 Density of natural spawners in key spawning areas

10. Patterns of genetic variation within and among natural populations do not diverge as a result of artificial production

10.1 Genetic profiles of naturally produced juveniles from indicator areas compared in time series, samples at five year intervals

11. Hatchery produced adults do not exceed appropriate proportions of natural spawners

11.1 Proportion of hatchery fish in key steelhead natural spawning areas

12. Juveniles are released after sufficient acclimation to maximize homing ability to intended locations

12.1 Length of acclimation period

12.2 Proportion of adult returns to intended location

12.3 Proportion of hatchery fish in key steelhead natural spawning areas

13. Number of adult hatchery returns surplus to broodstock needs declines to an average of 75% of that seen the last five years

13.1 Number of hatchery adults collected surplus to broodstock needs

14. Artificial production program uses standard scientific procedures to evaluate various aspects of artificial propagation

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14.1 Scientifically based experimental design, with measurable objectives and hypotheses

15. Monitoring and evaluation occurs on an appropriate schedule and scale to assess progress toward achieving the experimental objective and evaluate the beneficial and adverse affects on natural populations

15.1 Monitoring and evaluation framework including detailed timeline

15.2 Annual and final reports

16. Facility operation complies with applicable fish health and facility operation standards and protocols

16.1 Annual reports indicating level of compliance with applicable standards and criteria

17. Effluent from artificial production facilities will not detrimentally affect populations,

17.1 Discharge water quality compared to applicable water quality standards and guidelines

18. Water withdrawals and diversion structures used in operation of artificial production facilities will not prevent access to natural spawning areas, affect spawning behavior of listed natural populations, or impact juvenile rearing

18.1 Water withdrawals compared to applicable passage criteria

18.2 Water withdrawal compared to NMFS juvenile screening criteria

18.3 Proportion of diversion of total stream flow between hatchery facility intake and out-fall

18.4 Length of stream impacted by water withdrawal

19. Releases do not introduce new pathogens into local populations, and do not increase the levels of existing pathogens

19.1 Certification of juvenile fish health immediately prior to release

19.2 Juvenile rearing density

20. Any distribution of carcasses or other products for nutrient enhancement meets appropriate disease control regulations and guidelines

20.1 Number and location of carcasses distributed for nutrient enrichment

20.2 Disease examination of all carcasses to be used for nutrient enrichment

20.3 Statement of compliance with applicable regulations and guidelines

21. Broodstock collection does not significantly alter spatial and temporal distribution of naturally populations

21.1 Number of wild adult fish aggregating or spawning immediately below the adult weir

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22. Weir/trap operations do not result in significant stress, injury or mortality in natural populations

22.1 Adult trapping mortality rate for wild fish

23. Predation by artificially produced fish on natural produced fish does not significantly reduce numbers of natural fish

23.1 Size at, and time of release of juvenile fish, compared to size and timing of natural fish present

23.2 Rate of observation of listed fish in stomachs of sampled hatchery steelhead

24. Juvenile production costs are comparable to or less than other regional programs designed with similar objectives

24.1 Total cost of program operation

24.2 Average cost of similar operations

25. Non-monetary societal benefits for which the program is designed are achieved

25.1 Recreational fishery angler days

26. Fish health problems associated with hatchery production do not adversely impact wild fish productivity

26.1 Health condition and history of fish released

(Grande Ronde Summer Steelhead HGMP, p 4-7)

1. Adult returns

a) Numbers of adult returns (need data for the past 10-20 years)

Facility	Year	Male	Female	Total
Wallowa	2008	1,625	1,210	2,835
Big Canyon	2008	626	624	1,250
Wallowa	2007	1,359	1,401	2,760
Big Canyon	2007	351	464	815
Wallowa	2006	1,601	1,370	2,971
Big Canyon	2006	894	1,243	2,137
Wallowa	2005	1,088	1,277	2,365
Big Canyon	2005	529	616	1,145
Wallowa	2004	2,086	1,170	3,256
Big Canyon	2004	726	710	1,436
Wallowa	2003	935	1,155	2,090
Big Canyon	2003	545	824	1,369

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Wallowa	2002	1,471	1,480	2,951
Big Canyon	2002	1,146	1,591	2,737
Wallowa	2001	678	584	1,262
Big Canyon	2001	353	509	862
Wallowa	2000	492	474	966
Big Canyon	2000	132	201	333
Wallowa	1999	530	635	1,165
Big Canyon	1999	171	391	562

(Wallowa FH Annual Reports, ODFW steelhead annual reports 2008-1999)

b) Return timing and age-class structure of adults

Timing of adult steelhead returns to LSRCP facilities in 2005 by location and origin.
(Oregon Summer Steelhead Evaluation Studies, 2005, p14)

Period	Week of the year	Number of fish trapped ^a					
		Wallowa		Big Canyon		Little Sheep	
		Hatcher y	Natural	Hatcher y	Natural	Hatcher y	Natural
Jan 22-28	4	-	-	-	-	-	-
Jan 29-Feb 04	5	-	-	0	0	-	-
Feb 05-11	6	-	-	0	0	-	-
Feb 12-18	7	0	0	0	0	-	-
Feb 19-25	8	5	0	0	0	-	-
Feb 26-Mar 04	9	42	0	3	1	0	0
Mar 05-11	10	149	0	70	4	47	1
Mar 12-18	11	638	0	9	0	164	16
Mar 19-25	12	312	0	28	1	149	14
Mar 26-Apr 01	13	264	0	280	5	89	8
Apr 02-08	14	342	1	283	11	513	39
Apr 09-15	15	213	0	113	6	349	36
Apr 16-22	16	221	2	172	26	301	27
Apr 23-29	17	116	2	96	17	329	37
Apr 30-May 06	18	44	0	7	1	53	6
May 07-13	19	13	0	8	4	25	3
May 14-20	20	1	0	0	0	6	1
May 21-27	21	0	0	0	1	0	0
May 28-Jun 03	22	-	-	-	-	-	-
Total		2,360	5	1,069	77 ^b	2,025	188

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a. Weirs installed on 25th January at Big Canyon Facility (Deer Cr.) and 25th February at Little Sheep Creek Facility, and the ladder opened on 8th February at Wallowa Fish Hatchery. Adult collections stopped on 23rd May at Big Canyon Facility, and 26th May at both Little Sheep Creek Facility and Wallowa Fish Hatchery.

b. Includes one wild female observed in the ladder below the trap while it was being dewatered on 23 May 2005. The fish was sampled and passed above the weir.

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Table. Number, disposition, and mean fork length (mm) of adult steelhead that returned to LSRCP facilities in 2005 by stock, origin, estimated age (freshwater:saltwater), and gender. Fall broodstock were captured in the lower Grande Ronde River and transported to the hatchery. M indicates male and F indicates female. WFH indicates Wallowa Fish Hatchery. (Oregon Summer Steelhead Evaluation Studies, 2005, p15)

Facility, stock, disposition	Hatchery ^a									Natural ^b											Grand total	
	1:1		1:2		2:1		3:1		Total	2:1		2:2		3:1		3:2		4:1		Total		
	M	F	M	F	M	F	M	F		M	F	M	F	M	F	M	F					
Wallowa Fish Hatchery (Wallowa stock)																						
Trapped	890	354	386	730	0	0	0	0	2,360	0	0	0	1	0	2	1	1	0	0	5	2,365	
Passed	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	1	1	0	0	5	5	
Outplanted	36	9	13	15	0	0	0	0	73	0	0	0	0	0	0	0	0	0	0	0	73	
Kept	854	345	373	715	0	0	0	0	2,287	0	0	0	0	0	0	0	0	0	0	0	2,287	
Mortality	21	1	5	3	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	30	
Spawned ^c	156	52	82	190	0	0	0	0	480	0	0	0	0	0	0	0	0	0	0	0	480	
Killed ^d	677	292	286	522	0	0	0	0	1,777	0	0	0	0	0	0	0	0	0	0	0	1,777	
Fork length (mm)	570	558	702	694	-	-	-	-		-	-	-	-	-	-	-	-	-	-			
Standard dev.	37	25	48	53	-	-	-	-		-	-	-	-	-	-	-	-	-	-			
Sample size	16	9	12	28	-	-	-	-		-	-	-	-	-	-	-	-	-	-			
Wallowa Fish Hatchery (Wallowa Stock-Fall Broodstock)																						
Transferred to WFH	51	18	11	28	0	0	0	0	108	0	0	0	0	0	0	0	0	0	0	0	108	
Passed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Outplanted	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Kept	51	18	11	28	0	0	0	0	108	0	0	0	0	0	0	0	0	0	0	0	108	
Mortality	8	1	1	1	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	11	
Spawned	35	16	9	26	0	0	0	0	86	0	0	0	0	0	0	0	0	0	0	0	86	
Killed ^d	8	1	1	1	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	11	
Fork length (mm)	558	559	-	615	-	-	-	-		-	-	-	-	-	-	-	-	-	-			
Standard dev.	31	23	-	47	-	-	-	-		-	-	-	-	-	-	-	-	-	-			
Sample size	6	4	-	4	-	-	-	-		-	-	-	-	-	-	-	-	-	-			
Big Canyon Facility (Wallowa stock)																						
Trapped ^e	390	205	104	370	0	0	0	0	1,069	9	12	1	11	20	12	4	6	1	1	77	1,146	
Passed	0	0	0	0	0	0	0	0	0	9	12	1	11	20	12	4	6	1	1	77	77	
Outplanted	83	30	9	45	0	0	0	0	167	0	0	0	0	0	0	0	0	0	0	0	167	
Return to River ^f	7	1	1	9	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	18	

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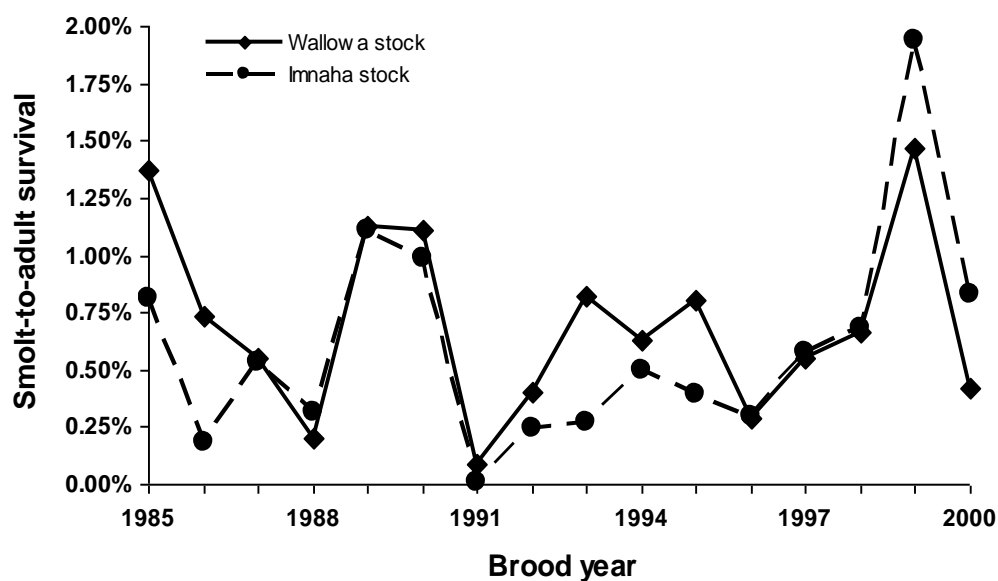
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Kept	530	486	70	137	0	9	1	1	1,216	0	0	0	0	0	0	0	0	0	0	0	1,216
Mortality	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Spawned	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killed ^{d,f}	299	174	94	316	0	0	0	0	883	0	0	0	0	0	0	0	0	0	0	0	883
Fork length (mm)	-	-	-	-	-	-	-	-	-	598	555	-	684	645	-	-	-	-	-	-	-
Standard dev.	-	-	-	-	-	-	-	-	-	4	14	-	46	-	-	-	-	-	-	-	-
Sample size	-	-	-	-	-	-	-	-	-	2	6	-	5	1	-	-	-	-	-	-	-

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c) Smolt-to-adult return rates

Smolt-to-adult survival rates for Willowa and Imnaha stock summer steelhead, 1985-2000 brood years. Data is based on CWT recoveries. (Oregon Summer Steelhead Evaluation Studies, 2005, p9)



d) Stock productivity (e.g. recruits per spawner)

The recruit per spawner for the Willowa steelhead program has been estimated at 15.0. This includes all adult recovery data within the Columbia River Basin. (HSRG, 2009)

2. Contributions to harvest and utilization (e.g. food banks)

- Harvest and escapement distribution of adult summer steelhead by recovery location for the 2004-05 run year using the PSMFC and ODFW mark recovery databases. "C and S" indicates ceremonial and subsistence tribal fisheries. Data were summarized as available through December 2008. "-" indicates not sampled or undefined. (Oregon Summer Steelhead Evaluation Studies, 2005, p21)

Location	Willowa Stock			Imnaha Stock		
	Estimate d CWT recoveri es	Total return	Percen t of total return	Estimate d CWT recoveri es	Total return	Percent of total return
Ocean harvest	1	2	0.0	0	0	0.0
Columbia River Harvest						
Treaty net	25	177	1.4	14	38	1.0

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C and S	0	0	0.0	0	0	0.0
Sport	36	312	2.4	41	108	2.9
Test	0	0	0.0	0	0	0.0
Tributary sport	0	0	0.0	0	0	0.0
Deschutes River Harvest						
Sport	9	45	0.3	11	35	0.9
C and S	0	0	0.0	0	0	0.0
Strays						
Outside Snake R. Basin ^a	22	175	1.4	8	32	0.9
Within Snake R. Basin [*]	5	28	0.2	0	0	0.0
SNAKE RIVER sport, tribs.*	545	3,874	30.1	177	514	13.7
Oregon tributary harvest ^b	380	4,820	37.5	112	278	7.4
Other in-basin escapement ^{* c}	-	0	0.0	-	720	19.2
Hatchery weir ^{* d}	298	3,429	26.7	298	2,027	54.0
Total estimated return	1,321	12,862	100	661	3,752	100
Return to compensation area		12,151			3,539	
Percent of compensation goal		132.3			177.0	

^{*} Indicates areas defining the compensation area. The compensation goal for Wallowa stock is 9,184 adults and the goal for Imnaha stock is 2,000 adults.

^a Due to lost snouts (N = 10) at Warm Springs National Fish Hatchery for the 2004-05 run year (David Hand, personal communication, 1/8/09), no CWT data was available for this recovery area. Therefore, total returns in areas outside of the Snake River Basin may be underestimated.

^b Harvest estimates based on angler surveys and harvest card returns.

^c Total returns to other in-basin escapement areas are escapement estimates of off-station direct stream releases based on coded-wire tag returns of direct stream release groups at hatchery weirs.

^d Total returns to the hatchery weir are actual numbers, except with the Imnaha stock where there is an estimated number of CWT fish recovered at the Little Sheep Creek Facility weir. This estimate is based on the actual number of CWT fish recovered at the weir and estimated number either passed above the weir to Little Sheep Creek or outplanted to Big Sheep Creek to spawn naturally.

(Oregon Summer Steelhead Evaluation Studies, 2004, p22)

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- Catch and escapement distribution of adult summer steelhead by recovery location for the 2002-2003 run year using the PSMFC and ODFW mark recovery databases. "C and S" indicates ceremonial and subsistence tribal fisheries. Data were summarized as available through January 2007. "-" indicates not sampled or undefined. (Oregon Summer Steelhead Evaluation Studies, 2003 Annual Progress Report, p19)

Location	Wallowa Stock			Imnaha Stock		
	Estimated CWT recoveries	Total return	Percent of total return	Estimated CWT recoveries	Total return	Percent of total return
Ocean catch	3	19	0.2	0	0	0.0
Columbia River						
Treaty net	61	283	3.1	12	56	1.5
C and S	0	0	0.0	0	0	0.0
Sport	65	256	2.8	84	430	11.4
Test	0	0	0.0	0	0	0.0
Tributary sport	2	12	0.1	0	0	0.0
Deschutes River						
Sport	50	207	2.3	16	88	2.3
C and S	0	0	0.0	0	0	0.0
Strays						
Outside Snake R. Basin	86	451	5.0	0	0	0.0
Within Snake R. Basin*	0	0	0.0	1	5	0.1
Snake River sport, tribs.*	279	1,752	19.3	109	521	13.9
Oregon tributaries* ^a	205	2,642	29.1	47	239	6.4
Other in-basin escapement* ^b	-	0	0.0	-	510	13.6
Hatchery weir* ^c	389	3,458	38.1	352	1,907	50.8
Total estimated return	1,140	9,080	100.0	621	3,756	100.0
Return to compensation area		7,852			3,182	
Percent of compensation goal		85.5			159.1	

* Indicates areas defining the compensation area. The compensation goal for Wallowa stock is 9,184 adults and the goal for Imnaha stock is 2,000 adults.

^a Total returns to Oregon tributaries are harvest estimates based on angler surveys and harvest card returns.

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^b *Total returns to other in-basin escapement areas are escapement estimates of off-station direct stream releases based on coded-wire tag returns of direct stream release groups at hatchery weirs.*

^c *Total returns to the hatchery weir are actual numbers, except with the Imnaha stock where there is an estimated number of CWT fish recovered at the Little Sheep Creek Facility weir. This estimate is based on the actual number of CWT fish recovered at the weir and estimated number either passed above the weir to Little Sheep Creek or outplanted to Big Sheep Creek to spawn naturally.*

3. Contributions to conservation

The program is a segregated program with no conservation objectives.

4. Other benefits

Adults in excess to broodstock needs and in-river harvest are distributed to food banks, stocked into area fishing ponds, or buried. (ODFW AOP 2008, p3,4)

E. Research, monitoring, and evaluation programs

Objectives

1. Document summer steelhead rearing and release activities at all LSRCP facilities.
2. Determine optimum rearing and release strategies that will produce maximum survival to adulthood for hatchery-produced summer steelhead smolts.
3. Document summer steelhead adult returns by stock to each LSRCP broodstock collection facility.
4. Determine if the total production of summer steelhead adults meets mitigation goals, and index annual smolt survival and adult returns to Lower Granite Dam for production groups.
5. Participate in planning activities associated with anadromous fish production and management in the Grande Ronde and Imnaha river basins, and participate in ESA permitting, consultation, and rearing activities.
6. Monitor natural spawning of summer steelhead in selected areas within the Grande Ronde Basin.
7. Determine the number of summer steelhead harvested annually and angler effort in recreational fisheries on the Grande Ronde, Wallowa, and Imnaha rivers.

(Oregon Summer Steelhead Evaluation Studies, 2005, p1)

F. Program conflicts

1. *Biological conflicts (e.g. propagated stock maladapted to hatchery water source)*

The dissolved oxygen content in pumped water at Irrigon FH is marginal at certain times of the year and must be enhanced with an aeration facility and liquid oxygen.

2. *Harvest conflicts (e.g. mixed stock fishery on hatchery and wild fish limits harvest opportunities on hatchery fish)*

Currently, the sport fishery on steelhead is a mixed stock fishery. Wild fish are encountered, but cannot be retained by anglers. There is likely some level of hooking mortality to wild origin steelhead. These impacts have been estimated and presented to NOAA Fisheries as part of the FMEP to operate fisheries in SE Washington.

3. *Conservation conflicts and risks*

a) Genetic conflicts associated with straying and natural spawning of hatchery fish (Stray rates, proportion of hatchery-origin fish on natural spawning grounds, etc. Provide tables or figures where appropriate)

- Although straying has been identified as an issue related to direct stream release of smolts, discontinuation of direct stream releases will minimize potential for straying within the basin.
- Development of an early returning broodstock to the Grande Ronde from the Wallowa stock was initiated to modified hatchery steelhead adult return timing to emphasize fall entry into the Grande Ronde thereby reducing potential for straying into Columbia River tributaries and emphasizing harvest within the LSRCP compensation area. ODFW is currently trying to accomplish this shift by developing a new Grande Ronde basin hatchery broodstock comprised of early returning hatchery origin broodstock collected from the lower Grande Ronde River during the fall. (Grande Ronde Summer Steelhead HGMP, p8-9).

b) Ecological conflicts (e.g. competition between hatchery fish and wild fish, predation,)

- Release of all production fish will occur at the smolt stage thereby reducing potential interaction with rearing naturally produced fish. (Grande Ronde Summer Steelhead HGMP, p4).

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4. Other conflicts between the hatchery program, or fish produced by the program, and other non-hatchery issues

No information provided.

IIB. Little Sheep Creek Summer Steelhead, Irrigon FH

A. General information

Irrigon FH was constructed in 1985 under the LSRCP Program, as authorized by the Water Resources Development Act of 1976, Public Law 94-587, to offset losses caused by the four Lower Snake River dam and navigation locks projects. Irrigon FH was designed to rear 280,000 pounds (1,600,000 smolts) of steelhead (6 fpp) for both The Grande Ronde and Imnaha river programs for release off station. All adults for the Imnaha program were to be trapped at Little Sheep Satellite Facility. The facility includes adult trapping/holding facilities, and acclimation ponds. Wallowa FH also provides early incubation for the program. The adult return goals for the Imnaha program is 2,200 steelhead back to the Imnaha River. (Herrig 1990, p25)

B. Stock/Habitat/Harvest Program Goals and Purpose

1. *Purpose and justification of program*

Irrigon FH was constructed in 1985 under the LSRCP Program, as authorized by the Water Resources Development Act of 1976, Public Law 94-587, to offset losses caused by the four Lower Snake River dam and navigation locks projects. Irrigon FH was designed to rear 280,000 pounds (1,600,000 smolts) of steelhead (6 fpp) for release off station.

2. *Goals of program*

The goal of this program is to return 2,000 adult steelhead to the Snake River Basin above Ice Harbor Dam to mitigate for survival reductions resulting from construction and operation of the four lower Snake River dams.

3. *Objectives of program*

- Collect 67 males and 67 females (6 wild males and 6 wild females) to spawn 134 adults (67 females). Broodstock numbers were determined based on a 5-year average of pre-spawning mortality (1.0% females; and 2.0% males) and mean fecundity of 4,963. (ODFW AOP 2008, p 7)
- Collect 315,000 green eggs to produce 282,000 eyed eggs (89.9% green egg to eyed egg survival). Transfer 282,000 eyed eggs to Irrigon FH to produce 215,000 smolts (76.2% eyed egg to smolt survival). (ODFW AOP 2008, p 5-6)
- Release 165,000 smolts into Little Sheep Ck. and 50,000 smolts into Big Sheep Ck. (ODFW AOP 2008, p 5-6)

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- The adult return goal for the program is 2,000 steelhead to the Imnaha River. (Herrig 1990, p25)

4. Type of program (Integrated or Segregated)

Integrated Harvest: A combination of harvest augmentation - "to increase sport and/or commercial harvest opportunities by releasing artificially propagated salmon smolts" (IMST 2001-1) and supplementation - "to increase the abundance of an existing, but depleted population". IMST has defined supplementation as "the use of artificial propagation in the attempt to maintain or increase natural production while maintaining long-term fitness of the target population, and keeping the ecological and genetic impacts on non-target populations within specified biological limits" (RASP 1992). (Imnaha Summer Steelhead HGMP, p 4)

5. Alignment of program with ESU-wide plans

The Little Sheep Hatchery Program provides adult steelhead for recreational and tribal harvest within the Lower Snake River Compensation Plan mitigation area (Snake River and tributaries above Ice Harbor Dam). The program utilizes an endemic steelhead hatchery stock that was founded on summer steelhead indigenous to Little Sheep Creek. Wild adults from Little Sheep Creek are incorporated within the broodstock annually and hatchery origin adults are allowed to spawn naturally in Little Sheep Creek each year. A portion of returning adults and smolts are also released into Big Sheep Creek to "supplement" natural spawner numbers. (Imnaha Summer Steelhead HGMP, p 4)

6. Habitat description and status where fish are released.

Human development and land management impacts consistent with those identified across the Columbia Basin affect steelhead production in the Imnaha basin. Loss of channel diversity, sedimentation, reduced stream flows, habitat constriction due to effects of irrigation withdrawn, water temperature and fragmentation of habitat all affect productivity of natural steelhead populations within the watershed. State programs in place through the Department of Environmental Quality, Department of Forestry and Division of State Lands along with federal Clean Water Act and Corps of Engineer 404 regulations provide standards for activities on private land that might otherwise contribute to the problems listed above. Activities on public lands or federally funded must additionally meet Endangered Species Act listed species protection criteria developed through consultation with US Fish and Wildlife Service and National Marine Fisheries Service as well as National Environmental Protection Act (NEPA) review.

These protection programs in conjunction with ongoing private and publicly funded restoration efforts have resulted in an upward trend in steelhead habitat in many Imnaha basin streams. Most watershed restoration/improvement projects are funded through the Grande Ronde Model Watershed Program, Oregon Watershed Enhancement Board, Bonneville Power Administration funded Northwest Power Planning Council's (NPPC) Fish and Wildlife Program, Mitchell Act Program and Natural Resource Conservation Service's (NRCS) Conservation Reserve Enhancement Program (CREP). Efforts include fencing streamside corridors to promote riparian vegetative recovery, improved fish passage at road crossings and diversions, reduced sediment production from roads and cropland and screening of irrigation

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diversions. Some programs like the Mitchell Act screening program began almost 50 years ago while others like CREP are very recent. Taken together habitat protection and improvement measures are (and will) continue to improve habitat for (and productivity of) the basin's wild summer steelhead populations. (Imnaha Summer Steelhead HGMP, p 17)

7. Size of program and production goals (No. of spawners and smolt release goals)

- Approximately 67 males and 67 females (6 wild males and 6 wild females) to spawn 134 adults (67 females) are needed for the Imnaha steelhead program. (ODFW AOP 2008, p 7)
- 165,000 smolts released into Little Sheep Ck. and 50,000 smolts released into Big Sheep Ck. (ODFW AOP 2008, p 5-6)

C. Description of program and operations

1. Broodstock goal and source

Broodstock is indigenous to Little Sheep Creek and has been collected at Little Sheep Creek facility annually since the start of the program (1982). (Imnaha Summer Steelhead HGMP, p 22)

2. Adult collection procedures and holding

- Little Sheep trap will be installed when winter conditions allow typically in late-February. Collections will continue until no fish are caught for 10 consecutive days, usually around early June. During the trapping period, adults are collected for broodstock. Surplus hatchery-origin returns are outplanted to Big Sheep Creek. The maximum number of fish that can be outplanted into Big Sheep Creek is unclear. The natural-origin escapement objective for Big Sheep Creek is 500 adults; however it is unclear how the escapement is determined annually. The 2009 AOP indicates that surplus hatchery-origin returns are used to meet this escapement objective. From 1999 through 2008 an average of 1,186 (range 42-2,030) have been outplanted into Big Sheep Creek for natural spawning.

(pNOB) Less than 25% of the natural-origin steelhead returning to the weir are collected and retained for broodstock; all others are passed upstream to spawn naturally. Program operations have attempted to incorporate at least 5% natural-origin fish in the broodstock annually and has averaged 7.4% with a range of 3.7% to 12.1% natural-origin fish (2001-2005).

The guideline for the proportion of natural fish in the broodstock is as follows: At less than or equal to 100 natural returns, use 10% of natural run for broodstock. At greater than 100 natural returns, use 10 natural fish plus 40% of the natural run greater than 100 for broodstock. A total of 134 adults (hatchery and natural origin combined) are required for broodstock. Examples:

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100 wild - 10 natural adults for broodstock

150 wild - 30 natural adults

200 wild – 50 natural adults

250 wild - 70 naturals adults

300 wild – 90 naturals adults

- From 1999 through 2008 an average of 71.85% of the fish passed upstream have been hatchery origin (pHOS). In 2008, 50.17% hatchery-origin steelhead were passed upstream.
- The weir on Little Sheep Creek is 100% effective, excluding all migration upstream past the facility except through the ladder and trap.
- The adult concrete holding pond is 40' x 20' x 4.00' (3,200 cubic feet volume). Water from Little Sheep Creek is diverted to the holding pond at 2300 gpm. Target maximum densities are 2.5 ft³/fish and 2 gpm/fish.
- All known out-of-basin, hatchery-origin strays are removed and destroyed.

(ODFW AOP 2009)

3. Adult spawning

a) Spawning protocols

- **Expected Spawning Frequency** – Spawning is done once per week.
- **Spawning Strategies** – Target sex ratio for this program has been a 1:1 male-to-female spawning ratio. Hatchery and natural-origin (estimated at 6 males and 6 females) fish are matrix spawned usually in 3 X 3 combinations with the intent of not using less than 1 natural fish in any group to maximize the contribution of natural-origin fish. . A maximum of 18 fish are spawned per spawn day. Natural-origin composition in hatchery brood is estimated at 10%.

b) No. of males and females spawned each year over past 10 years (table)

BY	Females	Males
2008	66	60
2007	79	71
2006	81	83
2005	95	87
2004	95	96
2003	84	90
2002	105	111
2001	109	112
2000	120	98
1999	127	91

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(Irrigon FH Annual Reports, ODFW steelhead annual reports 2008-1999)

4. Fertilization

a) Protocols

- Spawners are selected systematically, according to previously established pass/keep guidelines, from fish returning to the weir each week across the run. Recovery of adipose left-ventral clipped fish is encouraged when selecting hatchery-origin spawners. Hatchery broodstock are selected at random for spawning as they mature. Wild fish contribution is maximized by attempting to incorporate them into the maximum number of matrices.
- Target sex ratio for this program has been a 1:1 male-to-female spawning ratio. See Tables 8 for actual spawning ratios from 1990 to present. Males are retained at a higher rate from the early portion of the run to compensate for the lack of males at the end of the run.
- Matrix spawning is accomplished in 3x3 combinations. Number of groups containing at least one wild fish is maximized. Wild males are live spawned and passed upstream.
- Spawners are collected systematically, by sex from across the run. Wild fish are included in each brood and matrix-spawning strategies maximize contribution of wild fish to spawner groups. Matrix spawning attempts to utilize wild fish in as many groups as possible. Spawning groups are tracked. Those containing only hatchery by hatchery crosses may be culled subsequent to pathology determination. Wild x wild and hatchery x wild crosses are retained unless severe pathology conditions exist. (Imnaha Summer Steelhead HGMP, p 28)

b) Number of eggs collected and fertilized each year over past 10 years (table)

BY	Green Eggs	Eyed Eggs	% Eye-up
2008	297,350	263,300	88.55
2007	397,990	355,490	89.32
2006	408,230	370,990	90.88
2005	439,275	397,400	90.47
2004	432,180	398,120	92.12
2003	467,350	408,320	87.37
2002	514,670	425,475	82.67
2001	479,970	389,630	81.18
2000	568,500	464,730	81.75

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1999	606,740	516,190	85.08
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(Wallowa FH Annual Reports, 2008-1999) (Irrigon FH Annual Reports, ODFW steelhead annual reports 2008-1999)

5. Incubation

- Green eggs will be incubated at Wallowa Hatchery. Embryos will be transferred to Irrigon Hatchery as eyed eggs and will represent all egg takes. (ODFW AOP 2008, p 7)
- Incubator flow, eggs/tray, egg size and effluent dissolved oxygen for steelhead eggs incubated at Wallowa Hatchery, 1988-2000 (pers. comm. Greg Davis 2009).

Year	GPM per tray	Eggs per tray	Egg Size (eggs/gram)	Effluent D.O. (PPM)
1988	3.0	11,500-16,000		7.2 - 8.6
1989	3.0	11,500-16,000		7.2 - 8.6
1990	3.0	11,500-16,000	7.94 - 7.20	7.2 - 8.6
1991	3.5	11,500-16,000	8.40 - 6.81	7.2 - 8.6
1992	4.0	11,500-16,000	10.23 - 7.20	7.2 - 8.6
1993	4.0	11,500-16,000	10.23 - 7.62	7.2 - 8.6
1994	4.0	11,500-16,000	8.32 - 6.46	7.2 - 8.6
1995	4.0	11,500-16,000	10.44 - 7.55	7.2 - 8.6
1996	3.5	11,500-16,000	10.08 - 8.82	7.2 - 8.6
1997	4.0	11,500-16,000	11.63 - 9.4	7.2 - 8.6
1998	4.0	11,500-16,000	11.63 - 9.35	7.2 - 8.6
1999	4.0	11,500-16,000	12.93 - 9.68	7.2 - 8.6
2000	4.0	11,500-16,000	12.99 - 9.26	7.2 - 8.6

- Incubation to the eyed-egg stage occurs on spring and well water at Wallowa Hatchery and from eyed-egg stage to hatching on temperature controlled well water at Irrigon Hatchery. Sediment is not a problem at either site (pers. comm. Greg Davis 2009).

Incubation water parameters at Wallowa and Irrigon hatcheries

Hatchery	Source	D.O. (mg/L)	Temp. (F)	Conditions
Wallowa	Well	8.4	56° Avg.	Clear and silt free
Wallowa	Spring	9.8	42°-53°	Clear and silt free

- *Wallowa and Irrigon Hatcheries* – Water temperature is continuously monitored via recording thermograph or via chillers for water entering incubation trays. Dissolved oxygen has never presented a problem for egg survival. (Imnaha Summer Steelhead HGMP, p 29-30)

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6. Ponding

a) Protocols

Fry are initially reared in indoor starter tanks. Tanks are 6' diameter x 3' deep circular fiberglass with a water capacity at 2' depth of 423 gallons. Water exchanges per hour is 2.27, flow per tank is 25 gpm, maximum pounds per gpm is 3.42, maximum pounds per cubic foot is 1.52, and total flow required is 910 gpm. Approximately 267,900 Imnaha fry are loaded into 12 tanks at 400 fish per pound (602 lbs). Maximum pounds of fish per tank at 400 fish per pound is 85.5 lbs. Period of indoor rearing is June through mid-July. (Irrigon hatchery production criteria memo, indoor rearing section)

b) Number of fry ponded each year, including % hatch each year

BY	Eyed Eggs	Smolts	% Eyed-eggs to smolts
2008	263,300		
2007	344,980	275,834	79.96
2006	350,900	269,264	76.74
2005	397,400	289,967	72.97
2004	398,120	300,914	93.5*
2003	408,320	302,013	89.5*
2002	425,475	373,452	98.5*
2001	389,630	296,713	93.5*
2000	464,730	342,622	93.9*
1999	516,190	328,213	90.9*

*Embryos that were culled from production and not incubated and reared at Irrigon Fish Hatchery were subtracted from the calculation of embryo-to-smolt survival.

(Irrigon FH Annual Reports, 2008-1999)

7. Rearing/feeding protocols

- In mid-July through the end of April steelhead are transferred into 32 outdoor concrete raceways. Raceways are 100' x 20' x 5' with a capacity (at 3.5' water depth) of 52,367 cubic feet. Exchanges per hour is 1.77, velocity is 0.05 fps, flow per pond is 1,543 gpm (3.44 cfs), pounds of fish per gpm is 5.67, pounds of fish per cubic foot is 1.2, and total flow is 24,688 gpm (40cfs). (Irrigon hatchery production criteria memo, pond rearing section)
- Fish are reared in well water (seasonal temperature variations 50°F to 62°F).
- Dissolved oxygen levels are monitored during peak production and maintained above 6ppm. Raceways are cleaned weekly and mortalities are picked daily. (Imnaha Summer Steelhead HGMP, p 31)
- Fish are started on Bio Diet Starter then switched to Silver Cup Salmon from 800 fpp to smolt.

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- Feed rate:
Start - 5.0% B.W./day
End - 0.9% B.W./day
- The feed is distributed to the raceways with Garon feeders.
- Food conversions are 1.1

(Imnaha Summer Steelhead HGMP, p 32)

8. *Fish growth profiles*

End of month weight for samples of Little Sheep steelhead juveniles, 2001

Month	Fish /Pound
June	3100
July	430
Aug	154
Sept	77
Oct	40
Nov	21
Dec	12.5
Jan	8.3
Feb ¹	5.8
Mar ¹	5.2
Apr	5.0

¹ Larger fish are transferred to acclimation ponds beginning in February

(Imnaha Summer Steelhead HGMP, p 31)

9. *Fish health protocols and issues*

- Juvenile fish are treated for bacterial infections if necessary with oxytetracycline under an Investigational New Animal Drug Permit (INAD). (Imnaha Summer Steelhead HGMP, p 32)

Pretransfer Monitoring, Imnaha 2007 StS – No problems reported or detected.

(ODFW Fish Health March 2008 Monthly Report)

Little Sheep

Adult Spawner Examinations, Imnaha 2008 StS – One of 40 (2.5%) females sampled through the end of April are suspect positives for infectious hematopoietic necrosis virus

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(IHNV). Confirmation is pending. Forty-two possible nutrient enrichment fish were sampled for virus and *Myxobolus cerebralis* (whirling disease) – results pending.

Preliberation Examination, Imnaha 2907 StS – One of 10 (10%) mort/moribund fish had a low level of *F. psychrophilum*. Five of 10 (50%) had open sore areas between the pectoral fins, lower jaw and behind the head.

(ODFW Fish Health April 2008 Monthly Report)

Little Sheep

Adult Spawner Examinations, Imnaha 2908 StS – Infectious hematopoietic necrosis virus was confirmed in this stock at a low prevalence. One of 67 (1.5%) females sampled throughout the 2008 spawning season has been confirmed to be positive for infectious hematopoietic necrosis virus (IHNV). A few samples are still pending.

Nutrient Enrichment Fish - We completed sample collections from a total of 50 possible nutrient enrichment fish. BKD ELISA and *Myxobolus cerebralis* (whirling disease) results are pending. Possible spores of *M. cerebralis* have been found in many of the samples – confirmation is pending. There have been no virus detections in any of these fish - a few samples are pending.

(ODFW Fish Health May 2008 Monthly Report)

Little Sheep

Nutrient Enrichment Fish, Imnaha 2908 StS – Bacterial kidney disease ELISA testing was completed. One had a BKD ELISA value of 0.174 OD units and all others were ≤ 0.099 OD units. *Myxobolus cerebralis* (Whirling Disease) results are pending. All samples were negative for virus.

Irrigon

Monthly Monitoring, Imnaha 2908 StS – One of three (33.3%) mortalities had a moderate level of CWD bacteria and 2/3 (66.7%) had APS bacteria.

(ODFW Fish Health June 2008 Monthly Report)

Little Sheep

Nutrient Enrichment Fish, Imnaha 2908 StS – Test results were completed for *Myxobolus cerebralis* (Whirling Disease). Seventeen of 65 fish tested were cleared for use as nutrient enrichment fish.

Irrigon

Monthly Monitoring/Increased Loss, Imnaha 2908 StS – Six of 10 (60%) mortalities had low-moderate levels of CWD bacteria and 2/10 (20%) had APS bacteria. Losses went up early in the month and a 10 day Florfenicol treatment was given July 8-17. Losses subsided following this treatment.

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(ODFW Fish Health July 2008 Monthly Report)

Monthly Monitoring/Increased Loss, Imnaha 2908 StS – Four of 10 (40%) mortalities had CWD bacteria and 1/10 (10%) had APS bacteria. Losses were up for a short period later in August but then subsided without a repeat treatment of Florfenicol. In September, 5/10 (50%) mort/moribund fish had APS bacteria.

(ODFW Fish Health August/September 2008 Monthly Report)

Irrigon Hatchery

Monthly Monitoring, Imnaha 2908 StS – One of 10 (10%) mort/moribund fish had a heavy level of yeast and 2/10 (20%) had moderate levels of APS bacteria.

(ODFW Fish Health October 2008 Monthly Report)

Irrigon Hatchery

Monthly Monitoring, Imnaha 2908 StS – Six of 10 (60%) mort/moribund fish had low to heavy levels of APS bacteria.

(ODFW Fish Health November 2008 Monthly Report)

Irrigon Hatchery

Monthly Monitoring, Imnaha 2908 StS – Six of eight (75%) mort/moribund fish had moderate to heavy levels of APS bacteria.

(ODFW Fish Health December 2008 Monthly Report)

Irrigon Hatchery

Monthly Monitoring, Imnaha 2908 StS – Four of 10 (40%) mort/moribund fish had APS bacteria. Two of five (40%) moribund fish had low levels of *Ichthyobodo* (*Costia*) on the gills (unusual for Irrigon Hatchery).

(ODFW Fish Health January 2009 Monthly Report)

Irrigon Hatchery

Monthly Monitoring/Pre-transfer-Examination, Imnaha 2908 StS – Three of 10 (30%) mort/moribund fish had heavy levels of APS bacteria. No parasites were detected on skin scrapings.

(ODFW Fish Health February 2009 Monthly Report)

Irrigon Hatchery

Pre-liberation Examination, Imnaha 2908 StS – No significant levels of systemic bacteria or external parasites were detected.

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Little Sheep Satellite Facility

Pre-liberation Examination, Imnaha 2908 StS – Six of 10 (60%) mort/moribund fish had open sores and four had some external fungus. Two of 10 (20%) had low levels of APS bacteria.

(ODFW Fish Health March 2009 Monthly Report)

10. Chemotherapeutant use

Coldwater disease has required antibiotic treatment in six of the last eight years. When needed, juvenile fish are treated with florfenicol (Aquaflor) to control coldwater disease while in the circular tanks. Prior to 2008, florfenicol used at 15 mg/kg for ten days (on fish pills) had been effective in controlling disease before the fish were moved into the outdoor raceways. In June 2008, there was an outbreak of coldwater disease in both the Wallowa and Little Sheep Creek stock steelhead and in accordance with new regulatory mandates, fish were treated with a lower dosage of florfenicol (10 mg/kg) beginning July 1st & 8th for 10 days. A repeat antibiotic treatment was required to control the disease in August after fish were moved into the raceways.

11. Tagging and marking of juveniles

- Comparative survival studies (CSS) were discussed for steelhead released in 2008; however, no CSS PIT fish will be released in 2008. PIT released fish are randomly selected from the marked population. (ODFW AOP 2008, p 2)

- Little Sheep

173,000 Ad only

25,000 Ad, LV, CWT

9,300 PIT

Big Sheep (direct release) marks include:

100,000 no mark

5,700 PIT

Number ⁽¹⁾	Lbs	fpp	Location	In Facility	In River	Release Method ⁽³⁾	Marks
198,000	39,600	5.0	Little Sheep Acc	Mar 6-7	Apr 1 - 29	Volitional	25K AdLVCWT; 172K Ad
100,000	20,000	5.0	Big Sheep Cr	NA	Apr 7-10	Direct Stream	100K no mark

(ODFW AOP 2008, p 31)

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12. Fish Release

a) Protocols

- Little Sheep Acclimation: Approximately 294,000 smolts will be released in the Little Sheep and Big Sheep tributaries, 194,000 acclimated in Little Sheep and 100,000 direct stream released in Big Sheep

Acclimation. Approximately 198,000 smolts will be released after 5 to 8 weeks of acclimation.			
Location	Transfer in date	<i>Release dates</i>	<i>Comments</i>
Acclimation Pond	March 7-12	April 1-T	Screens will be pulled on April 1 allowing fish to leave for 28 days. On April 29, the remaining fish will be forced out.
		April 29 - T	
Note: Prior to April 29 ODFW Fish Research will sample smolts in the acclimation pond. If >70% of the sample contains <i>males</i> , remaining fish will be enumerated and up to 7,500 fish released in Kinney Lake.			

- Big Sheep direct release: Approximately 100,000 smolts will be released directly into Big Sheep April 7-10. NPT will check with Thompson's to make sure the gate is open to access Big Sheep.

(ODFW AOP 2008, p 1)

b) Number of fish released each year (subyearlings?; yearlings?; other?)

Approximately 294,000 smolts will be released in the Little Sheep and Big Sheep tributaries, 194,000 acclimated in Little Sheep and 100,000 direct stream released in Big Sheep.

D. Program benefits and performance

Provide adult hatchery summer steelhead within the LSRCP mitigation area while minimizing adverse impacts to listed fish.

Performance Standard (1): Imnaha basin steelhead production contributes to fulfilling tribal trust legal mandates and treaty rights

Indicator 1(a): Estimated number of program steelhead harvested in tribal fisheries by run year.

Indicator 1(b): Estimated number of Imnaha basin wild steelhead harvested in tribal fisheries by run year.

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Performance Standard (2): Program contributes to annual mitigation requirements

Indicator 2(a): Estimated number of recreational angler days in the Imnaha basin steelhead fishery by run year

Indicator 2(b): Estimated annual harvest in LSRCP mitigation areas and annual escapement to the hatchery facility.

Performance Standard (3): Fish are produced in a manner enabling effective harvest while avoiding over-harvest of non-target fish

Indicator 3(a): Estimated run year harvest and harvest related mortality for hatchery and wild fish, by fishery

Indicator 3(b): Estimated number of recreational angler days in the Imnaha basin steelhead fishery by run year.

Performance Standard (4): Release groups are marked to enable determination of impacts and benefits in fisheries

Indicator 4(a): Number of recovered marked fish reported in each fishery produces accurate estimates of harvest.

Indicator 4(b): Verify that mark rate, at release, is 95% to 100% for all smolt release groups.

Performance Standard (5): Non-monetary societal benefits for which the program is designed are achieved

Indicator 5(a): Number of recreational fishery angler days

Performance Standard (6): The hatchery program produces smolts at a higher efficiency than would be achieved in nature.

Indicator 6(a): Survival of steelhead, by life stage in the hatchery

Performance Standard (7): Artificial production program uses standard scientific procedures to evaluate various aspects of artificial propagation

Indicator 7(a): Scientifically based experimental design, with measurable objectives and hypotheses

Performance Standard (8): Facility operation complies with applicable fish health and facility operation standards and protocols

Indicator 8(a): Results of monthly fish health examinations

Indicator 8(b): Annual reports indicating level of compliance with applicable standards and criteria.

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Performance Standard (9): Releases do not introduce new pathogens into local populations, and do not increase the levels of existing pathogens

Indicator 9(a): Results of monthly fish health examinations

Indicator 9(b): Certification of juvenile fish health immediately prior to release

Indicator 9(c): Juvenile rearing density

Performance Standard (11): Any distribution of carcasses or other products for nutrient enhancement meets appropriate disease control regulations and interagency agreements.

Indicator 11(a): Number and location of carcasses distributed for nutrient enrichment

Indicator 11(b): Disease examination of all carcasses to be used for nutrient enrichment

Indicator 11(c): Statement of compliance with applicable regulations and guidelines

Performance Standard (12): Effluent from artificial production facilities will not detrimentally affect populations.

Indicator 12(a): Verify that hatchery effluent is in compliance with existing NPDES permit conditions and water quality standards.

Performance Standard (13): Juvenile production costs are comparable to or less than other regional programs designed with similar objectives.

Indicator 12(a): Total cost of program operation

Indicator 12(b): Average cost of similar operations

Performance Standard (14): Hatchery program is sustainable.

Indicator 14(a): Number of broodstock collected is sufficient to maintain the hatchery brood.

Indicator 14(b): Number of smolts released achieves smolt production goals.

Conserve genetic and life history diversity of steelhead within the Imnaha River.

Performance Standard (15): Broodstock collection does not reduce potential juvenile production in natural rearing areas

Indicator 15(a): Number of wild summer steelhead retained for broodstock collection does not exceed 25% of the annual natural spawner population.

Indicator 15(b): Percentage of wild fish returning to the facility taken for broodstock comprises at least 5% of the brood population.

Performance Standard (16): Weir/trap operations do not result in significant stress, injury or mortality in natural populations

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Indicator 16(a): Adult trapping mortality rate for wild fish does not exceed 5%

Indicator 16(b): Adult trap is checked daily when in operation.

Performance Standard (17): Juveniles are released after sufficient acclimation at the Little Sheep Creek facility to maximize homing to target sub-basins.

Indicator 17(a): Smolts are acclimated for 3-4 weeks prior to release.

Indicator 17(b): The proportion of hatchery summer steelhead returning to the hatchery facility is equal to or greater than 95% of reported escapement.

Performance Standard (18): Patterns of genetic variation within and among natural summer steelhead populations do not diverge as a result of artificial production programs.

Indicator 18(a): Compare genetic profiles and divergence of naturally produced juveniles from indicator areas within the Big Sheep Creek subbasin over time

Performance Standard (19): Hatchery produced adults do not exceed an average of 50% of natural spawners in the Big Sheep Creek subbasin.

Indicator 19(a): Proportion of hatchery and wild fish in key natural steelhead spawning areas

Performance Standard (20): Broodstock selection strategies effectively maintain genetic and life history characteristics in the hatchery population.

Indicator 20(a): Percentage of wild fish in the broodstock comprises at least 5% of the hatchery brood.

Indicator 20(b): Timing of hatchery adult returns to the Little Sheep Creek facility mimics wild steelhead returns.

Indicator 20(c): Genetic profile of wild and hatchery fish in Little Sheep Creek does not significantly diverge.

Indicator 20(d): Size and age composition of returning adults is consistent with wild run over time.

Performance Standard (21): Broodstock collection does not significantly alter spatial and temporal distribution of naturally spawning summer steelhead populations

Indicator 21(a): Number of wild adult fish aggregating or spawning immediately below the adult weir does not exceed historical distributions and spawning activity.

Indicator 21(b): Wild summer steelhead are captured and sorted, and either retained, transported, or released according to annual run timing and run size.

Performance Standard (22): Release numbers do not exceed habitat capacity for spawning, rearing, migration corridor, and estuarine and near-shore rearing.

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Indicator 22(a): Smolts are released in April through May and are released into targeted locations to promote smolt emigration.

Indicator 22(b): Proportion of residual hatchery smolts in key natural rearing areas does not exceed 10%.

Indicator 22(c): Outmigration behavior of hatchery smolts matches that of their wild counterparts.

Performance Standard (23): Water withdrawal and diversion structures used in operation of artificial production facilities will not prevent access to natural spawning areas, affect spawning behavior of listed natural populations, or impact juvenile rearing

Indicator 23(a): Water withdrawals compared to applicable passage criteria

Indicator 23(b): Water withdrawal compared to NMFS juvenile screening criteria

Indicator 23(c): Proportion of diversion of total stream flow between hatchery facility intake and out-fall

Indicator 23(d): Length of stream impacted by water withdrawal

Performance Standard (24): Predation by artificially produced fish on natural produced fish does not significantly reduce numbers of natural fish

Indicator 24(a): Size at, and time of juvenile release compared to size and timing of natural fish present

Performance Standard (25): Monitoring and evaluation occurs on an appropriate schedule and scale to assess progress toward achieving experimental objectives and evaluating the beneficial and adverse affects on natural populations

Indicator 25(a): Monitoring and evaluation framework including detailed timeline

Indicator 25(b): Annual and final reports

Performance Standard (26): Release groups are marked to allow evaluation of effects on local natural populations

Indicator 26(a): Visible mark (Ad-clip) ratio in hatchery release groups

(Imnaha Summer Steelhead HGMP, p 4-7)

1. Adult returns

a) Numbers of adult returns (need data for the past 10-20 years)

Facility	Year	Male	Female	Total
Little Sheep	2008	880	806	1,686
Little Sheep	2007	763	949	1,712

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Little Sheep	2006	1,089	1,260	2,349
Little Sheep	2005	988	1,037	2,025
Little Sheep	2004	1,322	1,291	2,613
Little Sheep	2003	825	1,082	1,907
Little Sheep	2002	1,256	2,004	3,260
Little Sheep	2001	601	623	1,224
Little Sheep	2000	159	286	445
Little Sheep	1999	157	175	332

(Wallowa FH Annual Reports, ODFW steelhead annual reports 2008-1999)

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b) Return timing and age-class structure of adults

Table. Timing of adult steelhead returns to LSRCP facilities in 2005 by location and origin.

Period	Week of the year	Number of fish trapped ^a					
		Wallowa		Big Canyon		Little Sheep	
		Hatcher y	Natural	Hatcher y	Natural	Hatcher y	Natural
Jan 22-28	4	-	-	-	-	-	-
Jan 29-Feb 04	5	-	-	0	0	-	-
Feb 05-11	6	-	-	0	0	-	-
Feb 12-18	7	0	0	0	0	-	-
Feb 19-25	8	5	0	0	0	-	-
Feb 26-Mar 04	9	42	0	3	1	0	0
Mar 05-11	10	149	0	70	4	47	1
Mar 12-18	11	638	0	9	0	164	16
Mar 19-25	12	312	0	28	1	149	14
Mar 26-Apr 01	13	264	0	280	5	89	8
Apr 02-08	14	342	1	283	11	513	39
Apr 09-15	15	213	0	113	6	349	36
Apr 16-22	16	221	2	172	26	301	27
Apr 23-29	17	116	2	96	17	329	37
Apr 30-May 06	18	44	0	7	1	53	6
May 07-13	19	13	0	8	4	25	3
May 14-20	20	1	0	0	0	6	1
May 21-27	21	0	0	0	1	0	0
May 28-Jun 03	22	-	-	-	-	-	-
Total		2,360	5	1,069	77 ^b	2,025	188

^a Weirs installed on 25th January at Big Canyon Facility (Deer Cr.) and 25th February at Little Sheep Creek Facility, and the ladder opened on 8th February at Wallowa Fish Hatchery. Adult collections stopped on 23rd May at Big Canyon Facility, and 26th May at both Little Sheep Creek Facility and Wallowa Fish Hatchery.

^b Includes one wild female observed in the ladder below the trap while it was being dewatered on 23 May 2005. The fish was sampled and passed above the weir.

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Table. Number, disposition, and mean fork length (mm) of adult steelhead that returned to LSRCP facilities in 2005 by stock, origin, estimated age (freshwater:saltwater), and gender. Fall broodstock were captured in the lower Grande Ronde River and transported to the hatchery. M indicates male and F indicates female. WFH indicates Wallowa Fish Hatchery. (Oregon Summer Steelhead Evaluation Studies, 2005, p15)

Facility, stock, Disposition	Hatchery									Natural											Grand total
	1:1		1:2		2:1		3:1		Total	2:1		2:2		3:1		3:2		4:1		Total	
	M	F	M	F	M	F	M	F		M	F	M	F	M	F	M	F				
<i>Little Sheep Creek Facility (Imnaha stock)</i>																					
Trapped	886	616	102	421	0	0	0	0	2,025	36	33	10	40	32	16	2	19	0	0	188	2,213
Passed	139	80	19	44	0	0	0	0	282	33	32	7	35	28	15	2	18	0	0	170	452
Outplanted ^g	652	493	78	332	0	0	0	0	1,555	0	0	0	0	0	0	0	0	0	0	0	1,555
Kept	95	43	5	45	0	0	0	0	188	3	1	3	5	4	1	0	1	0	0	18	206
	8	1	0	0	0	0	0	0	9	0	0	0	0	1	0	0	0	0	0	1	10
Mortality																					
Spawned ^h	82	40	5	45	0	0	0	0	172	3	1	3	5	3	1	0	1	0	0	17	189
Killed	5	2	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	7
Fork Length (mm)	559	557	681	693	-	-	-	-		-	520	-	672	-	582	-	652	-	-		
Standard	36	31	44	37	-	-	-	-		-	-	-	21	-	-	-	-	-	-		
deviation	21	13	5	15	-	-	-	-		-	1	-	3	-	1	-	1	-	-		
Sample size																					

^a Wallowa stock ages apportioned using 79 scale samples collected in 2005; Imnaha stock ages apportioned using 49 scale samples from 2004 and 53 scale samples from 2005 in order to increase sample size. Lengths are from fish with 2005 scale samples.

^b Wallowa and Big Canyon ages apportioned using historical data (128 samples) and 2005 data (16 samples); at Little Sheep Creek Facility historical data (70 samples), 2005 data (6 samples), 2006 data (56 samples), and 2007 data (42 samples) were used to increase sample size.

^c Includes 80 fish (40 males and 40 females) that were spawned and embryos were transferred to Washington Department of Fish and Wildlife (WDFW).

^d For Wallowa stock, 1,095 fish that returned to Wallowa Fish Hatchery and 545 fish that returned to Big Canyon were euthanized and donated to local food banks. In addition, 72 fish from Wallowa Hatchery and 78 fish from Big Canyon were euthanized and donated to local schools for educational purposes.

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^e *Includes one wild female observed in the ladder below the trap while it was being dewatered on 23 May 2005. The fish was sampled and passed above the weir.*

^f *Thirty-six fish were returned to the river fishery. Of these, nine males and nine females returned to the weir a second time and were euthanized. These 18 fish are included in the “killed” category.*

^g *Includes one male and six females outplanted, recaptured and passed above the weir. Also includes two females outplanted, recaptured and spawned.*

^h *Includes nine natural males that were live-spawned and passed above the weir.*

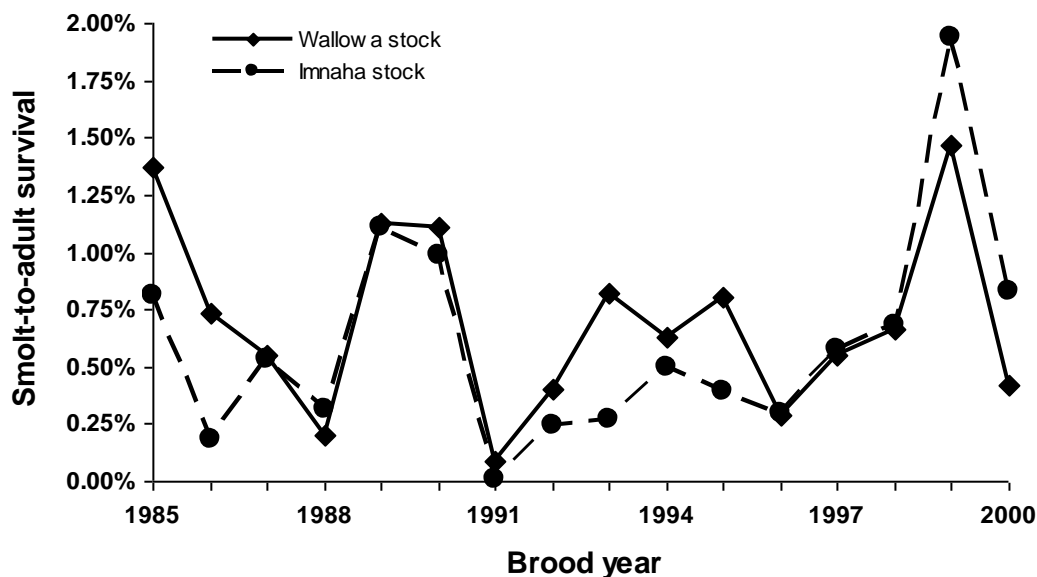
(Oregon Summer Steelhead Evaluation Studies, 2005, p14)

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c) Smolt-to-adult return rates

Smolt-to-adult survival rates for Wallowa and Imnaha stock summer steelhead, 1985-2000 brood years. Data is based on CWT recoveries. (Oregon Summer Steelhead Evaluation Studies, 2005, p9)



d) Stock productivity (e.g. recruits per spawner)

No information provided.

2. Contributions to harvest and utilization (e.g. food banks)

Table. Harvest and escapement distribution of adult summer steelhead by recovery location for the 2004-05 run year using the PSMFC and ODFW mark recovery databases. "C and S" indicates ceremonial and subsistence tribal fisheries. Data were summarized as available through December 2008. "-" indicates not sampled or undefined.

Location	Wallowa Stock			Imnaha Stock		
	Estimate d CWT recoveri es	Total return	Percen t of total return	Estimate d CWT recoveri es	Total return	Percent of total return
Ocean harvest	1	2	0.0	0	0	0.0
Columbia River Harvest						
Treaty net	25	177	1.4	14	38	1.0
C and S	0	0	0.0	0	0	0.0

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Sport	36	312	2.4	41	108	2.9
Test	0	0	0.0	0	0	0.0
Tributary sport	0	0	0.0	0	0	0.0
Deschutes River Harvest						
Sport	9	45	0.3	11	35	0.9
C and S	0	0	0.0	0	0	0.0
Strays						
Outside Snake R. Basin ^a	22	175	1.4	8	32	0.9
Within Snake R. Basin [*]	5	28	0.2	0	0	0.0
Snake River sport, tribs.*	545	3,874	30.1	177	514	13.7
Oregon tributary harvest ^b	380	4,820	37.5	112	278	7.4
Other in-basin escapement* ^c	-	0	0.0	-	720	19.2
Hatchery weir* ^d	298	3,429	26.7	298	2,027	54.0
Total estimated return	1,321	12,862	100	661	3,752	100
Return to compensation area		12,151			3,539	
Percent of compensation goal		132.3			177.0	

^{*} Indicates areas defining the compensation area. The compensation goal for Wallowa stock is 9,184 adults and the goal for Imnaha stock is 2,000 adults.

^a Due to lost snouts (N = 10) at Warm Springs National Fish Hatchery for the 2004-05 run year (David Hand, personal communication, 1/8/09), no CWT data was available for this recovery area. Therefore, total returns in areas outside of the Snake River Basin may be underestimated.

^b Harvest estimates based on angler surveys and harvest card returns.

^c Total returns to other in-basin escapement areas are escapement estimates of off-station direct stream releases based on coded-wire tag returns of direct stream release groups at hatchery weirs.

^d Total returns to the hatchery weir are actual numbers, except with the Imnaha stock where there is an estimated number of CWT fish recovered at the Little Sheep Creek Facility weir. This estimate is based on the actual number of CWT fish recovered at the weir and estimated number either passed above the weir to Little Sheep Creek or outplanted to Big Sheep Creek to spawn naturally.

(Oregon Summer Steelhead Evaluation Studies, 2004, p22)

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Table 12. Catch and escapement distribution of adult summer steelhead by recovery location for the 2003-2004 run year using the PSMFC and ODFW mark recovery databases. "C and S" indicates ceremonial and subsistence tribal fisheries. Data were summarized as available through December 2007. "-" indicates not sampled or undefined.

Location	Willapa Stock			Imnaha Stock		
	Estimated CWT recoveries	Total return	Percent of total return	Estimated CWT recoveries	Total return	Percent of total return
Ocean catch	0	0	0.0	0	0	0.0
Columbia River						
Treaty net	46	278	2.1	33	110	2.3
C and S	0	0	0.0	0	0	0.0
Sport	75	496	3.9	54	150	2.9
Test	0	0	0.0	0	0	0.0
Tributary sport	1	4	0.0	1	4	0.1
Deschutes River						
Sport	8	25	0.2	11	33	0.6
C and S	0	0	0.0	0	0	0.0
Strays						
Outside Snake R. Basin	33	236	1.9	5	14	0.3
Within Snake R. Basin ^a	7	28	0.2	3	8	0.2
Snake River sport, tribs. ^b	716	4,111	32.3	342	1,067	20.5
Oregon tributaries ^{c, d}	176	2,974	23.3	57	228	4.4
Other in-basin escapement ^{e, f}	-	0	0.0	-	980	18.8
Hatchery weir ^g	606	4,587	36.0	401	2,613	50.1
Total estimated return	1,670	12,739	100	907	5,217	100
Return to compensation area		11,700			4,896	
Percent of compensation goal		127.4			144.8	

^a Indicates areas defining the compensation area. The compensation goal for Willapa stock is 9,134 adults and the goal for Imnaha stock is 2,006 adults.

^b Total returns to Oregon tributaries are harvest estimates based on angler surveys and harvest card returns.

^c Total returns to other in-basin escapement areas are escapement estimates of off-station direct stream releases based on coded-wire tag returns of direct stream release groups at hatchery weirs.

^d Total returns to the hatchery weir are actual numbers, except with the Imnaha stock where there is an estimated number of CWT fish recovered at the Little Sheep Creek Facility weir. This estimate is based on the actual number of CWT fish recovered at the weir and estimated number either passed above the weir to Little Sheep Creek or outplanted to Big Sheep Creek to spawn naturally.

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Table. Catch and escapement distribution of adult summer steelhead by recovery location for the 2002-2003 run year using the PSMFC and ODFW mark recovery databases. "C and S" indicates ceremonial and subsistence tribal fisheries. Data were summarized as available through January 2007. "-" indicates not sampled or undefined.

Location	Wallowa Stock			Imnaha Stock		
	Estimated CWT recoveries	Total return	Percent of total return	Estimated CWT recoveries	Total return	Percent of total return
Ocean catch	3	19	0.2	0	0	0.0
Columbia River						
Treaty net	61	283	3.1	12	56	1.5
C and S	0	0	0.0	0	0	0.0
Sport	65	256	2.8	84	430	11.4
Test	0	0	0.0	0	0	0.0
Tributary sport	2	12	0.1	0	0	0.0
Deschutes River						
Sport	50	207	2.3	16	88	2.3
C and S	0	0	0.0	0	0	0.0
Strays						
Outside Snake R. Basin	86	451	5.0	0	0	0.0
Within Snake R. Basin*	0	0	0.0	1	5	0.1
Snake River sport, tribs.*	279	1,752	19.3	109	521	13.9
Oregon tributaries* ^a	205	2,642	29.1	47	239	6.4
Other in-basin escapement* ^b	-	0	0.0	-	510	13.6
Hatchery weir* ^c	389	3,458	38.1	352	1,907	50.8
Total estimated return	1,140	9,080	100.0	621	3,756	100.0
Return to compensation area		7,852			3,182	
Percent of compensation goal		85.5			159.1	

* Indicates areas defining the compensation area. The compensation goal for Wallowa stock is 9,184 adults and the goal for Imnaha stock is 2,000 adults.

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^a Total returns to Oregon tributaries are harvest estimates based on angler surveys and harvest card returns.

^b Total returns to other in-basin escapement areas are escapement estimates of off-station direct stream releases based on coded-wire tag returns of direct stream release groups at hatchery weirs.

^c Total returns to the hatchery weir are actual numbers, except with the Imnaha stock where there is an estimated number of CWT fish recovered at the Little Sheep Creek Facility weir. This estimate is based on the actual number of CWT fish recovered at the weir and estimated number either passed above the weir to Little Sheep Creek or outplanted to Big Sheep Creek to spawn naturally.

(Oregon Summer Steelhead Evaluation Studies, 2004, p22)

3. Contributions to conservation

Number of adult summer steelhead trapped at the Little Sheep Creek Facility weir that were either outplanted to Big Sheep Creek or passed above the weir, and were subsequently recaptured, 1999-2005. (Oregon Summer Steelhead Evaluation Studies, 2005, p17)

Year	Big Sheep Creek			Little Sheep Creek		
	Number of fish		%	Number of fish		%
	Outplanted	Recaptured ^a		Passed	Recaptured ^a	
1999	42	6	14.3	80	1	1.3
2000	138	17	12.3	200	9	4.5
2001	354	48	13.6	784	89	11.4
2002	2,030	907	44.7	1198	269	22.5
2003	1,403	439	31.3	387	36	9.3
2004	1,719	244	14.1	823	138	16.8
2005	1,555 ^c	109	7.0	461	37	8.0
Average	-	-	19.6	-	-	10.5

^a Total number of recaptures, including second and third time recaptures. For 1999-2002, recaptures were opercle punched at the weir and second and third time recaptures recorded.

^b Total recaptured divided by total outplanted.

^c Includes seven hatchery fish (one male and six females) outplanted, recaptured, and passed above the weir.

4. Other benefits

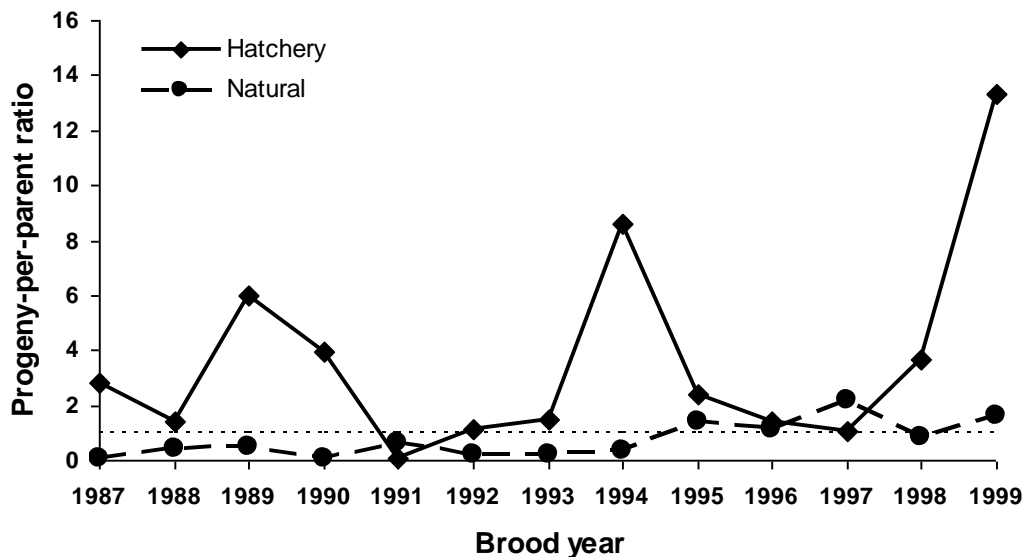
- The Imnaha steelhead supplementation program allows us to evaluate and compare productivity (adult progeny produced per parent) of hatchery and naturally spawning fish. Progeny-per-parent ratios for naturally spawning fish have been below 1.0 for completed brood years 1987 through 1994 and 1998, and above 1.0 for completed brood years 1995 to 1997 and 1999. Hatchery fish progeny-per-parent ratios (weir returns only) have been above 1.0 for all brood years except 1991. Hatchery ratios exceeded natural ratios for all brood years except 1991 and 1997. One purpose of the supplementation program is to

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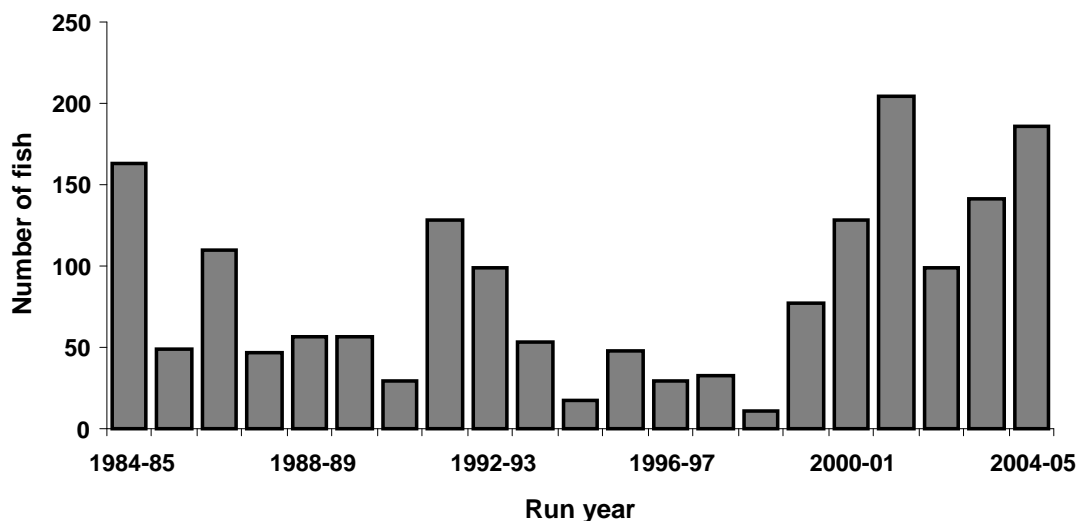
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enhance or stabilize natural fish abundance. Annual abundance of naturally-produced fish has been highly variable; however the most recent five years of data suggest an increasing trend in natural returns. (Oregon Summer Steelhead Evaluation Studies, 2005, p6)

- Progeny-to-parent ratios for Little Sheep Creek summer steelhead, 1987-1999 brood years. Dotted line represents replacement (P:P ratio =1). (Oregon Summer Steelhead Evaluation Studies, 2005, p10)



- Returns of naturally produced summer steelhead to Little Sheep Creek, run years 1984-85 to 2004-05. (Oregon Summer Steelhead Evaluation Studies, 2005, p10)



E. Research, monitoring, and evaluation programs

Objectives

1. Document summer steelhead rearing and release activities at all LSRCP facilities.
2. Determine optimum rearing and release strategies that will produce maximum survival to adulthood for hatchery-produced summer steelhead smolts.
3. Document summer steelhead adult returns by stock to each LSRCP broodstock collection facility.
4. Determine if the total production of summer steelhead adults meets mitigation goals, and index annual smolt survival and adult returns to Lower Granite Dam for production groups.
5. Participate in planning activities associated with anadromous fish production and management in the Grande Ronde and Imnaha river basins, and participate in ESA permitting, consultation, and rearing activities.
6. Monitor natural spawning of summer steelhead in selected areas within the Grande Ronde Basin.
7. Determine the number of summer steelhead harvested annually and angler effort in recreational fisheries on the Grande Ronde, Wallowa, and Imnaha rivers.

(Oregon Summer Steelhead Evaluation Studies, 2005, p1)

F. Program conflicts

1. Biological conflicts (e.g. propagated stock maladapted to hatchery water source)

The dissolved oxygen content in pumped water at Irrigon FH is marginal at certain times of the year and must be enhanced with an aeration facility and liquid oxygen.

2. Harvest conflicts (e.g. mixed stock fishery on hatchery and wild fish limits harvest opportunities on hatchery fish)

Currently, the sport fishery on steelhead is a mixed stock fishery. Wild fish are encountered, but cannot be retained by anglers. There is likely some level of hooking mortality to wild origin steelhead. These impacts have been estimated and presented to NOAA Fisheries as part of our FMEP to operate fisheries in SE Washington.

3. Conservation conflicts and risks

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a) Genetic conflicts associated with straying and natural spawning of hatchery fish (Stray rates, proportion of hatchery-origin fish on natural spawning grounds, etc. Provide tables or figures where appropriate)

Few adults are observed during annual spawning surveys. However, during spawning surveys on Camp Creek, all six adults identified as to origin were of wild origin. Additionally, in 2000 and 2001 less than 5% of the fish captured at Lightening Creek (NPT trap) in the Lower Imnaha tributaries were identified as being hatchery reared.. However, a relatively large numbers of hatchery adults have been released into the Big Sheep drainage in recent years; and it is assumed that a high proportion of natural spawners there is of hatchery origin. (Imnaha Summer Steelhead HGMP, p 13)

b) Ecological conflicts (e.g. competition between hatchery fish and wild fish, predation,)

Release of all production fish will occur at the smolt stage thereby reducing potential interaction with rearing naturally produced fish. (Grande Ronde Summer Steelhead HGMP, p4).

4. Other conflicts between the hatchery program, or fish produced by the program, and other non-hatchery issues

No information provided.

III. Lookingglass Fish Hatchery and Satellite Facilities

A. Description of hatchery

Lookingglass Hatchery was constructed in 1982 as part of the LSRCP program to mitigate for spring Chinook and summer steelhead losses caused by the four Federal dams constructed on the lower Snake River. Lookingglass is operated by ODFW and is used to rear spring Chinook for ocean and river fisheries. Lookingglass hatchery is located 19 miles north of the town of Elgin, Oregon adjacent to Lookingglass Creek 2.2 miles above its confluence with the Grande Ronde River at about river mile 86. The site is located at an elevation of 2520 feet above sea level, at latitude 45° 43' 55" N (45.73194) and longitude 117° 51' 45" W (117.8625). The area of the site is 22.5 acres, owned by the US Fish & Wildlife Service. Lookingglass Hatchery has 7 full time employees to operate Lookingglass Hatchery and Imnaha Satellite Facility

Hatchery facilities include a hatchery building, a storage building, and three residences. The Lookingglass Hatchery consists of one Hatchery building complex (11,588 ft.²). The complex includes an office, spawning room, incubation, rearing, cold storage, shop, lab, visitor center and dormitory. Water is supplied by a diversion from Lookingglass Creek via a screen building and pipeline, and a well. Adult facilities consist of two traps, four 76' by 10' by 4' concrete holding ponds and three 20' diameter by 4.5' deep fiberglass circular ponds. Incubation is in 63 8-tray stacks (504 trays total). Early rearing facilities include 28 21' by 2.5' by 3' fiberglass Canadian troughs each with a capacity of 100 to 125 pounds of fish. There are 18 100' by 10' by 3' concrete raceways (3,500 ft³) each with a capacity of 4,000 lb.

The hatchery is used for adult collection, incubation, and rearing of spring Chinook salmon. The production goal includes 900,000 Chinook salmon smolts of Grande Ronde stock for release into the Grande Ronde River Basin to return 5,820 hatchery origin adults to the LSRCP project area above Lower Granite Dam. Lookingglass Hatchery also produces 490,000 smolts of the Imnaha River stock with a goal of 3,210 adult returns. Water rights for the hatchery total 38,782 gpm from Lookingglass Creek and wells.

Rearing Facilities at Lookingglass Hatchery												
Unit		Unit		Unit		Unit		Unit		Number	Total	Constru ction
Type	Leng th	Widt h	Dept h	Volu me	Units	Volu me	Mate rial	Age	Cond ition	Com ment		
(ft)		(ft)		(ft)		(ft3)		(ft3)				
<u>Lookingglass</u>												
Adult Holding Ponds	76	10	4	3,040	4	12,160	concrete	1983	good	Inside wall cyclone fence		
Adult Holding Circulars	20	4.5	1,414	3	4,241	fiberglass	1997	good	Endemic			

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										building circul ars
Raceways	100	10	3	3,000	18	54,000	concrete	1983	good	
Canadian Troughs	21	2.5	3.0	158	28	4368	fiber glass	2000	good	117 cu. Ft. reari ng space
Vertical Incubators	504		315		fiberglass	1988		good		63 stacks of 8 trays
<u>Imnaha Pond</u>										
Acclimation pond	125	26	4	13,000	1	13,000	concrete	1989	good	Accli matio n/adu lt holdi ng

In addition to the Lookingglass Creek Fish Hatchery facility, there are four satellite facilities associate with the spring Chinook programs in the Grande Ronde and Imnaha River basins:

Imnaha River The Imnaha Facility is a satellite of Lookingglass Hatchery. It is located along the middle section of the Imnaha River, 32 miles upriver from the town of Imnaha. The site is at an elevation of 3,760 feet above sea level, at latitude 45° 43' 55" N and longitude 116° 52' 12" W. The facility, which was built in 1988, consists of a single acclimation pond (13,000 cu. Ft.) and adult ladder and trap. Imnaha adult collection and smolt acclimation facility is located two to three hours from Lookingglass hatchery, approximately 30 miles south from the town of Imnaha, Oregon adjacent to the Imnaha River (ODFW watershed code 0800200000) at river mile 45.5. Elevation at the Imnaha facility is 3,760 feet above sea level. Facilities consist of an adult trap, spawning area and one pond (13,000 ft³). The pond can be used for adult holding in the summer and juvenile acclimation and release in the spring. Capacity for juveniles is about 19,500 pounds (390,000 fish at 20 fpp).

Upper Grande Ronde River The Upper Grande Ronde Acclimation Facility (UGRAF) is located at rm 170.5 of the Grande Ronde River and consists of 4 portable raceways lined with vinyl fabric. Each raceway is 86 ft long, 8 ft wide, and the water depth is kept at around 3 ft (2,064 ft³). The water supply for UGRAF is diverted from the Grande Ronde River into the raceways by gravity using a screened cement intake structure located about 600 ft upstream from the raceways. The Upper Grande Ronde Adult Collection Facility (UGRACF) is located at rm 153.5 of the Grande Ronde River. The facility consists of a floating weir that spans the entire stream effectively blocking upstream passage. Trapping of spring Chinook salmon is accomplished by directing adults (age 4 and 5) and jacks (age 3) into a trapbox (fyke opening) located in the main channel near the bank that is 11 ft long, 10 ft wide, and the depth of the water in the trapbox is normally about 2.5 ft (275 ft³). The designed adult spring Chinook salmon holding capacities for these facilities is 28 at UGRACF using 10 ft³/adult.

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Catherine Creek The Catherine Creek Acclimation Facility (CCAF) is located at river mile (rm) 52.5 of Catherine Creek and is similar in design and operation to the UGRAF, consisting of 4 portable raceways lined with vinyl fabric). Each raceway is 86 ft long, 8 ft wide, and the water depth is kept at around 3 ft (2,064 ft³). The water supply for CCAF is pumped directly from Catherine Creek into the raceways using a screened submersible pump powered by a diesel powered electrical generator. The Catherine Creek Adult Collection Facility (CCACF) is located at rm 43.5 of Catherine Creek (Figure 1). The facility consists of a hydraulic weir which is attached at the bottom sill of a full channel width pool and chute type ladder. Trapping of adult summer steelhead and spring Chinook salmon is accomplished by directing adults into an off channel trap (fyke opening) and holding area that is 25 ft long, 6 ft wide, and the depth is kept at about 6 ft (900 ft³). The designed adult spring Chinook salmon holding capacities for these facilities is 90 at CCACF using 10 ft³/adult.

Lostine River The Lostine River acclimation facility is located at on the Lostine River at rivermile 10.2, near the town of Lostine, Oregon, and is similar in design and operation to the UGRAF and CCAF, consisting of 4 portable raceways lined with vinyl fabric). Each raceway is 86 ft long, 8 ft wide, and the water depth is kept at around 3 ft (2,064 ft³). The water supply for Lostine River Acclimation facility is surface water drawn from the Lostine River at a screened intake diversion and delivered to the raceways via a pipeline. The Lostine River adult trap consists of a temporary picket weir and trap box located in the Lostine River at rivermile 1.

B. Hatchery water sources

- Lookingglass Hatchery has several water rights to Lookingglass Creek water totaling 72 cfs, however water requirements do not usually exceed 50 cfs. In late summer, Lookingglass Creek flows can drop to as little as 35 cfs with elevated water temperatures.
- The main water source for Lookingglass Hatchery is Lookingglass Creek. Water temperatures fluctuate daily and seasonally with mean daily temperatures ranging between 1° and 16°C. A secondary water source is supplied from a well that is capable of pumping 5 cfs of 14°C water. Warmer well water is intended primarily to help reduce icing problems in winter at the intake area. High spring run-off has created problems with turbid water and sediment deposition in egg incubation trays, early rearing troughs, large raceways, and associated water delivery pipes.
- The water supplies for the four satellite facilities are raw water diversions directly from the rivers where the facilities are located. Water is diverted, passed through the acclimation ponds, and returned directly back to the source streams. The Upper Grande Ronde, Catherine Creek, and Lostine facilities each have water rights for 5 cfs. The Imnaha Facility has a diversion right for 9 Cfs.
- The water source for Lostine facilities is the Lostine River. The acclimation facility uses approximately 5 CFS from February to April. The adult collection facility is located in the stream, and uses the natural flow. Water temperatures fluctuate daily and seasonally with mean daily temperatures ranging between 0.5 ° and 16°C.
- The water source for Catherine Creek acclimation and adult trapping facilities is Catherine Creek. The acclimation facility has a 5 CFS water right February through April and the adult

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collections facility utilizes approximately 5 CFS April through September. Water temperatures fluctuate daily and seasonally with mean daily temperatures ranging between 0.5 ° and 16°C.

- The water source for Upper Grande Ronde acclimation and adult trapping facilities is the Upper Grande Ronde River. The acclimation facility has a 5 CFS water right February through April and the adult collections facility utilizes approximately 5 CFS April through September. Water temperatures fluctuate daily and seasonally with mean daily temperatures ranging between 0.5 ° and 16°C.
- The water source for Imnaha Satellite is the Imnaha River. ODFW surface water rights on the Imnaha River total 4,443 gpm (9.9 CFS) from March 1 to April 30 and June 1 to June 30. Surface water rights increase to 6,732 gpm (15 CFS) from June 1 to October 31. Water temperatures fluctuate daily and seasonally with mean temperatures ranging between 0.5 ° and 11°C.

C. Adult broodstock collection facilities

Several different stocks of spring Chinook are spawned and reared at Lookingglass Fish Hatchery:

Lookingglass Creek Stock: A Lookingglass Creek broodstock is being developed, based on returning adults from excess Catherine Creek stock smolts that have been released in Lookingglass Creek since 2001.

Two adult traps can be operated at Lookingglass Creek Fish Hatchery to collect adult Chinook returning to Lookingglass Creek. The upper trap is located at the facility intake. A block weir directs fish into ladder and through vee trap into a holding area. Fish are handled daily. The lower trap is located adjacent to the hatchery-building complex. A floating weir can be installed to direct fish into fish ladder. The ladder is operated with hatchery water effluent. Typically, the floating weir is not installed and fish volunteer into the ladder and holding pond. The main water source for Lookingglass Hatchery is Lookingglass Creek (50 CFS water right). During full production (1.39 million), withdrawal of 50cfs can create fish passage problems in some years during summertime low flow periods. Water temperatures fluctuate daily and seasonally with mean temperatures ranging between 1 ° and 16°C. Additional water source include 2 wells that are capable of pumping 5 CFS of 14.5°C.

Broodstock for the Lostine, Catherine Creek, and Upper Grande Ronde and Imnaha Programs are collected at traps located on each of the tributaries and transported to Lookingglass Fish Hatchery for holding and spawning.

Captive broodstock: Captive broodstock originating from parr collected in the Upper Grande Ronde, Catherine Creek, and Lostine River and reared to adults at Bonneville Fish Hatchery and Manchester Marine Laboratory have been used to supplement collections of anadromous adults for broodstock.

Imnaha Stock Spring Chinook: The Imnaha River satellite facility is located on the Imnaha River at rivermile 55 and consists of one support cabin (800 ft.²), one outside acclimation pond with rearing volume of 13,000 ft.³ (125'x26'x4'), picket-style weir, and adult trap (1,040 ft.³). Collected adults are transported to Lookingglass hatchery on a weekly or as needed basis. Wild

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and hatchery adults returning to the Imnaha River weir are collected throughout the entire run. A total of 216 adults are collected for broodstock. No more than 40 percent (86) of wild/ natural adults are kept for broodstock purposes. All wild/natural jacks are released above the weir. The remaining wild/natural fish are released above the weir. Hatchery adults are released above the weir in a 3:2 ratio of wild/natural to hatchery fish. Spawning matrices of 2 X 2 are used attempting to incorporate one wild/natural fish into each matrix.

Upper Grande Ronde Stock: The Upper Grande Ronde Adult Collection Facility (UGRACF) is located at rm 153.5 of the Grande Ronde River. The facility consists of a floating weir that spans the entire stream effectively blocking upstream passage (Figure 4). Trapping of summer steelhead and spring Chinook salmon is accomplished by directing adults (age 4 and 5) and jacks (age 3) into a trap box (fyke opening) located in the main channel near the bank that is 11 ft long, 10 ft wide, and the depth of the water in the trap box is normally about 2.5 ft (275 ft³). The designed adult spring Chinook salmon holding capacities for these facilities is 28 at UGRACF using 10 ft³/adult.

Adults are collected throughout the entire run. Up to 50% of the returning wild adults can be collected for broodstock; hatchery produced adults are used to make up the remainder of the broodstock goal. The spawning ratio of males to females is 1:1; adults are incorporated into a spawning matrix protocol to maintain genetic similarity between hatchery-origin and natural-origin populations. No captive progeny adults (F-1) will be used for brood.

Upper Grande Ronde Captive Brood Stock: Broodstock selection and spawning take place at Bonneville Captive Brood Facility. The Upper Grande Ronde Captive Brood Program transitions into the Safety Net Adult Program in 2009.

Lostine River Stock: The Lostine River adult collection facility consists of a cable-supported picket weir installed at a 45° angle to the flow with a vee trap and holding area near the upstream end of the weir. Holding area is constructed of picket panels and can vary in size from 192 ft.³ (8x12x2) to 600 ft.³ (12x24x2) and hold 75 adults for 24 hours. Collected adults are passed above the weir or transported to Lookingglass Hatchery within 48 hours of collection. Adults are collected throughout the entire run. The numbers of adults collected and the percentages of hatchery and wild broodstock vary according to a sliding scale based on total adult escapement. The spawning ratio of males to females is 1:1; adults are incorporated into a spawning matrix protocol to maintain genetic similarity between hatchery-origin and natural-origin populations. No captive-broodstock progeny adults (F-1) will be used for brood.

Lostine River Captive Brood Stock: Broodstock selection and spawning take place at Bonneville Captive Brood Facility. The Lostine River Captive Brood program is being phased out as remaining adults in the program are spawned.

Catherine Creek Stock: The Catherine Creek Adult Collection Facility (CCACF) is located at rm 43.5 of Catherine Creek. The facility consists of a hydraulic weir which is attached at the bottom sill of a full channel width pool and chute type ladder. Trapping of adult summer steelhead and spring Chinook salmon is accomplished by directing adults into an off channel trap (fyke opening) and holding area that is 25 ft long, 6 ft wide, and the depth is kept at about 6 ft (900ft³). Adults are collected throughout the entire run. The numbers of adults collected and the percentages of hatchery and wild broodstock vary according to a sliding scale based on total adult escapement. The spawning ratio of males to females is 1:1; adults are incorporated into a spawning matrix

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protocol to maintain genetic similarity between hatchery-origin and natural-origin populations. No captive-broodstock progeny adults (F-1) will be used for brood. Surplus stock will be used to supplement Lookingglass Creek broodstock.

Catherine Creek Captive Brood Stock: Broodstock selection and spawning take place at Bonneville Captive Brood Facility. The Catherine Creek Captive Brood program is being phased out as remaining adults in the program are spawned.

D. Broodstock holding and spawning facilities

- Adult facilities at Lookingglass Hatchery consist of one adult trap, two adult concrete holding ponds (4,560 ft³), each partitioned into two ponds, three adult circular holding tanks 1,100 ft.³ (20' x 4'), and three small circular tanks (6' x 3'). The separate holding facilities are used to keep the five stocks of spring chinook separate during holding and spawning.
- Adult spring chinook broodstock trapped at Upper Grande Ronde River, Catherine Creek, Lostine River, and Imnaha River are transported to Lookingglass Fish Hatchery for holding and spawning.

E. Incubation facilities

Incubation is in 504 Heath style vertical incubator trays with a capacity of 2.52 million eggs (5,000 eggs/tray) to hatching.

F. Indoor rearing facilities

There are 28 Deep Canadian troughs for early rearing with a capacity of 200 to 250 pounds (117 ft³) of fish each. The troughs are supplied with water from Lookingglass Creek that is treated with Ultra Violet light to reduce the pathogen load in the creek water. Up to 1,500 gpm can be treated. The creek water is supplemented with pathogen free well water at 14 °C to control rearing water temperatures.

G. Outdoor rearing facilities

Final rearing is in 18 concrete raceways (4,000 ft³) with 3,000 cubic feet of rearing space. Flows through the raceways range from 100 gpm to 800 gpm.. Final rearing density indices range from .17 to .24

H. Release locations and facilities

- Juvenile chinook salmon reared at Lookingglass Fish Hatchery are released at five different locations: 1) Upper Grande Ronde River; 2) Catherine Creek; 3) Lostine River; 4) Imnaha River, and; 5) Lookingglass Fish Hatchery.

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- The Lostine, Catherine Creek and Upper Grande Ronde Facilities each consist of 4 portable raceways lined with vinyl fabric. Each raceway is 86 ft long, 8 ft wide, and the water depth is kept at around 3 ft (2,064 ft³). The water supply for CCAF is pumped directly from Catherine Creek into the raceways using a screened submersible pump powered by a diesel powered electrical generator. The water supply for UGRAF is diverted from the Grande Ronde River into the raceways by gravity using a screened cement intake structure located about 600 ft upstream from the raceways. The water supply for the Lostine River Acclimation facility is also pumped directly from Lostine River into the raceways using a screened submersible pump powered by a diesel powered electrical generator.
- For all three facilities the water is drained from each raceway through an 8 inch pipe back to the river below the water intake. A 26 ft travel trailer is placed at each facility to provide onsite housing for facility operators, who provide 24 hour watch and maintenance of the facility. Each facility is designed to hold 31,250 fish per raceway at 20 fish/lb and a density of 0.76 lbs/ft³. Maximum flow design for the facilities is 625 gpm/raceway. Either one or two acclimation periods are conducted based on the total number of fish produced and/or broodstock groups for that particular year. The proposed acclimation period runs from the mid-March to mid-April. If two acclimation periods are needed, then the period is split in half with the first group released at the end of March. This time period is chosen to mimic the spring outmigration timing for natural smolts in the system.
- The Imnaha River Satellite Facility includes a concrete acclimation pond measuring 125'x26'x4 feet deep (volume of 13,000 ft.³) supplied by a diversion from the Imnaha River.
- Smolts for the Lookingglass Creek reintroduction program are released directly at Lookingglass Creek Fish Hatchery via the hatchery ladder which also carries the hatchery discharge water back to Lookingglass Creek.

I. Outmigrant Monitoring Facilities

Each of the smolt acclimation and release facilities in the Grande Ronde subbasin includes PIT tag detectors on the outlet pipes to record the peak times of emigration. Biologists from NPT Fisheries and CTUIR fisheries operate smolt traps on streams below the release sites. IDFG operates a smolt trap on the Snake River upstream from the Snake River-Clearwater River confluence which samples outmigrant smolts from the Grande Ronde drainage as well as other upstream areas. Each of the federal dams on the Snake and Columbia Rivers have PIT tag detectors and smolt sampling capability to monitor downstream migrations. Smolt monitoring and PIT tag detection is coordinated through the Fish Passage Center (www.fpc.org).

J. Additional or special facilities

Most of the Chinook salmon spawned, incubated, and reared at Lookingglass Creek Fish Hatchery are from broodstock captured at remote sites and smolts are released in those same remote areas. Therefore these programs depend on a reliable fleet of transport vehicles and operators to move broodstock from remote weirs and traps to Lookingglass Creek Fish Hatchery for holding and spawning and to transport smolts to remote sites for acclimation and release. The remote satellites

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require housing for employees and in some cases back-up electrical generation and communications equipment.

K. Outreach and public education facilities/programs

Lookingglass Hatchery includes a visitor center within the hatchery building with interpretive posters and displays that explain hatchery operations, salmon life history, and the LSRCP program. The Imnaha Satellite includes an interpretive kiosk. Lookingglass Hatchery receives approximately 300 visitors per year. The Imnaha Satellite Facility receives 2,000 to 4,000 visitors mostly during the summer months. Lookingglass hosts some elementary and high school classes taking science and biology field trips. The Lostine, CCR and UGR facilities are remote, only operated seasonally, and receive few visitors.

L. Special issues or problems (e.g. water and property rights issues, law suits, etc.)

Responsibilities for the Chinook salmon programs associated with Lookingglass Fish Hatchery are shared among the Oregon Department of Fish and Wildlife (ODFW), the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), and Nez Perce Tribe (NPT). The shared operation requires extensive communication, planning and coordination. Agreements among the comanagers fall under the oversight of U.S. Federal courts in U.S. v. Oregon.

IIIA. Lookingglass Creek Spring Chinook, Lookingglass FH

A. General information

- When Lookingglass Creek Fish Hatchery was first designed and constructed, it was operated as a mitigation program to provide fish for harvest. Goals included producing 900,000 smolts for release in the Grande Ronde River to return 5,820 hatchery-origin adults to the LSRCP project area upstream of Lower Granite Dam and 490,000 smolts for release into the Imnaha River to return 3,210 adults (0.65 SAR) (LSRCP Status review, 1998 P. 82-95). .
- When broodstock development options were considered in the late 1970s, it was thought that too few natural fish remained in Lookingglass Creek to develop adequate broodstock. In order to achieve smolt production goals out-of-basin stocks were imported. The primary stock used was Rapid River Chinook along with Carson hatchery spring Chinook. No adult Chinook salmon were allowed to pass the barrier weir in Lookingglass Creek to reduce the likelihood that infectious pathogens would be incorporated in the hatchery water supply. As a result, the remnant indigenous Chinook population of Lookingglass Creek was extirpated. Although most of the 900,000 smolt production was released at Lookingglass Creek Fish Hatchery, smolts, pre-smolts and adults were released in other portions of the Grande Ronde basin periodically from 1980 to 1990 (LSRCP Status review). In 1990, ODFW adopted a Wild Fish Management Policy that limited the acceptable proportion of non-local hatchery origin fish, and in 1992, NOAA Fisheries listed the natural populations of Snake River spring/summer Chinook as threatened under the endangered species act.
- After Snake River spring/summer Chinook were listed as threatened in 1992, the mitigation program at Lookingglass Creek Fish Hatchery began to evolve into conservation programs. The use of composite, out-of-basin stocks (Rapid River and Carson) was phased out, and local indigenous broodstocks were developed for Upper Grande Ronde, Catherine Creek, and Lostine River based on a combination of captive broodstocks and anadromous adult collections in each tributary (LSRCP Status review, P 82-95). In the 1990s, co-managers and the Federal agencies began to discuss logistical and biological considerations for reintroducing Chinook into the Lookingglass Creek drainage upstream from the hatchery weir. In 2001, an experimental program to reestablish a naturally spawning population into Lookingglass Creek by releasing hatchery-reared smolts was initiated. Catherine Creek stock was selected because it was a listed stock, indigenous to the Grande Ronde River Basin, occupied similar habitat, and excess embryos from the captive rearing program were available (ODFW 2002).
- Hatchery mitigation goal (Currently Permitted Program) for the Grande Ronde spring/summer chinook salmon is 900,000 smolts. Production is based on prioritization process outlined in the Grande Ronde Spring Chinook Hatchery Management Plan (Zimmerman et al 2002). Expected program size includes:
 - 5. Up to 250,000 smolts released into Catherine Creek.
 - Captive number based on juvenile sliding scale.
 - Up to 150,000 from captive brood stock production.

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- Long term reduce to 150,000.
- 6. Up to 250,000 smolts released into Lostine River.
 - Up to 150,000 from captive brood stock production
- 7. Up to 250,000 smolts released into Upper Grande Ronde River.
- 8. Up to 150,000 smolts released into Lookingglass Creek.
 - Long term increase to 250,000.

- **Background**

- *Historical potential*-The ICTRT recently classified the Lookingglass Creek as an “extinct” basic population within the Snake River spring/summer Chinook ESU (ICTRT, 2005 p. 17). The extinct classification was primarily based on out of basin releases of Rapid River and Carson hatchery stocks and the elimination of natural spawning adults above the hatchery (ICTRT 2005). Blocking upstream migration of adults at the hatchery, to prevent disease organisms from being spread in the hatchery water supply resulted in the loss of a localized Lookingglass Creek population in the 1980s.

The ICTRT analysis categorized the historical habitat potential of Lookingglass Creek as a “basic” rating, and a minimum abundance threshold criteria of 500 naturally produced spawners. Approximately 90% of the habitat is located above the hatchery intake.

- *Artificial production*-Carson and Rapid River origin fish were used from the onset of the Lookingglass Hatchery program in 1982. Release of Rapid River and Carson origin fish was discontinued after parr were released in the summer 2000 (Figure 1).

In 2001, Catherine Creek, a more localized stock, was selected as an appropriate stock to be used for Lookingglass Hatchery mitigation program. Guidelines were developed to use surplus captive brood progeny and surplus captive brood adults returning Catherine Creek for Lookingglass Creek production. Surplus Catherine Creek captive brood adults have been available for smolt production and adult outplants into Lookingglass Creek. Surplus captive brood eggs have also been available for smolt production. However, it is expected that the captive brood program will be phased out within the next three to five years. At such time, ongoing Lookingglass Creek program will be dependent on the success of past releases.

The first Catherine Creek parr were released from the hatchery in 2001, and first adults were released above the hatchery in 2004. Projected and actual numbers of fish juvenile fish will be intermittent through 2008 (Figure 1).

Co-managers have taken aggressive measures to reduce the influence of Rapid River/Carson stock in Lookingglass Creek by eliminating their propagation and removing suspected F1 naturalized Rapid River/Carson adults. The last known

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(marked) returns were collected at Lookingglass Hatchery in 2004. Unmarked adults have been removed since 2002 and will continue through 2007 and 2008 (five-year-olds). It is unclear how strongly the Rapid River/Carson stocks have naturalized to lower Lookingglass Creek. Since redd counts of 10, 50, 10, 28 were observed in 2003, 2004, 2005, and 2006, respectively, it is expected that the Rapid River/Carson stocks may have some genetic influence on the new Lookingglass Creek stock.

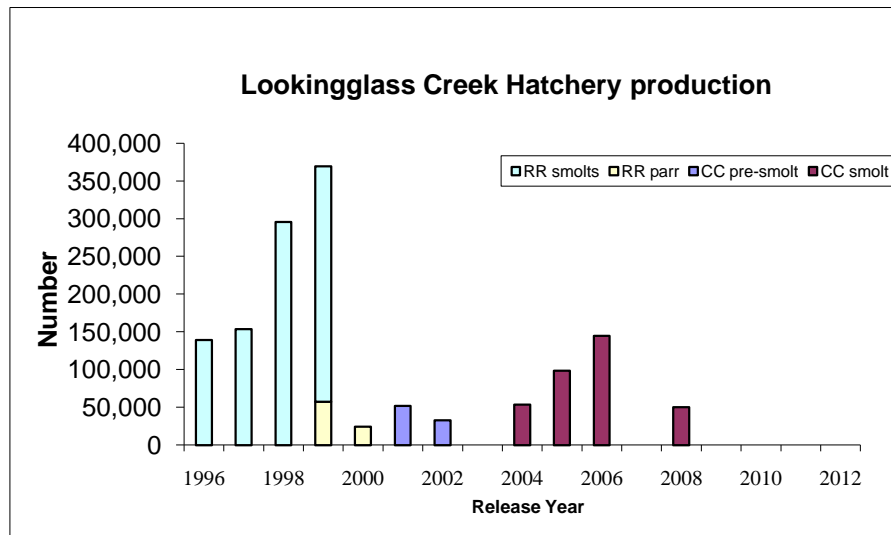


Figure 1. Actual and projected smolt releases in Lookingglass Creek from 1996 through 2008. Release in 2008 is a projected numbers based on current inventory at Lookingglass Hatchery. (ODFW AOP 2008 Appendix M p.51)

- The first unmarked adults, considered progeny of Catherine Creek stock, will return in 2008 (age-four). Only known CC stock adults will be passed above the hatchery from 2002 to 2008. All adults in 2009 (unmarked and marked) will be considered appropriate for natural escapement and/or brood stock for Lookingglass Creek production. (ODFW AOP 2008 Appendix M p.51)
- Management Guidelines
 - ODFW proposes aggressive weir management guidelines to expedite adult escapement (Table 1). The intent is to use the hatchery resource is to magnify adult numbers to provide 1) broodstock (170 spawners) to become self-sufficient, 2) escapement of 450 adults above the hatchery, and 3) harvest when escapement predictions exceed 620 adults (ODFW AOP 2008 Appendix M p.51).
 - The longer-term objective is to modify weir management guidelines to transition escapement above Lookingglass Hatchery and broodstock to naturalized adults.

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- Table 1. Proposed adults weir management guidelines for the Lookingglass Creek (ODFW AOP 2008 p 52).

Estimated adult escapement to Lookingglass creek ^a	Ratio of hatchery to natural adults at the mouth	Maximum % of natural adults to retain for broodstock	% of hatchery adults to retain for broodstock	% of adults released above the weir can be of hatchery origin	Minimum % of broodstock of natural origin	% known Strays allowed above the weir
≤300	Any	50	50	na	na	≤5
301-449	Any	≤50	≤50	any	any	≤5
450-619	Any	≤25	≤35	any ^b	≥90	0
≥620 ^c	Any					
^a pre-season or adjusted season estimate for total escapement						
^b Not to exceed 450 total fish, no limit on naturalized adults						
^c Selective sport harvest threshold						

B. Stock/Habitat/Harvest Program Goals and Purpose

1. Purpose and justification of program

Lookingglass Hatchery was constructed in 1982 as part of the Lower Snake River Compensation Program (LSRCP)—a program to mitigate for spring chinook and summer steelhead losses caused by the four federal dams constructed on the lower Snake River. The purpose of the Lookingglass Chinook stock program is to meet a portion of the LSRCP mitigation goals, using a locally adapted endemic stock, and also to attempt to restore naturally spawning chinook to Lookingglass Creek using Catherine Creek origin stock.

2. Goals of program

The short-term goal is to use smolts derived from the Catherine Creek captive brood stock to develop an anadromous return of adult Chinook salmon to Lookingglass Creek Hatchery. The longer term goals include expanding this new “Lookingglass Stock” to a size sufficient to meet mitigation release goals and to provide adults to spawn in natural habitat in Lookingglass Creek. Associated objectives include:

- Reintroduce spring/summer Chinook into Lookingglass Creek with Catherine Creek stock, which is indigenous to the Grande Ronde sub-basin,
- Maintain genetic diversity of indigenous artificially propagated chinook populations,

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- Maintain genetic diversity in wild chinook populations specifically the Minan and Wenaha rivers,

(Grande Ronde Spring/Summer Chinook HGMP 2002)

The long-term goal of this program is recovery, de-listing, and to mitigate for fish losses occurring as a result of the construction and operation of the four Lower Snake River Dams.

3. Objectives of program

- Objective 1: Foster and sustain opportunities for sport, commercial, and tribal fishers consistent with the conservation of naturally produced native fish.
- Lookingglass Creek Stock: 250,000 (11,363 pounds) for release into Lookingglass Creek. Approximately 100,000 Lookingglass stock will be reared at Irrigon Hatchery from April to October 2009 and then returned to Lookingglass for final rearing and release (ODFW 2009 p. 39).
- Objective 2: Contribute toward the sustainability of naturally produced native fish populations through the responsible use of hatcheries and hatchery-produced fish.
- Objective 3: Maintain genetic resources of native fish populations spawned or reared in captivity.
- Objective 4: Restrict the introduction, amplification, or dissemination of disease agents in hatchery produced fish and in natural environments by controlling egg and fish movements and by prescribing a variety of preventative, therapeutic and disinfecting strategies to control the spread of disease agents in fish populations in the state.
- Objective 5: Minimize adverse ecological impacts to watersheds caused by hatchery facilities and operations.
- Objective 6: Communicate effectively with other fish producers, managers and the public.

4. Type of program (Integrated or Segregated)

The Lookingglass Creek reintroduction program is planned with an integrated recovery model, based on the reintroduced Catherine Creek stock. Long term expectation is for about 170 adults to be collected at random from the return with 500 adults allowed to spawn naturally in habitat upstream from the hatchery weir (Zimmerman et al. 2002).

5. Alignment of program with ESU-wide plans

The Lookingglass Creek reintroduction program relates to other plans and policies regarding the management and restoration of anadromous fish resources in the Pacific Northwest. Artificial propagation, including the use of captive broodstocks and artificial supplementation programs as part of a strategy to recover depleted salmon populations is described in the

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Basinwide Salmon Recovery Strategy, which was developed by the Federal government to restore ESA-listed salmon and steelhead throughout the Columbia River basin (Federal Caucus 2000).

In addition, the Proposed Action is consistent with on-going ESA recovery planning. Recovery plans are being developed in most sub-basins in the Columbia River system. These recovery plans will contain: (1) measurable goals for delisting, (2) a comprehensive list of the actions necessary to achieve delisting goals, and (3) an estimate of the cost and time required to carry out those actions. All factors that have been identified as leading to the decline of ESA-listed species will be addressed in these recovery plans. For ESA-listed salmon and steelhead, these factors include hydroelectric operations, harvest, habitat use, and artificial propagation.

Other Federal, state, and Tribal plans and policies that would potentially address effects on fish populations in the Snake River basin apply within or near the action area. Federal actions include Forest Service and Bureau of Land Management land and resource management plans that are designed to foster sustainable ecosystems and resilient watersheds. State initiatives include legislative measures to facilitate the recovery of listed species and their habitats, as well as the overall health of watersheds and ecosystems. State land management, environmental quality, water resources, and agriculture agencies all have policies and plans that address water quality and land use practices that are designed to achieve desirable water quality and resource conditions, some specific to protected species, some more generally addressing water and resource quality. Regional programs are being developed that designate priority watersheds and facilitate development of watershed management plans. Tribes have developed a joint restoration plan for anadromous fish in the Columbia River basin, known as the Wy-Kan-Ush-Mi Wa-Kish-Wit or *Spirit of the Salmon* plan (CRITFC 1995). The Proposed Action is expected to be compatible with the goals and objectives of other regional actions.

6. Habitat description and status where fish are released.

Lookingglass Creek is a tributary to the Grande Ronde River. The drainage area is 78.3 square miles upstream from the hatchery intake. Elevation ranges from 2500 feet at the hatchery to over 5,000 feet in the headwaters. Peak discharge has exceeded 2,000 cfs in spring floods while summertime flows may be as low as 50 cfs. Most of the watershed is forested and either national forest or private timberland. There are habitat impacts from past and ongoing timber harvest and road building, ranching and vacation home development. Stream habitat is in fair condition (NPCC 2004). The Interior Columbia Technical Review Team concluded that the habitat in Lookingglass Creek was adequate to support a “basic” population of 500 Chinook spawners (ICTRT 2005).

7. Size of program and production goals (No. of spawners and smolt release goals)

The current program for Lookingglass Creek is to release 250,000 smolts with a goal of returning 170 adults for broodstock, 500 adults for natural spawning escapement above the hatchery, and additional fish to contribute to tribal, commercial, and recreational fisheries in the Grande Ronde basin and downstream areas (ODFW AOP 2009).

C. Description of program and operations

1. Broodstock goal and source

For Lookingglass Creek, an estimated number of 80 - 85 pairs (170 fish) should be collected to produce 250,000 smolts. This is based on performance history of the CC stock. Currently the target is to collect 60 pairs from anadromous returns. Additional production can be obtained from the Catherine Creek captive brood production.

The long-term goal is to collect sufficient broodstock of the Catherine Creek stock as anadromous returns to the Lookingglass Creek weir to produce 250,000 smolts. The broodstock source is Catherine Creek adults retuning to Lookingglass Creek Fish Hatchery, as identified by marks and tags. Additionally, captive-reared broodstock of the Catherine Creek stock will be used. In the future, Lookingglass Creek stock will be managed as a separate stock (ODFW AOP 2008 p 50).

2. Adult collection procedures and holding

The intake trap at Lookingglass Hatchery will be operated from March (environmental conditions allow) through mid-September. Known returns of CC smolts released into Lookingglass, and unmarked jacks and four-year olds, will be used for outplants or broodstock.

Work trap as needed. Draft guidelines management guidelines are located in Appendix M of the 2008 ODFW Annual Operating Plan (AOP).

- 1) Unmarked five year old Chinook ($\geq 83\text{cm}$), considered progeny of Rapid River origin stock, can be given to the Tribes for C/S or released above the weir providing the number is $\leq 5\%$ of the total release.
- 2) Up to 500 adults (ad clipped and unmarked) will be held at Lookingglass Hatchery and released around August 1. All collected fish will receive prescribed injection through July 6th. Fifty percent can be kept for broodstock up to the 60 pair target.
- 3) Surplus hatchery jacks can be euthanized.
- 4) All Chinook passed upstream of the intake trap will have tissue collected for future genetic analysis (pedigree)

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3. *Adult spawning*

a) **Spawning protocols⁹**

Spawning Guidelines (for each stock)

1. Anesthetic MS222 or Aqui-S.
2. Sorting – The first sort will occur the week of August 11th.
3. Expected First Spawn – The week of August 11th.
4. Spawning Frequency - Once per week or as required (deceased females will not be spawned). Tentative Schedule: Tuesday-IM, Wednesday-LR, LGCR, Thursday-UGR, CC.
5. Spawning Strategies - All spawning will be done at Lookingglass Hatchery. Sorting and spawning to take place the same day. Hatchery and co-manager staffs will determine fertilization matrices. All Tyvek tag numbers will be recorded on the spawning matrix sheets. Most spawning matrices will be 2 females x 2 males, but matrices of 1 x 1, 1 x 2, 2 x 1, or 3 x 2 can be used if necessary. Fertilized eggs will be incubated at Lookingglass hatchery. Fecundity will be determined at eye-up. If a ripe female is observed during sorting and no ripe male is available, the female will be returned to the holding pond until a ripe male is located. Ripe male gametes can be collected in an emergency (priority intended):
 - a. Sperm on ice from fish passed at weirs - These fish will be given a 1LOP opercle punch so they can be identified during spawning surveys and counted as “taken”.
 - b. Cryopreserved sperm Fill out request form (Appendix I.)
 - c. If milt is not available after 7 days of holding a ripe female, transport female(s) to river of origin.

b) **No. of males and females spawned each year over past 10 years (table)**

This is a new program, with first adult returns in 2008. There is no historical data on adult collections or spawning.

3. *Fertilization*

a) **Protocols**

All spawning will be done at Lookingglass Hatchery. Sorting and spawning to take place the same day. Hatchery and co-manager staffs will determine fertilization matrices. All Tyvek tag numbers will be recorded on the spawning matrix sheets. Most spawning matrices will be 2 females x 2 males, but matrices of 1 x 1, 1 x 2, 2 x 1, or 3 x 2 can be

⁹ ODFW AOP 2008.

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used if necessary. Fertilized eggs will be incubated at Lookingglass hatchery. Fecundity will be determined at eye-up. If a ripe female is observed during sorting and no ripe male is available, the female will be returned to the holding pond until a ripe male is located. Ripe male gametes can be collected in an emergency

b) Number of eggs collected and fertilized each year over past 10 years (table)

This is a new program, with first adult returns in 2008. There is no historical data on adult collections or spawning.

4. Incubation

All stocks will be incubated at Lookingglass Hatchery using a combination of chilled well water and UV treated ($>60,000 \text{ uw/cm}^2/\text{sec}$) creek water.

1. Hatchery Program – Each female's eggs will be incubated in one tray until disease screening profiles results are completed. Eggs may be combined after fecundity estimates are completed. Incubation temperatures will be manipulated to bring all spawn dates together during incubation and early rearing.

Early Rearing Program –

1. Lookingglass – Catherine, Grande Ronde, Lostine, and Lookingglass (CC captive brood) fry will be loaded at 30 to 50 thousand per trough.

2. Segregation of eyed-eggs and progeny will occur based on BKD ELISA values of kidneys from spawned females. The degree of segregations is based on allowable space.

3. Catherine Creek, Lostine, and Grande Ronde smolts produced will target 25fpp in October 2009.

4. Lookingglass Creek production above 150,000 may be transferred to Irrigon for rearing between May and September 2009. Prior to steelhead marking at Irrigon, pre-smolts will be transferred back to Lookingglass in October 2009 and released from the adult holding pond in April 2010.

5. Ponding

a) Protocols

Fish production will prioritize 12 raceways for Grande Ronde tributary production and 6 raceways for Imnaha production at Lookingglass Hatchery. Priorities include:

- Lostine; 4 raceways; 3 raceways conventional and 1 raceway captive broodstock
- Upper Grande Ronde; 4 raceways.

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- Catherine Creek; 2 raceways
- Lookingglass Creek; 2 raceways
- Imnaha; 6 raceways

All Chinook fry at Lookingglass Creek Fish Hatchery are transferred outside into final rearing raceways at --? fpp in April or early May. Rearing is on raw Lookingglass Creek water. Target size is 20-22 fpp by time of release or transportation to acclimation facilities in the following February-April.

b) Number of fry ponded each year, including % hatch each year

- The average survival for Catherine Creek broodstock is 87.1% from green eggs to smolt.
- Current survivals for Lookingglass Creek stock (BY 07 and 08) include: Green to eye-egg: 92.6% and 76.9% respectively and an eyed egg to smolt survival of 95.6% for BY07. Fish are held indoors until 250 fpp because: the fish are too small in relation to the mesh size to put them out much earlier; in attempt to avoid putting the fish out in the raceways during spring runoff; and to provide time to move the prior year's fish out and clean the raceways.
- After hatch, the fry are reared in 8 of the 28 indoor tanks (Canadian troughs), at approximately 48,000 fish per trough. The troughs are 117 cubic feet, with a flow rate of up to 50 gpm

6. Rearing/feeding protocols

- Every attempt is made not to exceed 0.75 DI in the indoor tanks. However, at times, DI's exceed 0.85 due to the limited early rearing space
- Once the fish reach 250 fpp, they are transferred to the outdoor raceways to be reared on raw creek water (late April to early May). Juvenile fish are retained indoors until high spring flows and subsequent sediment/turbid water decreases.
- The targeted density index for the Lookingglass Creek spring Chinook stock is 0.2 D.I and the flow index is 1.5 in the outdoor raceways. However, this group is sometimes loaded at 75,000 fish per raceway (two raceways) for final rearing. Under this scenario, the density index by release time reaches 0.25 D.I.
- Fish production prioritizes 12 raceways for Grande Ronde tributary production and 6 raceways for Imnaha production at Lookingglass Hatchery. Priorities include:
 - Lostine; 4 raceways; 3 raceways conventional and 1 raceway captive broodstock (60,000-65,000 fish per raceway)
 - Upper Grande Ronde; 4 raceways. (60,000-65,000 fish per raceway)

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- Catherine Creek; 2 raceways (60,000-65,000 fish per raceway)
- Lookingglass Creek; 2 raceways (75,000 fish per raceway)
- Imnaha; 6 raceways (60,000-65,000 fish per raceway)
- Lookingglass stock spring Chinook production above 150,000 (up to 100,000) are transferred to Irrigon FH for rearing between May and October if total production of all programs exceeds the capacity of Lookingglass FH. Prior to steelhead marking at Irrigon, pre-smolts will be transferred back to Lookingglass in October 2009 and reared in and released from the adult holding pond in April 2010.

7. *Fish growth profiles*

No information provided.

8. *Fish health protocols and issues*

- A formalin treatment is applied (167 ppm for 1 hour) for 2 consecutive days after marking. The fish are monitored to determine if additional treatment is needed. Formalin treatment is applied to control fungus.
- The fish receive one 28 day erythromycin treatment (2.25% aquamycin) to control BKD, typically in July shortly after marking.
- Bacterial kidney disease is not a problem in the conventional spring Chinook juveniles; although it has caused some mortality in the juveniles from the captive broodstock programs
- Monthly health monitoring examinations are conducted on each spring/summer Chinook stock. The sample includes a minimum of 10 moribund/dead fish (if available) and 4-6 live fish per raceway. Results are reported on the ODFW Fish Health Examination report. The causative agent of whirling disease, *Myxobolus cerebralis*, was recently confirmed as present in wild rainbow trout and steelhead juveniles that reside above the hatchery in Lookingglass Creek. Hatchery juveniles are sampled for this parasite every year, prior to release, and through 2009, it had not been detected in the production fish. Sanitation policy is contained in Appendix C. of the Annual Operating Plan.

9. *Chemotherapeutant use*

Appendix E of the Annual Operating Plan describes fish health monitoring protocols and outlines trigger points for use of chemotherapeutants and pharmaceuticals to treat disease.

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10. Tagging and marking of juveniles

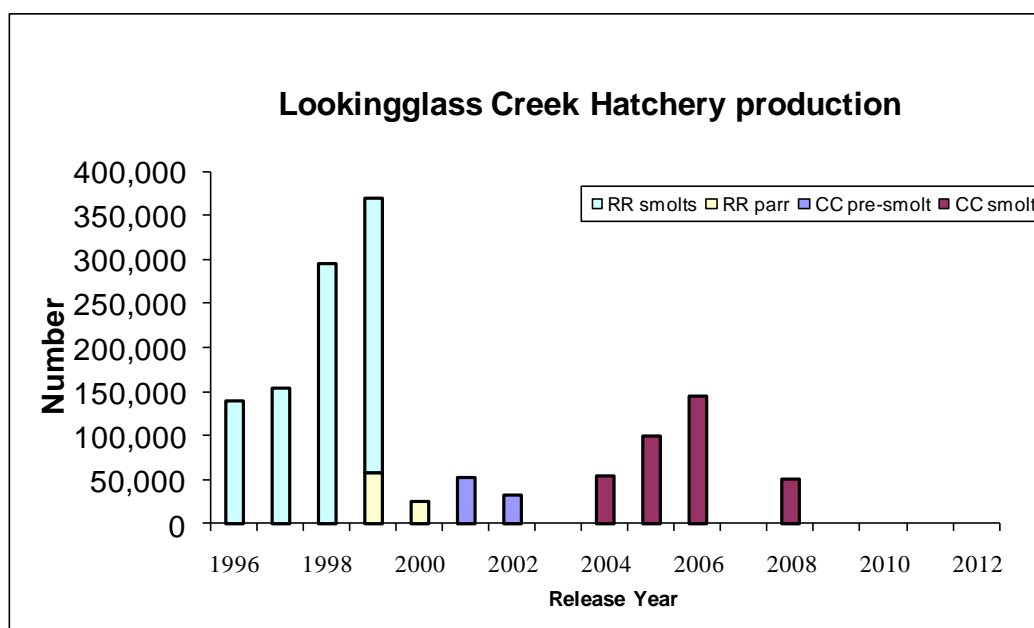
Annual tagging plans are outlined in the Annual Operating Plan. Lookingglass stock smolts are marked 100% with adipose clips and cwt. Additionally 1500 PIT tags are inserted for monitoring emigration and smolt survival.

11. Fish Release

a) Protocols

Lookingglass Creek smolts are released directly from the outdoor rearing raceways at Lookingglass Creek Fish Hatchery. Screens are pulled on or about April 1; remaining fish are forced out after approximately two weeks. Release may be delayed or advanced depending on environmental conditions. Smolts leave the hatchery via the tail race and fish ladder into Lookingglass Creek which is the normal route for hatchery effluent water.

b) Number of fish released each year (subyearlings?; yearlings?; other?)



Lower Snake River Fish and Wildlife Compensation Plan Grande Ronde and Imnaha basins annual operation plan for the period of February 1, 2008 – January 31, 2009

D. Program benefits and performance

The Lookingglass Creek reintroduction program was initiated with releases of Catherine Creek parr in 2001. Evaluation of the program is ongoing.

From the draft HGMP for Grande Ronde Basin Spring/Summer Chinook Program, May 2009:

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Legal Mandates - Provide adult spring Chinook within the LSRCP mitigation area while minimizing adverse impacts to listed fish.

- ***Performance Standard (1):*** Grande Ronde Basin Chinook production contributes to fulfilling tribal trust legal mandates and treaty rights

Indicator 1(a): Estimated number of program Chinook harvested in tribal fisheries by run year.

- ***Performance Standard (2):*** Program contributes to annual LSRCP mitigation goals

Indicator 2(a): Estimated annual harvest in LSRCP mitigation areas and annual escapement to the hatchery facility and program streams.

Harvest

- ***Performance Standard (3):*** Fish are produced in a manner enabling effective harvest while avoiding over-harvest of non-target fish

Indicator 3(a): Estimated run year harvest and harvest related mortality for hatchery and natural fish, by fishery.

- ***Performance Standard (4):*** Release groups are marked to enable determination of impacts and benefits in fisheries

Indicator 4(a): Number of recovered marked fish reported in each fishery produces accurate estimates of harvest.

Indicator 4(b): Verify that mark rate is 95% to 100% for all smolt release groups.

- ***Performance Standard (5):*** Non-monetary societal benefits for which the program is designed are achieved.

Indicator 5(a): Number of recreational fishery angler days.

Hatchery Performance

- ***Performance Standard (6):*** The hatchery program produces smolts at a higher efficiency than would be achieved in nature.

Indicator 6(a): Survival of Chinook, by life stage in the hatchery.

- ***Performance Standard (7):*** Artificial production program uses standard scientific procedures to evaluate various aspects of artificial propagation.

Indicator 7(a): Scientifically based monitoring and experimental design, with measurable objectives and hypotheses.

- ***Performance Standard (8):*** Facility operation complies with applicable fish health and facility operation standards and protocols.

Indicator 8(a): Results of monthly fish health examinations.

Indicator 8(b): Annual reports indicating level of compliance with applicable standards and criteria.

- ***Performance Standard (9):*** Releases do not introduce new pathogens into local populations, and do not increase the levels of existing pathogens.

Indicator 9(a): Results of monthly fish health examinations.

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Indicator 9(b): Certification of juvenile fish health immediately prior to release.

Indicator 9(c): Juvenile rearing density.

Indicator 9 (d): Results of adult fish health monitoring at Lookingglass Hatchery and in streams.

- **Performance Standard (10):** Any distribution of carcasses or other products for nutrient enhancement meets appropriate disease control regulations and interagency agreements.

Indicator 10(a): Number and location of carcasses distributed for nutrient enrichment.

Indicator 10(b): Disease examination of all carcasses to be used for nutrient enrichment.

Indicator 10(c): Statement of compliance with applicable regulations and guidelines.

- **Performance Standard (11):** Effluent from artificial production facilities will not detrimentally affect populations.

Indicator 11(a): Verify that hatchery effluent is in compliance with existing NPDES permit conditions and water quality standards.

- **Performance Standard (12):** Juvenile production costs are comparable to or less than other regional programs designed with similar objectives.

Indicator 12(a): Total cost of program operation.

Indicator 12(b): Average cost of similar operations.

- **Performance Standard (13):** Hatchery program is sustainable.

Indicator 13(a): Number of broodstock collected is sufficient to maintain the hatchery broodstock.

Indicator 13(b): Number of smolts released produces equivalent adults (P:P ratio).

Conservation Objectives - Conserve genetic and life history diversity of spring Chinook within the Grande Ronde River Basin.

- **Performance Standard (14):** Broodstock collection does not reduce potential juvenile production in natural rearing areas.

Indicator 14(a): Number of natural spring Chinook retained for broodstock collection does not exceed 50% of the annual natural-origin escapement population.

Indicator 14(b): Percentage of natural-origin fish returning to the facility taken for broodstock comprises at least 30% of the broodstock population.

- **Performance Standard (15):** Weir/trap operations do not result in significant stress, injury or mortality in natural populations.

Indicator 15(a): Adult trapping mortality rate for natural-origin fish does not exceed 5%.

Indicator 15(b): Adult trap is checked daily when in operation.

- **Performance Standard (16):** Juveniles are released after sufficient acclimation in the Catherine Creek, Lostine River, and Upper Grande Ronde River facilities to reduce handling stress and to maximize homing to target tributaries in the basin.

Indicator 16(a): Smolts are acclimated for 2-6 weeks prior to release.

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Indicator 16(b): The number of marked spring Chinook returning to the Grande Ronde facilities is equal to or greater than 95% of reported escapement (i.e., < 5% straying).

- **Performance Standard (18):** Patterns of genetic variation within and among natural-origin spring Chinook populations do not diverge as a result of artificial production programs.

Indicator 18(a): Compare genetic profiles and divergence of naturally produced juveniles from indicator areas within the Grande Ronde Basin over time.

- **Performance Standard (19):** Hatchery produced adults do not exceed an average of 70% of natural spawners in Catherine Creek and Lostine River above the collection facilities.

Indicator 19(a): Proportion of hatchery and natural-origin fish in key natural spawning areas.

- **Performance Standard (20):** Broodstock selection strategies effectively maintain genetic and life history characteristics in the hatchery population.

Indicator 20(a): Percentage of natural-origin fish in the broodstock comprises at least 30% of the hatchery broodstock.

Indicator 20(b): Timing of hatchery adult returns to the collection facilities and spawn timing mimic natural-origin Chinook returns.

Indicator 20(c): Genetic profile of natural-origin and hatchery Chinook in Grande Ronde Basin does not significantly diverge.

Indicator 20(d): Size and age composition of returning adults is consistent with natural-origin run.

- **Performance Standard (21):** Broodstock collection does not significantly alter spatial and temporal distribution of naturally spawning spring Chinook populations

Indicator 21(a): Number of adult fish aggregating or spawning immediately below the adult weir does not exceed historical distributions and spawning activity.

Indicator 21(b): Natural-origin spring Chinook are captured and sorted by gender, and either retained, transported, or released according to annual run timing and run size.

Ecological Impacts

- **Performance Standard (22):** Release numbers do not exceed habitat capacity for spawning, rearing, migration corridor, and estuarine and near-shore rearing.

Indicator 22(a): Smolts are released in March through April and are released into targeted locations to promote quick smolt emigration.

Indicator 22(b): Proportion of residual hatchery smolts in key natural rearing areas does not exceed 10%.

Indicator 22(c): Emigration behavior of hatchery smolts matches that of their wild counterparts.

Indicator 22(d): Releases of parr and adults are made to under-seeded outlet streams.

- **Performance Standard (23):** Water withdrawal and diversion structures used in operation of artificial production facilities will not prevent access to natural spawning areas, affect spawning behavior of listed natural populations, or impact juvenile rearing.

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Indicator 23(a): Water withdrawals compared to applicable passage criteria.

Indicator 23(b): Water withdrawal compared to NOAA juvenile screening criteria.

Indicator 23(c): In stream flow between hatchery facility intake and out-fall are maintained in all facilities.

Indicator 23(d): Length of stream impacted by water withdrawal.

- **Performance Standard (24):** Predation by artificially produced fish on natural produced fish does not significantly reduce numbers of natural fish.

Indicator 24(a): Size at, and time of juvenile release compared to size and timing of natural fish present.

Monitoring and Evaluation:

- **Performance Standard (25):** Monitoring and evaluation occurs on an appropriate schedule and scale to assess progress toward achieving experimental objectives and evaluating the beneficial and adverse affects on natural populations.

Indicator 25(a): Monitoring and evaluation framework including detailed timeline.

Indicator 25(b): Annual and final reports.

- **Performance Standard (26):** Release groups are marked to allow evaluation of effects on local natural populations.

Indicator 26(a): Visible mark (Ad-clip) in Captive Broodstock hatchery-origin release groups. Two visible marks in conventional broodstock hatchery-origin for Catherine Creek and Lostine River release groups. No visible mark (Coded Wire Tagged [CWT] only) on conventional broodstock hatchery-origin in Upper Grande Ronde River. All release groups represented with a percentage of CWT.

1. Adult returns

a) Numbers of adult returns (need data for the past 10-20 years)

- Historical potential-The ICTRT recently classified the Lookingglass Creek as an “extinct” basic population within the Snake River spring/summer Chinook ESU. The extinct classification was primarily based on out of basin releases of Rapid River and Carson hatchery stocks and the elimination of natural spawning adults above the hatchery between 2000-2003. Actions resulted in the loss of a localized Lookingglass Creek population. The ICTRT analysis categorized the historical habitat potential of Lookingglass Creek as a “basic” rating, and a minimum abundance threshold criteria of 500 naturally produced spawners. Approximately 90% of the habitat is located above the hatchery intake. Co-managers have taken aggressive measures to reduce the influence of Rapid River/Carson stock in Lookingglass Creek by eliminating their propagation and removing suspected F1 naturalized Rapid River/Carson adults. The last known (marked) returns were collected at Lookingglass Hatchery in February 15, 2008. Unmarked adults have been removed since 2002 and will continue through 2007 and 2008 (five– year-olds). It is unclear how strongly the Rapid River/Carson stocks have naturalized to lower Lookingglass Creek. Since redd counts of 10, 50, 10, 28 were observed in 2003, 2004, 2005, and 2006, respectively, it

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is contemplation that the Rapid River/Carson stocks will have some genetic influence on the new Lookingglass Creek stock. The first unmarked adults, considered progeny of Catherine Creek stock, will return in 2008 (age-four). Only known Catherine Creek stock adults will be passed above the hatchery from 2002 to 2008. All adults in 2009 (unmarked and marked) will be considered appropriate for natural escapement and/or brood stock for Lookingglass Creek production. (ODFW Annual Operation Plan 2008: Appendix G).

- Historically, it is estimated that 3,200 fish spawned annually in Lookingglass Creek (NPPC 2004). The subbasin plan estimated that on average, 211 spring Chinook spawn naturally in the system each year (NPPC 2004). A large portion of these fish are likely hatchery fish released from Lookingglass Hatchery or strays from other basins., as reported in HSRG (2009): (ODFW Annual Operation Plan 2008: Appendix E).

Table x. Adult spawning data for spring/summer Chinook at Lookingglass Hatchery for producing the 2004 - 2008 brood years.¹⁰

Brood Year	Marked Males Spawne d	Marked Females Spawne d	Unmark ed Males Spawne d	Unmark ed Females Spawne d	% Unmarke d	Spawnin g Ratio F/M	Average Fecundit y	Egg Take (1,000's)	Fry Poned (1,000's)	Smolts releases (1,000's)
2004	56	53	--	--	0.0%	0.95	2867	172	146	150
2005 *	--	--	--	--	--	--	--	--	--	--
2006 *	--	--	--	--	--	--	--	--	--	--
2007	41	23	--	--	0.0%	0.56	2997	68	51	N/A
2008	128	76	24	--	12%	0.50	3768	286	N/A	N/A

b) Return timing and age-class structure of adults

- The intake trap at Lookingglass Hatchery will be operated from March (environmental conditions allow) through mid-September. Known returns of Catherine Creek smolts released into Lookingglass, and unmarked jacks and four-year olds, will be passed upstream or used for broodstock.
- Adult spring Chinook enter the Columbia River in March through May. Movement into summer holding areas ranges from April through July. Age 4 fish typically dominate returns to the Grande Ronde Basin. Spawning occurs from early August through mid- September and generally peaks in late August (Grande Ronde Basin Spring/Summer Chinook Draft HGMP, Section 2.2.1).
- Age class structure is expected to be similar to Catherine Creek stock until a locally adapted stock becomes established.

¹⁰ Table 6.2.1.D from the DRAFT Hatchery and Genetic Management Plan (HGMP) for Grande Ronde Basin Spring/Summer Chinook Program, Oregon Department of Fish and Wildlife (May 1, 2009).

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c) Smolt-to-adult return rates

Unknown at this time. Expected to be similar to Catherine Creek stock until a locally adapted stock becomes established.

d) Stock productivity (e.g. recruits per spawner)

Unknown at this time. Expected to be similar to Catherine Creek stock until a locally adapted stock becomes established.

2. *Contributions to harvest and utilization (e.g. food banks)*

- Low at this time until a locally adapted stock becomes established.
- In 2001 and 2002, artificially propagated endemic Catherine Creek, Lostine River, and Upper Grande Ronde River stocks, as well as, the Rapid River/Carson composite stock were available to sport harvest from the ocean to the mouth of the Grande Ronde River. Also, the composite stock was available for harvest in a 2.2 mile section of Lookingglass Creek.

3. *Contributions to conservation*

The Lookingglass Creek reintroduction is planned to reestablish a self-sustaining, naturally reproducing return of listed Snake River spring Chinook salmon to a habitat from which the indigenous stock was extirpated. The stock used is indigenous to the Grande Ronde River basin and occupies habitat similar to that available in Lookingglass Creek. Success of this program will contribute to recovery of the threatened Snake River spring/summer Chinook ESU.

4. *Other benefits*

- The Lookingglass Creek reintroduction is expected to contribute to Tribal and recreational fisheries in the Grande Ronde basin and in downstream fisheries. Data collected while developing and monitoring this program will contribute to understanding the protocols for reintroductions of this species into other vacant habitats.
- The intent is to use the hatchery resource is to magnify adult numbers to provide 1) broodstock (170 spawners) to become self-sufficient, 2) escapement of 450 adults above the hatchery, and 3) harvest when escapement predictions exceed 620 adults (ODFW AOP 2008: Appendix G).

E Research, monitoring, and evaluation programs

- The Lookingglass Creek reintroduction program is being evaluated along with the other captive broodstock and conventional supplementation programs in the Grande Ronde and Imnaha River basins.

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- Lookingglass stock smolts are marked 100% with adipose clips. All Lookingglass stock spring Chinook reared at Lookingglass FH are coded-wire tagged and all Lookingglass spring Chinook reared at Irrigon FH are adipose-fin clipped only. In 2009, 1,000 fish will also be PIT tagged for monitoring outmigration and smolt survival. Tags are apportioned equally across raceways.
- The Lookingglass Creek reintroduction program is being evaluated along with the other captive broodstock and conventional supplementation programs in the Grande Ronde and Imnaha River basins.
- A variety on monitoring and evaluation efforts are ongoing for all Chinook smolts reared at Lookingglass Hatchery, including:
 1. Genetic tissue collection for monitoring and potentially pedigree analysis.
 2. Pre-liberation weight and length
 3. Downstream migration.
 4. PIT survival studies; CSS PIT for Catherine Creek and Imnaha.
 5. Tag retention and fin clip quality.
 6. Captive vs. Conventional production
 7. Hatchery vs. Natural
- Coded wire tags are used to assess contribution to fisheries and estimate smolt to adult survival.
- PIT tag data provides information regarding downstream migration timing and comparative performance of wild, captive brood, and conventional juveniles.
- The Lookingglass Creek reintroduction program is being evaluated along with the other captive broodstock and conventional supplementation programs in the Grande Ronde and Imnaha River basins.
- A significant amount of data collected for the Grande Ronde and Imnaha has not been evaluated and published in peer reviewed documents due to limited staffing and funding priorities.
- **Research Monitoring and Evaluation Objectives** (ODFW 2007 Annual Progress Report to LSRCP: Feldhaus et al. 2010)
 1. Document Chinook salmon rearing and release activities at all LSRCP facilities.
 2. Determine optimum rearing and release strategies that will produce maximum survival to adulthood for hatchery-produced Chinook salmon smolts.

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3. Document Chinook salmon adult returns to broodstock collection facilities in the Imnaha River, Lostine River, Catherine Creek, upper Grande Ronde River, and Lookingglass Creek.
4. Estimate annual hatchery returns to compensation areas and determine success in meeting mitigation goals.
5. Estimate annual smolt survival to Lower Granite Dam (LGD) for production and experimental groups.
6. Conduct index, extensive, and supplemental Chinook salmon spawning ground surveys for all populations in northeast Oregon to assess spawn timing and spawning distribution, and estimate natural spawner escapement.
7. Determine the proportion of naturally spawning spring Chinook salmon that are of hatchery origin in the Imnaha and Grande Ronde basin Chinook salmon populations.
8. Determine annual escapement and spawner numbers to estimate and compare productivity (recruits per spawner) for natural- and hatchery-produced fish in the Imnaha and Grande Ronde basin Chinook basins.
9. Compare life history characteristics (age structure, run timing, sex ratio, egg size, and fecundity) of hatchery and natural origin salmon.
10. Coordinate Chinook salmon broodstock marking programs for Lookingglass Fish Hatchery.
11. Participate in planning activities associated with anadromous salmon production and management in the Imnaha and Grande Ronde river basins and participate in ESA permitting, consultation, and recovery planning.

F. Program conflicts

1. Biological conflicts (e.g. propagated stock maladapted to hatchery water source)

The Lookingglass FH facility and intake weir design may prevent upstream and downstream passage of native fish populations such as bull trout, especially during low flows.

2. Harvest conflicts (e.g. mixed stock fishery on hatchery and wild fish limits harvest opportunities on hatchery fish)

None Identified

3. Conservation conflicts and risks

a) Genetic conflicts associated with straying and natural spawning of hatchery fish (Stray rates, proportion of hatchery-origin fish on natural spawning grounds, etc. Provide tables or figures where appropriate)

- There is no contingency established for reducing or eliminating the number of hatchery-origin fish passed upstream relative to the number naturalized adults returning. Continuing to pass hatchery-origin fish upstream onto the natural spawning grounds once a natural population is at a viable size poses a greater reproductive fitness risk than abundance benefit to the naturally spawning population
- The estimated parametric productivity ($k = 3.0$ recruits/spawner) and capacity ($C = 200$ adult recruits) for spring Chinook in Lookingglass Creek, and the predicted mean number of natural-origin adult recruits per year ($N=134$) obtained by the HSRG under current conditions, may not be sufficient to maintain a properly-integrated hatchery program that requires 85 male and 85 female (hatchery + wild) spawners. In short, a naturalized population with $PNI > 0.5$ is – most likely – not obtainable under current conditions.

b) Ecological conflicts (e.g. competition between hatchery fish and wild fish, predation,)

- Utilizing the majority of natural-origin recruits for broodstock and allowing a larger proportion of hatchery-origin compared to natural-origin fish to pass upstream is likely to inhibit the development of a sustainable naturally spawning population.
- Spring Chinook and steelhead adults migrating above the water intake structure for the hatchery in Lookingglass Creek increase disease risks to spring Chinook reared on surface water.
- Amplification of disease within the hatchery poses a disease risk to the Lookingglass spring Chinook population.
- Wild juvenile fish that enter the raceways through the water intake structure could pose a disease and ecological risk to the watershed where the fish are released.
- Lookingglass Creek spring Chinook are reared on creek water with limited UV treatment and then transferred to Irrigon FH for rearing. This poses a health risk to fish reared at Irrigon FH.
- The transfer and short-term rearing of Lookingglass spring Chinook fingerlings at Irrigon FH and subsequent transfer back to Lookingglass FH may promote the transfer of fish pathogens between stocks reared at these two facilities.
- The amplification of disease within the hatchery poses a risk of pathogen transmission to fish populations downstream of Lookingglass FH and the risk of vectoring disease in the region.

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- Cultured fish may amplify fish disease in the waters where the fish are acclimated and released (applies to satellite facilities).
- Wild juvenile fish that enter the raceways through the water intake structure could pose a disease and ecological risk to the watershed where the fish are transferred, particularly if brook trout are introduced into bull trout occupied areas.

4. Other conflicts between the hatchery program, or fish produced by the program, and other non-hatchery issues

- Water supply constraints such as turbidity, sediment, and woody debris during spring runoff may disrupt flow, force holding fingerlings longer and at higher densities in hatchery nursery tanks, and decrease efficacy of UV disinfection system which may lead to higher incidences of disease during hatchery rearing.
- Late summer and early fall low flows and high water temperatures may contribute to deteriorating health of spring Chinook adults held on station.
- Transportation of adults and juveniles long distances for long periods may pose a stress condition on the fish leading to higher incidence of disease.
- Acclimation site staffing may not be sufficient to deter poaching or provide sufficient facility security.
- Extreme cold water conditions at the acclimation sites may result in diminished or complete water flow loss resulting in catastrophic fish loss.
- The transfer of fish from the Hatchery raceways to extreme cold water conditions at the acclimation sites may pose a physiological (stress) risk for the fish.
- Crowding and loading in association with transportation to acclimation sites may physically harm the fish, which may be contributing to increased post-release mortality.
- Lack of adequate safety railings at the intake pose a human health and safety risk. This risk is particularly high during high spring runoff flow conditions.
- Lack of working space and sorting containers at the Lookingglass FH spawning area makes it more strenuous and work intensive to conduct adult biosampling and spawning protocols, posing a human health risk.

IIIB. Upper Grande Ronde River Spring Chinook, Lookingglass FH

A. General information

Lookingglass Hatchery is used for spawning, incubation and rearing of listed Snake River spring/summer progeny from the endemic adult supplementation program and endemic captive broodstock program in the Grande Ronde River Basin and endemic spring Chinook in the Imnaha River Basin. The Upper Grande Ronde Chinook program is one of five spring Chinook stocks reared at Lookingglass Creek Fish Hatchery, and is similar in goals and operations to the programs at Catherine Creek and Lostine River for spring chinook

Hatchery mitigation goal (Currently Permitted Program) for the Grande Ronde spring/summer chinook salmon is 900,000 smolts. Up to 250,000 smolts of the total are progeny of the endemic Upper Grande Ronde River stock released into Upper Grande Ronde River.

The Upper Grande Ronde River program is the portion of the overall Grande Ronde Endemic Spring Chinook Salmon Supplementation Program (GRESOSP) that focuses on supplementation of the indigenous spring Chinook population in the upper Grande Ronde River.

Upper Grande Ronde River

The Upper Grande Ronde River population dropped to a very low level in 1989 with no redds counted in the spawning area. Redd counts again dropped to very low levels in the mid to late 1990's with only four redds counted in 1994, seven in 1995, and no redds in 1999. These levels are well below the highest historically recorded redd counts of 304 in 1968, 185 in 1987, 116 in 1988, and 116 in 1992. Redd levels have remained low with counts of 0 to 29 redds from 1996 to 2003. The return in 2001 was estimated at 34 fish of which 100% were natural origin. The first adult returns from the endemic hatchery program occurred in 2002. The population estimate for the upper Grande Ronde River has increased each of the last two years and the redd count number increased significantly in 2003. Composition of the return was 94.4% natural origin in 2002 and 93.7% in 2003. Abundance and redd counts have generally increased the last three years. Escapement estimates have remained below the critical and viable threshold levels. However, it is anticipated that escapement estimates for 2004 will exceed the critical threshold level and may also surpass the viable threshold level.

B. Stock/Habitat/Harvest Program Goals and Purpose

1. Purpose and justification of program

Lookingglass Hatchery was constructed in 1982 as part of the Lower Snake River Compensation Program (LSRCP)—a program to mitigate for spring chinook and summer steelhead losses caused by the four federal dams constructed on the lower Snake River. The Upper Grande Ronde portion of the Lookingglass Creek Fish Hatchery program focuses on

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the indigenous spring Chinook salmon stock of the Upper Grande Ronde River. Wild anadromous adults from this stock are incorporated within the broodstock annually and portions of hatchery origin adults are allowed to spawn naturally in the target tributary each year. All adults returning from the captive brood origin smolts are allowed to spawn naturally. A portion of returning hatchery adults can be out planted in areas determined by the Grande Ronde Spring Chinook Hatchery Management Plan (Zimmerman et al. 2002).

2. Goals of program

The short-term goal is to use captive broodstock technology and conventional supplementation to prevent the extinction (preservation/conservation) of the wild chinook population in the Upper Grande Ronde River, provide a future basis to reverse the decline in stock abundance of Grande Ronde River chinook salmon, and ensure a high probability of population persistence well into the future once the causes of basin wide population declines have been addressed.

Associated objectives include:

1. To prevent extinction of native wild chinook populations in the upper Grande Ronde River,
2. Maintain genetic diversity of indigenous artificially propagated chinook populations,
3. Maintain genetic diversity in wild chinook populations specifically the Minan and Wenaha rivers,

An intermediate goal of this program is the restoration of spring chinook salmon in the Grande Ronde sub-basin using three indigenous stocks.

The long-term goal of this program is recovery, de-listing, and to mitigate for fish losses occurring as a result of the construction and operation of the four Lower Snake River Dams.

3. Objectives of program

- Objective 1: Foster and sustain opportunities for sport, commercial, and tribal fishers consistent with the conservation of naturally produced native fish.
- Upper Grande Ronde Captive Brood (080F) Stock: Rear up to 195,000 fish (9,750 pounds) for release into the Grande Ronde River.
- Upper Grande Ronde (080) Stock: Produce 41,000 fish (2,050 pounds) for release into the Grande Ronde River.
- Objective 2: Contribute toward the sustainability of naturally produced native fish populations through the responsible use of hatcheries and hatchery-produced fish.
- Objective 3: Maintain genetic resources of native fish populations spawned or reared in captivity.
- Objective 4: Restrict the introduction, amplification, or dissemination of disease agents in hatchery produced fish and in natural environments by controlling egg and fish

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movements and by prescribing a variety of preventative, therapeutic and disinfecting strategies to control the spread of disease agents in fish populations in the state.

- Objective 5: Minimize adverse ecological impacts to watersheds caused by hatchery facilities and operations.
- Objective 6: Communicate effectively with other fish producers, managers and the public.

4. Type of program (Integrated or Segregated)

The Upper Grande Ronde River supplementation program is planned with an integrated recovery model, based on the indigenous Upper Grande Ronde stock. The current operation includes both an integrated conventional broodstock and a captive broodstock produced by parr collected in the Upper Grande Ronde River and reared to adults for spawning. Long term expectation is for about 170 adults to be collected at random from the return with 500 adults allowed to spawn naturally in habitat upstream from the Upper Grande Ronde adult trap weir.

5. Alignment of program with ESU-wide plans¹¹

The Upper Grande Ronde supplementation program relates to other plans and policies regarding the management and restoration of anadromous fish resources in the Pacific Northwest. Artificial propagation, including the use of captive broodstocks and artificial supplementation programs as part of a strategy to recover depleted salmon populations is described in the Basinwide Salmon Recovery Strategy, which was developed by the Federal government to restore ESA-listed salmon and steelhead throughout the Columbia River basin (Federal Caucus 2000).

In addition, the Proposed Action is consistent with on-going ESA recovery planning. Recovery plans are being developed in most sub-basins in the Columbia River system. These recovery plans will contain: (1) measurable goals for delisting, (2) a comprehensive list of the actions necessary to achieve delisting goals, and (3) an estimate of the cost and time required to carry out those actions. All factors that have been identified as leading to the decline of ESA-listed species will be addressed in these recovery plans. For ESA-listed salmon and steelhead, these factors include hydroelectric operations, harvest, habitat use, and artificial propagation.

Other Federal, state, and Tribal plans and policies that would potentially address effects on fish populations in the Snake River basin apply within or near the action area. Federal actions include Forest Service and Bureau of Land Management land and resource management plans that are designed to foster sustainable ecosystems and resilient watersheds. State initiatives include legislative measures to facilitate the recovery of listed species and their habitats, as well as the overall health of watersheds and ecosystems. State land management, environmental quality, water resources, and agriculture agencies all have policies and plans that address water quality and land use practices that are designed to achieve desirable water quality and resource conditions, some specific to protected species, some more generally

¹¹ Refer to "I. Columbia River Gorge" section "D. ESUs identified by NMFS and Current ESA status" for list of ESUs.

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addressing water and resource quality. Regional programs are being developed that designate priority watersheds and facilitate development of watershed management plans. Tribes have developed a joint restoration plan for anadromous fish in the Columbia River basin, known as the Wy-Kan-Ush-Mi Wa-Kish-Wit or *Spirit of the Salmon* plan (CRITFC 1995). The Proposed Action is expected to be compatible with the goals and objectives of other regional actions.

6. Habitat description and status where fish are released.

The Upper Grande Ronde release site is in the headwaters of the Grande Ronde River. The habitat within the Upper Grande Ronde area has been substantially degraded by past land use practices, primarily timber harvest and grazing. The main stem of the Grande Ronde River has been significantly altered by highway and railroad construction, channelization and flood control actions as well as being impacted by agriculture and urban development. Chinook habitat productivity is estimated to be reduced by 78% from historical conditions. (NPCC subbasin plan)

7. Size of program and production goals (No. of spawners and smolt release goals)

The current program is sized at 250,000 smolts with emphasis on conventional broodstock when available. Shortfalls in egg takes are made up with captive broodstock. Excess smolts or parr from the captive program may also be released into under-stocked habitat in the Upper Grande Ronde area and tributaries. The long term requirement is 80 to 85 pairs of adults for broodstock, 500 adults for natural spawning escapement and additional fish for tribal and non-tribal fisheries.

C. Description of program and operations

1. Broodstock goal and source

Text A target of 83 a pairs should be collected to produce 250,000 smolts. Grande Ronde conventional program calls for collection of 50% of natural fish and up to 100% conventional returns.

2. Adult collection procedures and holding

A target of 83 a pairs should be collected to produce 250,000 smolts. This is based on a female survival of 92%, fecundity of 4,062, and 81% survival from green egg to smolt. Trapping will begin in March 2008 to monitor steelhead abundance. Overnight staffing will occur after April 15 and trapping will continue, if river conditions allow, through July 31. Grande Ronde conventional program calls for collection of 50% of natural fish and up to 100% conventional returns. Pass 100% of captives.

General Guidelines –

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- a. Trapping facilities will be checked daily.
- b. Water temperature data will be collected. When water temperature exceeds 65°F (18.3°C) fish will not be handled. Picket will be pulled and fish will be allowed to pass. It is expected that as water temperatures increase facility operators will adjust their schedule to best coincide their work with the coolest water temperatures. Water temperatures can be monitored with Onset temperature loggers.
- c. Surveys will be conducted by walking the stream bank for a mile section below each weir. Surveys frequency ranges from daily to weekly depending on water temperatures and fish activity. Information is used to determine if salmon are accumulating below the weirs. Surveys may include snorkeling.
- d. Attempts will be made to haul captured adults on a daily basis. However, adults in CC and UGR will be worked on M, W, F schedule, but will be worked more often during the peak of the run, if necessary. Fish may be held up to 72 hours.

Disposition of Trapped Fish --Adults considered fish age-4 (two ocean) and age-5 (three ocean).

- a. Bull Trout – Enumerate and estimate length (minimize handling). Data and reports sent to ODFW (ODFW District and Regional offices), and LSRCP (Krakker).
- b. Returning Adults from Captive Brood (F₁) – Pass or out plant. Data include fish length, genetic (tissue), and sex prior to release above the weir. Excess jacks may be sacrificed for CWT recovery
- c. Unmarked Chinook can be anesthetized with Aqui-S (pending INAD), CO₂ or MS 222 prior to handling. A data sheet should be provided to Lookingglass Hatchery for all transferred fish (AAT). Each fish trapped will be measured to the nearest mm fork length, sex determined, and a tissue sampled (opercle or caudal punches) for genetic analysis. Fish passed above the weir will be allowed to fully recover in sheltered flow before being released. Fish placed above the weir will be opercle punched (UGR=1ROP, CC=1ROP, LR=Unique opercle punch monthly) for population estimates. *The opercle tissue is generally saved for genetic analysis.* LR fish taken to the Lookingglass will receive three opercle punches (3-ROP) and Tyvek tag. Wild fish from Upper Grande Ronde transferred to Lookingglass will have a Green Tyvek tag and hatchery fish a yellow Tyvek tag. Hatchery fish trapped on Lookingglass Creek, identified as CC, UGR, will either be released back to the stream of origin, marked with 2ROP and identifying tag and held with their respective brood. LR strays will be returned to the Lookingglass Creek. Adults may be outplanted after July 25 or spawned for production. If outplanted, Lookingglass returning fish will be opercle punched and tissue saved for genetic analysis.
- d. Carcasses weirs – Trapping mortalities will be processed as kept fish and transported to Fish Health, fresh if possible, for examination. Fish dead for less than 24 hrs keep on ice. Fish dead more than 24 hours freeze. Other pre-spawning mortalities discovered during weir-effect surveys will also be sent to Fish Health. Data will be sent to ODFW Fish Research (Monzyk). Following examination, the carcasses may be disposed of by Tribal distribution, habitat or landfill.

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Note: Tumors- Fish will be inspected for tumors along the gum line. If a tumor is suspected, fish will be held for consultation.

7. Broodstock Transportation Procedures – CTUIR will provide transportation of adult fish from CC and uGR and NPT will provide transportation from the Lostine. ODFW Regional Transport coordinator will provide back-up transportation.

a. Attempt to haul broodstock adults daily. Adults will not be held more than 72 hours.

b. Driver is responsible to complete a transfer data sheet to the Lookingglass Hatchery staff upon arrival for data entry in the HMIS system.

c. Thermal shock will be minimized during transport. Hauling will normally occur in the morning to take advantage of cooler stream temperatures. Temperature differences between transport container and facility water will not exceed 10°F or 5.6°C. Tempering may be necessary to reduce temperature difference.

d. Fish Handling- Fish will be netted from the transport tank and placed in holding tanks at Lookingglass Hatchery. Lookingglass Hatchery personnel will record all observations on data sheets and report to Fish Health at the end of the season.

8. Adult holding (Attempts will be made to add ambient lighting to circular tanks)

Catherine Creek – All fish will be held in one adult holding raceway.

Lookingglass Creek-Up to 500 fish will be held in one adult holding raceway.

Lostine River-All fish will be held in circular tank in endemic building (number TBA).

Upper Grande Ronde—All adults will be held in one or two circular tanks in the endemic building (numbers TBA).

3. Adult spawning

a) Spawning protocols

Spawning Guidelines (for each stock)

1. Anesthetic MS222 or Aqui-S.
2. Sorting – The first sort will occur the week of August 11th.
3. Expected First Spawn – The week of August 11th.
4. Spawning Frequency - Once per week or as required (deceased females will not be spawned). Tentative Schedule: Tuesday-IM, Wednesday-LR, LGCR, Thursday-UGR, CC.

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5. Spawning Strategies - All spawning will be done at Lookingglass Hatchery. Sorting and spawning to take place the same day. Hatchery and co-manager staffs will determine fertilization matrices. All Tyvek tag numbers will be recorded on the spawning matrix sheets. Most spawning matrices will be 2 females x 2 males, but matrices of 1 x 1, 1 x 2, 2 x 1, or 3 x 2 can be used if necessary. Fertilized eggs will be incubated at Lookingglass hatchery. Fecundity will be determined at eye-up. If a ripe female is observed during sorting and no ripe male is available, the female will be returned to the holding pond until a ripe male is located. Ripe male gametes can be collected in an emergency (priority intended):

a. Sperm on ice from fish passed at weirs - These fish will be given a ILOP opercle punch so they can be identified during spawning surveys and counted as “taken”.

b. Cryopreserved sperm Fill out request form (Appendix I.)

c. If milt is not available after 7 days of holding a ripe female, transport female(s) to river of origin.

Note: Gene Banking – Sperm from males will be cryopreserved on the day of spawning. NPT will provide staffing and coordination with Lookingglass Hatchery.

b) No. of males and females spawned each year over past 10 years (table)

Table: Upper Grande Ronde River spring/summer Chinook salmon spawning data 2001-07 (Grande Ronde and Imnaha AOP 2009)

Brood Year	Marked Females Spawned	Unmarked Females Spawned	% Un-marked	Spawning Ratio F/M	Average Fecundity	Egg Take	Fry Poned	Smolt releases
2001	0	8	100%	1.00:1	4,420	35,360	*25,339	26,923
2002	0	25	100%	1.09:1	3,454	86,355	70,250	70,088
2003	0	23	100%	1.10:1	5,249	120,733	105,374	104,347
2004	0	7	100%	1.00:1	2,979	20,850	19,057	18,901
2005	37	3	7.5%	1.54:1	3,877	155,080	119,963	118,803
2006	71	13	15.5%	1.45:1	3,539	297,244	269,439	260,500
2007	25	6	19.4%		3,960	122,750	99,136	
Total	133	85	39.0%		3,846	838,372		599,562

*Inventory correction; In 2004, eggs have been electronically counted
Numbers in blue current inventory
2001-06 brood, estimate survival from green egg to smolt at 83.4%.

4. Fertilization

a) Protocols

All spawning will be done at Lookingglass Hatchery. Sorting and spawning to take place the same day. Hatchery and co-manager staffs will determine fertilization matrices. All

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Tyvek tag numbers will be recorded on the spawning matrix sheets. Most spawning matrices will be 2 females x 2 males, but matrices of 1 x 1, 1 x 2, 2 x 1, or 3 x 2 can be used if necessary. Fertilized eggs will be incubated at Lookingglass hatchery. Fecundity will be determined at eye-up. If a ripe female is observed during sorting and no ripe male is available, the female will be returned to the holding pond until a ripe male is located. Ripe male gametes can be collected in an emergency

5. Incubation

All stocks will be incubated at Lookingglass Hatchery using a combination of chilled well water and UV treated ($>60,000 \text{ uw/cm}^2/\text{sec}$) creek water.

Hatchery Program – Each female's eggs will be incubated in one tray until disease screening profiles results are completed. Eggs may be combined after fecundity estimates are completed. Incubation temperatures will be manipulated to bring all spawn dates together during incubation and early rearing.

Early Rearing Program –

- **Lookingglass** – Catherine, Grande Ronde, Lostine, and Lookingglass (CC captive brood) fry will be loaded at 30 to 50 thousand per trough.
- **Segregation of eyed-eggs and progeny will occur based on BKD ELISA** values of kidneys from spawned females. The degree of segregations is based on allowable space.
- **Catherine Creek, Lostine, and Grande Ronde** smolts produced will target 25fpp in October 2009.

a) Number of eggs collected and fertilized each year over past 10 years (table)

Table: Upper Grande Ronde River spring/summer Chinook salmon spawning data 2001-07 (Grande Ronde and Imnaha AOP 2009)

Brood Year	Marked Females Spawned	Unmarked Females Spawned	% Un-marked	Spawning Ratio F/M	Average Fecundity	Egg Take	Fry Pondered	Smolt releases
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2002	0	25	100%	1.09:1	3,454	86,355	70,250	70,088
2003	0	23	100%	1.10:1	5,249	120,733	105,374	104,347
2004	0	7	100%	1.00:1	2,979	20,850	19,057	18,901
2005	37	3	7.5%	1.54:1	3,877	155,080	119,963	118,803
2006	71	13	15.5%	1.45:1	3,539	297,244	269,439	260,500
2007	25	6	19.4%		3,960	122,750	99,136	
Total	133	85	39.0%		3,846	838,372		599,562
*Inventory correction; In 2004, eggs have been electronically counted								

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Numbers in blue current inventory
2001-06 brood, estimate survival from green egg to smolt at 83.4%.

Incubation Strategies – All stocks will be incubated at Lookingglass Hatchery using a combination of chilled well water and UV treated ($>60,000$ uw/cm²/sec) creek water.

1. Hatchery Program – Each female's eggs will be incubated in one tray until disease screening profiles results are completed. Eggs may be combined after fecundity estimates are completed. Incubation temperatures will be manipulated to bring all spawn dates together during incubation and early rearing.

6. Ponding

a) Protocols

Fry will be reared in 6 double deep troughs at Lookingglass Hatchery on UV treated water Lookingglass Creek water. Fish will be fed a 14-day "pro-active" feed in lieu of a 28-day medicated feed treatment prior to transferring outside. Fish will be transfer outside to raw creek water in April or May. After marking, fish will be divided into 5 raceways with approximately 57,600 fish per raceway. In July/August, a prophylactic feed treatment will be administered to control BKD.

b) Number of fry ponded each year, including % hatch each year

See Lookingglass Creek Spring Chinook, Section C.

7. Rearing/feeding protocols

See Lookingglass Creek Spring Chinook, Section C.

8. Fish growth profiles

See Lookingglass Creek Spring Chinook, Section C.

9. Fish health protocols and issues

See Lookingglass Creek Spring Chinook, Section C.

10. Chemotherapeutant use

See Lookingglass Creek Spring Chinook, Section C.

11. Tagging and marking of juveniles

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See Lookingglass Creek Spring Chinook, Section C.

12. Fish Release

a) Protocols

All acclimation facilities will be set-up and operational at least 2 days prior to scheduled delivery of smolts. Weather permitting; the Upper Grande Ronde release is scheduled for delivery of fish on approximately March 10 each year. Acclimation facility operator will notify ODFW if their facility is not operational on scheduled dates. Release number will be determined by last physical inventory minus mortality. If two groups are acclimated, the first group is acclimated for about two weeks before the screens are pulled for volitional emigration. After one week, the remaining smolts are forced out, the facility is re-watered and the second group is acclimated and released.

b) Number of fish released each year (subyearlings?; yearlings?; other?)

- See table in section C5a) above. For release years 2003-2007, the number of smolts released from the captive and conventional programs are (2003) 210,113 and 26,923, (2004) 75,063 and 69,856, (2005) 1,019 and 104,350, (2006) 76 and 18,901, and (2007) 20,620 and 118,803, respectively.
- Due to limited capacity of the Upper Grande Ronde acclimation facility, the spring Chinook are acclimated and released in two phases: the first in mid-March, and the second, April 1. The fish are acclimated for one week and allow at least two weeks for fish to volitionally emigrate, and then perform a forced release into the river. The target size at transfer is 25 fpp for both groups.

D. Program benefits and performance

See list of program performance standards in Section D of Lookingglass Creek Spring Chinook section.

1. Adult returns

From HSRG 2009: Recently (1953-2003), the ICTRT reports that abundance of spring Chinook for this subbasin has ranged from 3 to 855 fish, with a recent 10-year geometric run size of 38 fish. Natural-origin spawners have comprised a total of 77% of total spawners over the last 10 years. Historically, spawning in the mainstem Upper Grande Ronde River, likely numbered in the thousands. The ICTRT has classified this population of Chinook as a “Large” population in size based on its historic habitat potential. A “Large” population is one that requires a minimum abundance of 1,000 wild spawners and an intrinsic productivity of 1.6 recruits per spawner (R/S) to be viable at the 5% extinction risk threshold.

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a) Numbers of adult returns (need data for the past 10-20 years)

Table: Appendix P. Preliminary CTUIR data from Upper Grande Ronde releases between 1998 and 2007 summarized by ODFW.

Brood Year	Release Year	Release Type	Number	Return Years			Total Return	SAR Percent
				<u>2001</u>	<u>2002</u>	<u>2003</u>		
1998	2000	Conventional	0					
		Captive	1,508	0	3	1	4	0.2653
		Natural-Redds	42	0	83	229	312	
				<u>2002</u>	<u>2003</u>	<u>2004</u>		
1999	2001	Conventional	0					
		Captive	2,560	0	8	6	14	0.5469
		Natural-Redds ¹	0	1	6	0	7	
				<u>2003</u>	<u>2004</u>	<u>2005</u>		
2000	2002	Conventional	0					
		Captive ^{2, 3}	228,385	60	545	26	631	0.2763
		Natural-Redds	20	3	43	9	55	
				<u>2004</u>	<u>2005</u>	<u>2006</u>		
2001	2003	Conventional	26,923	12	92	0	104	0.3863
		Captive ⁴	242,913	73	276	7	356	0.1465
		Natural-Redds	15	6	12	2	20	
				<u>2005</u>	<u>2006</u>	<u>2007</u>		
2002	2004	Conventional	69,856	9	159	9	177	0.2405
		Captive	75,063	0	1	0	1	0.0013
		Natural-Redds	23	0	52	11	63	
				<u>2006</u>	<u>2007</u>	<u>2008</u>		
2003	2005	Conventional ⁵	104,350	2	28		30	0.0287
		Captive	1,019	0	0		0	0.0000
		Natural-Redds	40	4	22		26	
				<u>2007</u>	<u>2008</u>	<u>2009</u>		
2004	2006	Conventional	19,061	18				
		Captive	90	0				
		Natural-Redds	186	0				
				<u>2008</u>	<u>2009</u>	<u>2010</u>		
2005	2007	Conventional	119,002					
		Captive	20,687					
		Natural-Redds	91					
				<u>2009</u>	<u>2010</u>	<u>2011</u>		
2006	2008	Conventional	260,000					
		Captive	0					

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Natural-Redds

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¹ No survey in Vey Meadows. Unknown number of redds.

² 76,941 were released as parr.

³ Does not include 50,100 smolts lost in acclimation pond accident prior to release

Redd counts observed in selected tributaries in the Grande Ronde Basin, 1986-2008 (ODFW unpublished data as presented in Table 2.2.2A Draft HGMP for Grande Ronde Basin Spring/Summer Chinook Program, May 2009).

Year	Catherine Creek	Lostine River	Upper Grande Ronde River	Minam River	Wenaha River
1986	94	90	48	63	68
1987	234	94	207	103	152
1988	212	182	115	96	170
1989	46	52	Na	38	18
1990	39	27	31	67	83
1991	20	28	10	50	58
1992	49	36	116	95	183
1993	84	102	103	88	100
1994	11	16	3	29	42
1995	14	11	6	15	21
1996	15	27	22	84	102
1997	46	49	19	48	72
1998	34	35	25	57	65
1999	40	57	0	40	22
2000	34	64	20	128	119
2001	133	118	15	179	262
2002	158	209	14	193	211
2003	167	194	29	153	157
2004	96	189	185	151	198
2005	74	148	88	95	132
2006	117	111	18	114	103
2007	59	104	1	95	86
2008	101	293	32	137	108

b) Return timing and age-class structure of adults

- Adult spring Chinook enter the Columbia River in March through May. Movement into summer holding areas ranges from April through July. Age 4 fish typically dominate returns to the Grande Ronde Basin. Spawning occurs from early August through mid- September and generally peaks in late August (Grande Ronde Basin Spring/Summer Chinook Draft HGMP 2009, Section 2.2.1).
- Table 6 below is from ODFW 2007 Annual Progress Report to LSRCP: Feldhaus et al.

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Table 6. Number and disposition, by origin, age, and sex, of adult spring Chinook salmon returning to northeast Oregon LSRCP facilities in 2007. The numbers of Chinook trapped/passed above the weir were adjusted to account for the estimated number of returning unclipped hatchery fish without a coded wire tag (CWT).

returning unclipped hatchery fish without a coded wire tag (CWT).																
Stock, Disposition	Age	Hatchery						Natural						Grand total		
		3		4		5		3		4		5				
		M	F	M	F	M	F	Total	M	F	M	F	M		F	Total
<u>Imnaha River</u>																
Trapped ^d	496	0	376	243	25	38	1178	21	0	55	23	15	39	153	1331	
Passed above the weir	10	0	172	108	10	18	318	21	0	34	10	12	25	102	420	
Outplanted	398	0	29	72	7	12	618	0	0	0	0	0	0	0	618	
Ceremonial/Subsistence	28	0	0	0	0	0	28	0	0	0	0	0	0	0	28	
Kept ^a	55	0	75	63	4	16	213	0	0	21	13	3	14	51	264	
Actual spawned	20	0	59	58	3	14	154	0	0	19	8	4	13	44	198	
Killed, not spawned	11	0	6	1	0	0	18	0	0	0	0	0	0	0	18	
Pre-spawn mortality	24	0	10	4	1	2	41	0	0	2	5	0	0	7	48	
Mean length (mm) ^c	570		773	796	974	860		n/a	-	748	757	876	895			
(Sample Size)	(20)	-	(44)	(48)	(2)	(13)				(15)	(10)	(2)	(14)			
Weir age composition (%)	42.1	0.0	31.9	20.6	2.1	3.2	100	13.7	0.0	36.0	15.0	9.8	25.5	100		
<u>Catherine Creek</u>																
Trapped at Catherine Creek ^d	29	0	48	78	11	7	173	6	0	19	20	15	15	75	248	
Passed above the weir	2	0	38	48	9	7	104	5	0	10	14	8	7	44	148	
Returned to Lookingglass	3	0	2	5	0	0	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	10	
Kept ^a	30	0	12	35	2	0	79	1	0	9	6	5	8	29	108	
Spawned	4	0	12	31	0	0	47	1	0	8	6	5	8	28	75	
Killed not spawned	26	0	0	3	2	0	31	0	0	0	0	0	0	0	31	
Pre-spawn mortality	0	0	0	2	0	0	1	0	0	1	0	0	0	1	2	
Mean length (mm) ^c	501		774	734	827			415		727	718	883	841			
(Sample Size)	(5)	-	(11)	(28)	(2)	n/a		(1)	-	(8)	(6)	(4)	(7)			

Table 6 continued.

Table 6 continued.

Stock, Disposition	Hatchery							Natural							Grand total
	3		4		5		Total	3		4		5		Total	
	M	F	M	F	M	F		M	F	M	F	M	F		
<u>Upper Grande Ronde River (UGR)</u>															
Trapped at UGR ^a	5	0	10	15	3	8	40	0	0	10	11	6	6	33	73
Passed above the weir	3	0	0	0	0	0	3	0	0	5	4	3	4	16	19
Returned to Lookingglass	12	0	6	3	1	1	23	n/a	n/a	n/a	n/a	n/a	n/a	n/a	23
Kept ^c	13	0	16	18	4	9	60	0	0	5	5	3	3	16	76
Spawnee	7	0	10	18	3	8	46	0	0	5	3	3	3	14	60
Killed not spawned	5	0	3	0	0	0	8	0	0	0	1	0	0	1	9
Pre-spawn mortality	2	0	3	0	1	1	6	0	0	0	2	0	0	2	8
Mean length (mm) ^e	470	-	756	729	904	821	-	-	-	728	675	893	755	-	-
(Sample Size)	(12)	-	(15)	(17)	(4)	(8)	-	-	-	(4)	(2)	(2)	(3)	-	-
Age composition (%)	26.5	0.0	25.0	28.1	6.3	14.1	100	0.0	0.0	30.3	30.3	18.2	21.2	100	-
<u>Lostine River</u>															
The Nez Perce Tribe reported that some members of the hatchery production staff falsified weir data from 2001-2008. Therefore, these data are unreliable.															
Trapped															
Passed															
Returned below weir															
Outplanted															
Kept ^c	3	0	32	36	1	8	71	2	0	16	15	2	7	42	125
Actual spawned	3	0	27	32	1	8	71	2	0	14	13	2	7	38	109
Killed, not spawned	0	0	0	0	0	0	0	0	0	1	1	0	0	2	2
Pre-spawn mortality	0	0	5	4	0	0	9	0	0	1	1	0	0	2	11
Mean length (mm) ^e	522	-	775	759	847	844	-	553	-	780	765	908	868	-	-
(Sample Size)	(3)	-	(32)	(36)	(1)	(8)	-	(2)	-	(16)	(15)	(2)	(7)	-	-
Spawnee fish age composition (%)	4.2	0.0	45.1	38.0	11.3	1.4	100	5.3	0.0	34.2	36.8	18.4	5.3	100	-

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Table 6 continued.

Table 6 continued.

Stock, Disposition	Hatchery							Natural							Grand total
	3		4		5		Total	3'		4'		5'		Total	
	M	F	M	F	M	F		M	F	M	F	M	F		
<u>Lookingglass Creek</u>															
Trapped ^d	58	0	36	58	10	3	165	7	0	6	4	2	1	20	185
Passed	0	0	25	36	5	1	67	6	0	0	0	0	0	6	73
Returned below weir	0	0	0	0	0	0	0	0	0	1	0	1	0	2	2
Kept ^{e,h}	58	0	11	22	5	2	98	0	0	5	4	1	1	11	109
Spawnd	24	0	11	20	4	2	61	0	0	0	0	0	0	0	61
Killed not spawned	32	0	0	0	0	0	32	0	0	5	4	1	1	11	43
Pre-spawn mortality	3	0	0	2	1	0	6	0	0	0	0	0	0	0	6
Mean length (mm) ⁱ	490		719	717	865	856		-	-	-	-	-	-		
(Sample Size)	(23)	-	(6)	(14)	(4)	(2)									
Age composition (%)	35.1	0.0	21.8	35.2	6.1	1.8	100	35.0	-	30.0	20.0	10.0	5.0	100	

^a Number of fish per age class determination based on Imnaha River age-length key (<630 = Age 3; 630-850 = Age 4; >850 = Age 5)

^b Age composition based on CWT data, scale ages, and the Imnaha River age-length key.

^c Mean length per age class determined from known age fish based on either CWT, or scales.

^d Number of fish per age class determination based on Catherine Creek/Grande Ronde River age-length key (<600 = Age 3; 601-799 = Age 4; ≥800 = Age 5)

^e Age composition based on CWT data, scale ages, and the Catherine Creek/Grande Ronde River age-length key

^f Age composition based on CWT data, scale ages, and the Lostine River age-length key (<630 = Age 3; 630-850 = Age 4; >850 = Age 5).

^g Total does not include strays from Catherine Creek (16) or the Upper Grande Ronde River (25).

^h Kept fish were strays from Catherine Creek and Grande Ronde River. The Catherine Creek and Grande Ronde River strays were used as broodstock for those programs.

¹ Assumed to be Lookingglass Creek stock.

² Assumed to be Rapid River stock.

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Number of female spring/summer Chinook salmon (N) and mean egg weight (g) by stock, origin (hatchery or natural), and age. Within an age class, shared letters are not significantly different (Tukey-kramer; $P > 0.05$) between stocks (from ODFW 2007 Annual Progress Report to LSRCP: Feldhaus et al. 2010 Table 2).

			Hatcher y		Natural			Grand total/ mean
Stock	Age 4		Age 5	Total/ mean	Age 4	Age 5	Total/ mean	
Imnaha River	N	56	14	70	8	13	21	91
	Mean	0.250 _A	0.270 _A	0.254	0.238 _A	0.310 _A	0.274	0.261
Catherine Creek	N	31	—	31	6	8	14	45
	Mean	0.230 _{A,B,C}	--	0.230	0.205 _B	0.268 _A	0.237	0.233
Grande Ronde Lookingglass	N	17	8	25	3	3	6	31
	Mean	0.223 _{B,C}	0.238 _A	0.228	0.234 _{A,B}	0.206 _A	0.220	0.226
Lostine River	N	20	3	23	--	--	--	23
	Mean	0.211 _C	0.250 _A	.217	--	--	--	0.217
	N	31	8	39	12	7	19	58
	Mean	0.239 _{A,B}	0.262 _A	0.243	0.233 _{A,B}	0.306 _A	0.270	0.249

c) Smolt-to-adult return rates

- From Lower Snake River Fish and Wildlife Compensation Plan Grande Ronde and Imnaha Basins Annual Operation Plan 2008: Appendix P (see table above in Section D.1.a): smolt to adult survival rates have ranged from 0.0013% to 0.55% for brood years 1998 to 2002 for the captive and conventional hatchery program in the upper Grande Ronde River.

d) Stock productivity (e.g. recruits per spawner)

- The hatchery program has achieved 5.0 recruits per spawner (HSRG 2009).
- The habitat capacity and productivity provided to the HSRG is currently estimated at 300 adults and 1.0 recruits per spawner, respectively.

2. Contributions to harvest and utilization (e.g. food banks)

- Contribution to harvest is low at this time.
- In 2001 and 2002, artificially propagated endemic Catherine Creek, Lostine River, and Upper Grande Ronde River stocks, as well as, the Rapid River/Carson composite stock were available to sport harvest from the ocean to the mouth of the Grande Ronde River. Also, the composite stock was available for harvest in a 2.2 mile section of Lookingglass Creek.

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3. Contributions to conservation

- Salmon supplementation contains uncertainties. Cuenco et al. (1993) and Waples (1995) outlined potential benefits that include:
 1. Reduce short-term extinction risk
 2. Provide survival advantage for depressed stocks
 3. Speed recovery or rebuilding to carrying capacity
 4. Help maintain population while factors for decline are being addressed
 5. Establish a reserve population for use if wild/natural population suffers a catastrophic loss
 6. Reseed vacant or barren habitat
 7. Provide scientific information for use of supplementation in conservation of wild/natural populations
- **Conservation Objective from Draft HGMP** - Conserve genetic and life history diversity of spring Chinook within the Grande Ronde River Basin.
- ***Endemic Program (Conventional Broodstock)***--This portion of the program is directed by NOAA to supplement Grande Ronde Chinook with stocks indigenous to the basin.
- ***Captive Broodstock***-- This program was initiated as a conservation measure in response to severely declining abundance of Chinook salmon in the Grande Ronde Basin.

(Grande Ronde Basin Spring/Summer Chinook Draft HGMP 2009, Section 3.5)

4. Other benefits

Research Benefits—Opportunity for improving our understanding of the role of supplementation in the recovery of Chinook populations can be gained from this project. Data from acclimated release studies will increase our knowledge of smolt migration and survival rates. Information on adult escapement and interaction between hatchery and naturally reared Chinook may also be gained. In addition, the trapping facilities and monitoring and evaluation components of the program will improve our knowledge of abundance and life history of Grande Ronde Basin spring Chinook salmon (Grande Ronde Basin Spring/Summer Chinook Draft HGMP 2009).

E. Research, monitoring, and evaluation programs

- The Catherine Creek, Lookingglass, Lostine, and Upper Grande Ronde River spring Chinook are part of a Snake River basin-wide assessment of supplementation that has generated a long-term data set.

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- If captive brood progeny are used to backfill the conventional program, then the captive brood progeny are 100% adipose-fin clipped and coded-wire tagged, and conventional fish are 100% coded-wire tagged, no adipose-fin clip. If all of the production comes from conventional program, 50% will be coded-wire tagged, no adipose fin clip; 25% will be adipose-fin clipped and coded-wire tagged, and 25% will be adipose-fin clip only. Approximately 2,000 will be PIT tagged. Tags are apportioned equally across raceways.
- Age and broodyear is determined by size and size distribution of the returning adults.
- Coded wire tags are used to assess contribution to fisheries and estimate smolt to adult survival.
- PIT tag data provides information regarding downstream migration timing and comparative performance of wild, captive brood, and conventional juveniles.
- ODFW operates a smolt trap below the spawning and upper rearing areas on the Upper Grande Ronde River near the town of Starky (2007). The trap is used to collect wild fish so that they can be PIT tagged and used to determine smolt outmigrant timing to Lower Granite Dam. The trap provides abundance information and provides a basis for SARs for wild adults.
- During migration years 1994 through 2007, ODFW estimated that an average of 12,734 (range 51-38,725) juvenile spring Chinook salmon migrated out of upper rearing areas in the upper Grande Ronde River with an average of 23% (range 1%-83%) leaving as early migrants and 77% (range 17%-99%) leaving as late migrants.
- Upper Grande Ronde juvenile spring Chinook salmon survival probability by location and tag group from time of tagging to Lower Granite Dam for Chinook salmon tagged from fall 2006 to spring 2007 and detected at the dams during 2007 was 0.242% for Chinook tagged in the fall at the trap, 0.138% for Chinook tagged in the winter above the trap, and 0.373% for Chinook tagged in the spring at the trap.
- ODFW developed release-recapture information of PIT-tagged smolts from each raceway to calculate Cormack-Jolly-Seber (CJS) survival probabilities to Lower Granite Dam using the SURPH 2.2 program with a single release recapture model. Mean stock survival was calculated as the weighted average of the raceways for each stock with the number of smolts in each raceway as the weight. Mean survival rate for smolts released from Upper Grande Ronde in 2006 was 55% .
- The Confederated Tribes of the Umatilla Indian Reservation initiated a multi-year project in 2000, designed to monitor and evaluate supplementation of endemic spring Chinook salmon in Catherine Creek and the upper Grande Ronde River to; 1) evaluate and contrast performance of supplemented endemic juvenile spring Chinook salmon of conventional and captive broodstock hatchery origin acclimated and released at facilities on Catherine Creek and the upper Grande Ronde River and naturally produced juveniles, 2) Evaluate life history differences between natural and supplemented (hatchery-origin F1) adult spring Chinook salmon from Catherine Creek and the upper Grande Ronde River and 3) Describe life history characteristics and genetic stock structure of adult summer steelhead from Catherine Creek and the upper Grande Ronde River.

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- See ODFW 2007 Annual Progress Report to LSRCP: Feldhaus et al. 2010 for research, monitoring and evaluation objectives as shown in Lookingglass Creek section of this report.

F. Program conflicts

1. Biological conflicts (e.g. propagated stock maladapted to hatchery water source)

- See the Lookingglass Creek Spring Chinook program for demographic risks associated with rearing at Lookingglass FH.
- Continued trapping of the majority of returning adults for broodstock limits the number and diversity of natural spawners.
- Transportation of adults and juveniles long distances for long periods may pose a stress condition on the fish leading to higher incidence of disease.
- Extreme cold water conditions at the acclimation site may result in diminished or complete water flow loss, resulting in catastrophic fish loss.
- The transfer of fish from hatchery raceways to extreme cold water conditions at the acclimation site may pose a physiological (stress) risk for the fish.
- The weir structure may inhibit natural upstream migration of adults back to the major spring Chinook spawning areas, resulting in increased pre-spawning mortality and reduced reproductive success.

2. Harvest conflicts (e.g. mixed stock fishery on hatchery and wild fish limits harvest opportunities on hatchery fish)

None identified.

3. Conservation conflicts and risks

a) Genetic conflicts associated with straying and natural spawning of hatchery fish (Stray rates, proportion of hatchery-origin fish on natural spawning grounds, etc. Provide tables or figures where appropriate)

- The comparatively low recruit to spawner ratio for naturally spawning fish coupled with the high proportion of hatchery-origin spring Chinook spawning in the Upper Grande Ronde River inhibits development of a properly integrated program, which poses a genetic domestication risk to the remnant Upper Grande Ronde spring Chinook population. However, under current conditions, the naturally spawning

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population is not able to sustain itself and the demographic risks of extinction far outweigh these genetic risks.

- Continued reliance on a captive brood program to supplement the Upper Grande Ronde spring Chinook population reduces the effective population size.

b) Ecological conflicts (e.g. competition between hatchery fish and wild fish, predation,)

- Amplification of disease within the hatchery program poses a disease risk to the Upper Grande Ronde River spring Chinook population.
- Anadromous fish in the Upper Grande Ronde River above the satellite facility intake pose a minor fish health risk to the Chinook held at the Upper Grande Ronde River trap and acclimation facility
- See the Lookingglass Creek Spring Chinook program for physical risks associated with rearing at Lookingglass FH.
- Placement or resetting of the temporary weir can pose a safety risk to operating personnel

4. Other conflicts between the hatchery program, or fish produced by the program, and other non-hatchery issues

None identified.

IIIC. Catherine Creek Spring Chinook, Lookingglass FH

A. General information

Lookingglass Hatchery is used for spawning, incubation and rearing of listed Snake River spring/summer progeny from the endemic adult supplementation program and endemic captive broodstock program in the Grande Ronde River Basin and endemic spring Chinook in the Imnaha River Basin. The Catherine Creek Chinook program is one of five spring Chinook stocks reared at Lookingglass Creek Fish Hatchery, and is similar in goals and operations to the programs at Upper Grande Ronde River and Lostine River for spring Chinook.

Hatchery mitigation goal (Currently Permitted Program) for the Grande Ronde spring/summer chinook salmon is 900,000 smolts. The Catherine Creek program currently accounts for 130,000 to 150,000 smolts, based on Annual Operating Plan decisions

Introduction

The Grande Ronde endemic spring Chinook (GRESKP) artificial production of 900,000 smolts is authorized under the US Fish and Wildlife Lower Snake River Compensation Program (LSRCP). LSRCP program was approved by the Water Resources Development Act of 1976 (PL 94-587, Section 102) to mitigate for the losses of fish and wildlife caused by the construction of dams on lower Snake River.

Initiation of the Bonneville Power Administrations Fish and Wildlife program reallocated 650,000 smolts from LSRCP mitigation program for experimental supplementation programs on Catherine Creek, Lostine River, and Upper Grande Ronde. The hatchery-produced fish could be experimentally used as a recovery tool to supplement natural production but also provide tributary harvest during years of high adult escapement. This re-allocation of hatchery production resulted in a reduction of Lookingglass Creek mitigation to 250,000 smolts.

The Catherine Creek program is the portion of the overall Grande Ronde Endemic Spring Chinook Salmon Supplementation Program (GRESKSP) that focuses on supplementation of the indigenous spring Chinook population in the Catherine Creek drainage

B. Stock/Habitat/Harvest Program Goals and Purpose

1. Purpose and justification of program

Lookingglass Hatchery was constructed in 1982 as part of the Lower Snake River Compensation Program (LSRCP)—a program to mitigate for spring chinook and summer steelhead losses caused by the four federal dams constructed on the lower Snake River. Lookingglass is used to raise spring chinook for the Grande Ronde and Imnaha rivers as part of LSRCP. The Grande Ronde sub-basin hatchery program provides adult chinook for

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hatchery broodstock, adult chinook to supplement natural spawning, and limited recreational and tribal harvest within the Lower Snake River Compensation Plan mitigation area (Snake River and tributaries above Ice Harbor Dam). The program utilizes three (Catherine Creek, Lostine River, and Upper Grande Ronde) endemic chinook hatchery stocks that were founded on spring/summer chinook indigenous to the Grande Ronde sub-basin.

The Catherine Creek portion of the Lookingglass Creek Fish Hatchery program focuses on the indigenous spring Chinook salmon stock of Catherine Creek . Wild anadromous adults from this stock are incorporated within the broodstock annually and portions of hatchery origin adults are allowed to spawn naturally in the target tributary each year. All adults returning from the captive brood origin smolts are allowed to spawn naturally. A portion of returning hatchery adults can be out planted in areas determined by the Grande Ronde Spring Chinook Hatchery Management Plan (Zimmerman et al. 2002).

2. Goals of program

The short-term goal is to use captive broodstock technology and conventional supplementation to prevent the extinction (preservation/conservation) of the wild chinook population in Catherine Creek , provide a future basis to reverse the decline in stock abundance of Grande Ronde River chinook salmon, and ensure a high probability of population persistence well into the future once the causes of basin wide population declines have been addressed. Associated objectives include:

- To prevent extinction of native wild chinook populations in Catherine Creek
- Maintain genetic diversity of indigenous artificially propagated chinook populations,
- Maintain genetic diversity in wild chinook populations specifically the Minan and Wenaha rivers,

An intermediate goal of this program is the restoration of spring chinook salmon in the Grande Ronde sub-basin using three indigenous stocks.

The long-term goal of this program is recovery, de-listing, and to mitigate for fish losses occurring as a result of the construction and operation of the four Lower Snake River Dams.

3. Objectives of program

- Objective 1: Foster and sustain opportunities for sport, commercial, and tribal fishers consistent with the conservation of naturally produced native fish.
- Catherine Creek Conventional program: Collect 43pairs of Chinook for broodstock and produce 130,000 smolts for release back into Catherine Creek
- Objective 2: Contribute toward the sustainability of naturally produced native fish populations through the responsible use of hatcheries and hatchery-produced fish.

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- Objective 3: Maintain genetic resources of native fish populations spawned or reared in captivity.
- Objective 4: Restrict the introduction, amplification, or dissemination of disease agents in hatchery produced fish and in natural environments by controlling egg and fish movements and by prescribing a variety of preventative, therapeutic and disinfecting strategies to control the spread of disease agents in fish populations in the state.

4. Type of program (Integrated or Segregated)

The Catherine Creek supplementation program is planned with an integrated recovery model, based on the indigenous Catherine Creek stock. The current operation includes both an integrated conventional broodstock and a captive broodstock produced by parr collected in Catherine Creek and reared to adults for spawning. Long term expectation is for about 170 adults to be collected at random from the return with 500 adults allowed to spawn naturally in habitat upstream from the Catherine Creek adult trap weir.

5. Alignment of program with ESU-wide plans

Same as Upper Grande Ronde

6. Habitat description and status where fish are released.

Same as Upper Grande Ronde

7. Size of program and production goals (No. of spawners and smolt release goals)

Release 130,000 smolts with the goal of returning 500 adults for natural spawning, 85 adults for hatchery broodstock and additional fish to support tribal and recreational fisheries.

C. Description of program and operations

1. Broodstock goal and source

Broodstock needs are based on fecundity and green egg to smolt survival. A target of 42 pairs should be collected to produce 130,000 smolts. The estimate is based on a female survival of 95%, fecundity of 3,824, and green eggs to smolt survival of 86%. The source of broodstock is natural and hatchery produced adult salmon returning to Catherine Creek

2. Adult collection procedures and holding

- Collect 41 males and 41 females (assuming an average fecundity of 3,818) at the Catherine Creek trap site to produce approximately 130,000 smolts (includes prespawn

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mortality and potential culling of eggs from high BKD parents). The estimate is based on a female survival of 95% (spawn 40 females), fecundity of 3,818 (produce 153,000 green eggs), and green eggs to smolt survival of 87.1% (release 130,000 smolts)

- Collect both unmarked natural-origin fish and marked hatchery-origin Catherine Creek spring Chinook for broodstock.
- Collected adults are transported at least once every three days (daily during peak season) from the adult trap to Lookingglass Hatchery in a 240-gallon transport tank.
- Use broodstock collection guidelines (sliding scale) based on estimated escapement to Catherine Creek (table 27 below) to determine the number of adults and proportion of hatchery to natural-origin fish to collect and the number and proportion of hatchery and natural-origin fish to pass upstream on an annual basis.
- Table: Catherine Crk. Spring Chinook broodstock/upstream passage management guidelines (pers. comm. Scott Patterson, ODFW, 2009)

Estimated total adult escapement to the Lostine River mouth (hatchery plus natural) ^a	Ratio of hatchery to natural adults at the mouth	Maximum % of natural adults to retain for broodstock	% of hatchery adults to retain for broodstock ^b	% of adults released above the weir can be of hatchery origin	Minimum % of broodstock of natural origin	% Strays allowed above the weir ^c
<250	Any	40	40	d	d	≤5
251-500	Any	20 ^d	20	≤70	≥20	≤5
>500	Any	≤20	^e	≤50	≥30	≤5
^a Pre-season estimate of total escapement ^b Conventional hatchery adults only, all captive brood adults released to spawn naturally or outplanted ^c For hatchery adults originating from different gene conservation groups (Rapid River stock or strays from outside the Grande Ronde basin) ^d Not to exceed 130,000 smolt production initially ^e Not decision factor at this level of escapement, percentage determined by other criteria						

- Adults collected for broodstock receive an erythromycin injection (20mg/kg) and an oxytetracycline injection (10 mg/kg) at capture to control BKD and Furunculosis, respectively. A second treatment of erythromycin has been applied the first week of August if necessary. The second treatment only occurs if BKD is found in the earlier taken prespawning mortalities.
- The adults receive a formalin treatment 3 times per week. Depending upon the number and health of the adults, treatment can run into September. • Eggs are spawned into colanders to remove ovarian fluid, fertilized, and then water-hardened with 100ppm iodophor for a minimum of 15 minutes.

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3. Adult spawning

a) Spawning protocols

- The intent is to spawn the Catherine Creek spring Chinook in a 2:2 matrix. Occasionally the fish are spawned 1:2, depending upon the number of ripe fish available. At least one natural-origin adult is included in the spawning matrix.
- Current spawning protocols allow up to a maximum of 10% of the eggs to be fertilized by jacks (3-year old males), although a specific protocol or requirement for including jacks has not been established. The milt from up to six jacks may be pooled to fertilize one-half to one-third of the eggs from each females in a 1x2, 2x2 or 2x3 (females x males) spawning matrix, where one of the males in the matrix actually represents the pooled milt from up to six jacks. However, the actual number of jacks spawned and/or the proportion of eggs fertilized by jacks is unknown or not.

b) No. of males and females spawned each year over past 10 years (table)

Table: Catherine Creek spring/summer Chinook salmon spawning data for the 2001-07
(Grande Ronde and Imnaha AOP 2009)

Catherine Creek spring/summer Chinook salmon spawning data for the 2001-07								
Brood Year	Marked Females Spawned	Unmarked Females Spawned	% Un-marked	Spawning Ratio F/M	Average Fecundity	Egg Take	Fry Poned	Smolt releases
2001	0	12	100%	1.71:1	3,651	43,813	26,426	24,392
2002	0	20	100%	1.18:1	4,096	81,926	71,750	70,959
2003*	0	28	100%	1.47:1	4,639	129,888	123,394	120,753
2004	0	9	100%	1.50:1	2,912	26,204	24,465	23,216
2005	9	8	47.1%	1.42:1	3,149	53,533	49,222	49,696
2006	28	8	22.2%	1.24:1	3,642	131,139	121,868	116,882
2007	30	15	33.3%	1.45:1	3,801	171,065	146,207	139,000
2008	21	11	31.3%	1.6:1	3,885	124,317	117,605	111,800
	88	111	55.8		3,818	761,885	680,937	656,698
*Inventory correction; Since 2004, eggs have been electronically counted								
Numbers in blue current inventory								
2001-06 brood, estimate survival from green egg to smolt at 87.1%								

4. Fertilization

a) Protocols

Eggs are spawned into colanders to remove ovarian fluid, fertilized, and then water-hardened with 100ppm iodophor for a minimum of 15 minutes.

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b) Number of eggs collected and fertilized each year over past 10 years (table)

See table in section C3b above.

5. Incubation

- Eggs receive a formalin treatment (1667 ppm) 3 times per week, beginning 48 hours post spawn until the eggs are picked.
- Chilled well water is used on the early egg takes to reduce the water temperature to around 50 degrees. UV treated surface water is used for incubation after August, when surface temperatures can reach 70 degrees.
- Flows are regulated at 4 to 6 gpm per vertical stack.
- Eggs are reloaded after eye-up at 1 female per tray at approximately 3,500 eggs per

6. Ponding

a) Protocols

- After hatch, the fry are reared in 3 of the 28 indoor tanks (Canadian troughs), at approximately 50,000 fish per trough. The troughs are 117 cubic feet, with a flow rate of up to 50 gpm.
- In January-March, Lookingglass Creek temperatures drop to 32-35 degrees F. At this time well water is blended with treated surface water to increase the water temperature to approximately 40 degrees.

b) Number of fry ponded each year, including % hatch each year

Survival data is categorized in the following sentence and production projections are modeled using 85% survival of green eggs to smolt. Green egg to eyed-egg: 90%; eyed-egg to swim-up fry: 98%; swim-up fry to fingerling (marking): 97%; and fingerling to smolt (marking to release): 99%.

7. Rearing/feeding protocols

- Every attempt is made not to exceed 0.75 DI in the indoor tanks. However, at times, DI's exceed 0.85 due to the limited early rearing space.
- The flow index can reach approximately 2.4 when the fish are 250 fpp. However, the water temperature at this time is between 35 and 40 degrees.

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- Once the fish reach 250 fpp, they are transferred to the outdoor raceways to be reared on raw creek water (late April to early May). Juvenile fish are retained indoors until high spring flows and subsequent sediment/turbid water decreases.
- Fish in the outdoor raceways are fed using automated feeders. During cold weather (Jan-March), the fish are fed by hand because the automated feeders are inoperable.

8. Fish growth profiles

No information provided.

9. Fish health protocols and issues

- The causative agent of whirling disease, *Myxobolus cerebralis*, was recently confirmed as present in wild rainbow trout and steelhead juveniles that reside above the hatchery in Lookingglass Creek. Hatchery juveniles are sampled for this parasite every year, prior to release, and through 2009, it had not been detected in the production fish.
- Bacterial kidney disease is not a problem in the conventional spring Chinook juveniles; although it has caused some mortality in the juveniles from the captive broodstock programs
- Monthly health monitoring examinations are conducted on each spring/summer Chinook stock. The sample includes a minimum of 10 moribund/dead fish (if available) and 4-6 live fish per raceway. Results are reported on the ODFW Fish Health Examination report.

10. Chemotherapeutant use

- A formalin treatment is applied (167 ppm for 1 hour) for 2 consecutive days after marking. The fish are monitored to determine if additional treatment is needed. Formalin treatment is applied to control fungus.
- The fish receive one 28 day erythromycin treatment (2.25% aquamycin) to control BKD, typically in July shortly after marking.

11. Tagging and marking of juveniles

Fish are typically held in one raceway until they are marked and tagged (90 fpp-180 fpp), at which time they are split across two raceways. The fish are adipose-fin clipped and coded-wire tagged in June-July.

12. Fish Release

a) Protocols

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- The Catherine Creek stock has a target size of 25 fpp by October 31 and 20 fpp at release (Grande Ronde Basin Chinook AOP). The target size at transfer is 25 fpp for both groups.
- The CTUIR operates an acclimation facility on Catherine Creek at rivermile 52.5. Acclimation occurs in four raceways approximately 8'x85'x3.25' (2,210 ft³) in size. The site's capacity is approximately 150,000 fish at 20 fpp. The maximum density index is 0.15 at 20 fpp. The flow index is 0.95.
- Due to limited capacity of the Catherine Creek acclimation facility, the spring Chinook are often acclimated and released in two phases: the first in mid- March, and the second, April 1. The fish are acclimated for one week and allow at least two weeks for fish to volitionally emigrate, and then perform a forced release into the river.
- The current strategy is to acclimate smolts for 1 week, followed by a two week volitional release. At the end of the volitional release period, fish remaining in the pond are forced out. The time frame for smolt acclimation and release is from mid-March to mid-April.
- The fish are fed a maintenance diet during acclimation and at a decreasing level throughout the course of the volitional release

b) Number of fish released each year (subyearlings?; yearlings?; other?)

See table in section C3b above.

D. Program benefits and performance

See list of program performance standards in Section D of Lookingglass section.

1. Adult returns

a) Numbers of adult returns (need data for the past 10-20 years)

- See Tables and information in Upper Grande Ronde section.
- Recently (1955-2005), the ICTRT reports that the abundance of spring Chinook for this subbasin has ranged from 27 to 2,947 fish, with a recent 10-year geometric run size of 89. Natural-origin spawners have comprised a total of 83% of total spawners over the last 10-years (HSRG 2009). For abundance and productivity measures, the ICTRT considers Catherine Creek as an "Intermediate" population with a target abundance and productivity of 750 and 1.8, respectively (HSRG 2009).

b) Return timing and age-class structure of adults

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- Adult spring Chinook enter the Columbia River in March through May. Movement into summer holding areas ranges from April through July. Age 4 fish typically dominate returns to the Grande Ronde Basin. Spawning occurs from early August through mid- September and generally peaks in late August (Grande Ronde Basin Spring/Summer Chinook Draft HGMP 2009, Section 2.2.1).

c) Smolt-to-adult return rates

Table: Appendix O. Preliminary CTUIR data from Catherine Creek releases between 1998 and 2007 summarized by ODFW (ODFW AOP 2008: Appendix O)

Brood Year	Release Year	Release Type	Number	Return Years			Total Return	SAR Percent
				<u>2001</u>	<u>2002</u>	<u>2003</u>		
1998	2000	Conventional	0	-	-	-	-	-
		Captive	38,149	157	205	57	419	1.10
		Natural-Redds	34	46	190	192	428	
				<u>2002</u>	<u>2003</u>	<u>2004</u>		
1999	2001	Conventional	0	-	-	-	-	-
		Captive	136,833	17	194	19	230	0.168
		Natural-Redds	40	19	71	9	99	
				<u>2003</u>	<u>2004</u>	<u>2005</u>		
2000	2002	Conventional	0	-	-	-	-	-
		Captive	180,343	73	570	24	667	0.3699
		Natural-Redds	34	6	77	7	90	
				<u>2004</u>	<u>2005</u>	<u>2006</u>		
2001	2003	Conventional	24,392	22	27	5	54	0.2214
		Captive	105,292	39	89	2	130	0.1235
		Natural-Redds	133	5	49	7	61	
				<u>2005</u>	<u>2006</u>	<u>2007</u>		
2002	2004	Conventional	70,071	10	69	4	83	0.1185
		Captive	91,791	19	138	15	172	0.1874
		Natural-Redds	158	4	114	2	120	
				<u>2006</u>	<u>2007</u>	<u>2008</u>		
2003	2005	Conventional	120,753	7	55		62	.0513
		Captive	68,827	0	63		63	.0915
		Natural-Redds	167	12	43		65	
				<u>2007</u>	<u>2008</u>	<u>2009</u>		
2004	2006	Conventional	23,216	4			4	
		Captive	45,604	24			24	
		Natural-Redds	96	7			7	
				<u>2008</u>	<u>2009</u>	<u>2010</u>		

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2005	2007	Conventional	49,783			
		Captive	21,647			
		Natural-Redds	74			
				<u>2009</u>	<u>2010</u>	<u>2011</u>
2006	2008	Conventional	121,000			
		Captive	0			
		Natural-Redds	117			

d) Stock productivity (e.g. recruits per spawner)

- The hatchery program has an R/S value of 6.0 (HSRG 2009).
- The habitat capacity provided to the HSRG is currently estimated at 500 adults.

2. Contributions to harvest and utilization (e.g. food banks)

- The Catherine Creek spring Chinook program provides limited contribution to total tribal, commercial and recreational fisheries downstream of the project area, including the lower Columbia River. Estimates of harvest outside the project area of Catherine Creek spring Chinook include; 4 fish in 2006 (ocean), 32 fish in 2005 (2-Columbia River non-treaty net, and 30 Columbia River sport), 164 fish in 2004 (31-Columbia River treaty net, 33-Columbia River non-treaty net, 90-Columbia River sport, and 1- Deschutes River sport), 45 fish in 2003 (7-Columbia River ceremonial/subsistence, and 38-Columbia River sport), and 77 fish in 2002 (37- Columbia River ceremonial/subsistence, 3-Columbia River non-treaty net, 36-Columbia River sport, and 1-Columbia River test fishery).
- In 2001 and 2002, artificially propagated endemic Catherine Creek, Lostine River, and Upper Grande Ronde River stocks, as well as, the Rapid River/Carson composite stock were available to sport harvest from the ocean to the mouth of the Grande Ronde River. Also, the composite stock was available for harvest in a 2.2 mile section of Lookingglass Creek.

3. Contributions to conservation

- The Catherine Creek spring Chinook program is expected to preserve/conservate the Catherine Creek population in the short term, and to assist in restoration of the population to historic levels.
- Naturally spawning spring Chinook in Catherine Creek and adult outplants into Indian Creek are expected to enhance ecological processes in these watersheds.
- There is a potential, but undocumented demographic and/or ecological benefit to the naturally spawning populations in Indian Creek where adults are outplanted.
- The adult outplants into Lookingglass Creek are expected to contribute to the reintroduction of a naturally spawning Lookingglass Creek spring Chinook population.

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- Salmon supplementation contains uncertainties. Cuenco et al. (1993) and Waples (1995) outlined potential benefits that include:
 1. Reduce short-term extinction risk
 2. Provide survival advantage for depressed stocks
 3. Speed recovery or rebuilding to carrying capacity
 4. Help maintain population while factors for decline are being addressed
 5. Establish a reserve population for use if wild/natural population suffers a catastrophic loss
 6. Reseed vacant or barren habitat
 7. Provide scientific information for use of supplementation in conservation of wild/natural populations
- **Conservation Objective from Draft HGMP** - Conserve genetic and life history diversity of spring Chinook within the Grande Ronde River Basin.
- ***Endemic Program (Conventional Broodstock)***--This portion of the program is directed by NOAA to supplement Grande Ronde Chinook with stocks indigenous to the basin.
- ***Captive Broodstock***-- This program was initiated as a conservation measure in response to severely declining abundance of Chinook salmon in the Grande Ronde Basin.

(Grande Ronde Basin Spring/Summer Chinook Draft HGMP 2009, Section 3.5)

4. Other benefits

- Tribal harvest provides ceremonial, cultural and subsistence benefits to Columbia.
- Research Benefits—Opportunity for improving our understanding of the role of supplementation in the recovery of Chinook populations can be gained from this project. Data from acclimated release studies will increase our knowledge of smolt migration and survival rates. Information on adult escapement and interaction between hatchery and naturally reared Chinook may also be gained. In addition, the trapping facilities and monitoring and evaluation components of the program will improve our knowledge of abundance and life history of Grande Ronde Basin spring Chinook salmon (from Grande Ronde Basin Spring/Summer Chinook Draft HGMP 2009).

E Research, monitoring, and evaluation programs

- The program provides opportunities for evaluation of captive broodstock vs. conventional program.
- The program provides research and information on supplementation issues.

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- See ODFW 2007 Annual Progress Report to LSRCP: Feldhaus et al. 2010 for research, monitoring and evaluation objectives as shown in Lookingglass Creek section of this report.

F. Program conflicts

1. Biological conflicts (e.g. propagated stock maladapted to hatchery water source)

None noted.

2. Harvest conflicts (e.g. mixed stock fishery on hatchery and wild fish limits harvest opportunities on hatchery fish)

- None at this time. The program provides limited contribution to fisheries downstream of the project area.

3. Conservation conflicts and risks

a) Genetic conflicts associated with straying and natural spawning of hatchery fish (Stray rates, proportion of hatchery-origin fish on natural spawning grounds, etc. Provide tables or figures where appropriate)

- The comparatively low recruit to spawner ratio for naturally spawning fish coupled with the high proportion of hatchery-origin spring Chinook spawning in Catherine Creek inhibits development of a properly integrated program, which poses a genetic domestication risk to the Catherine Creek spring Chinook population.
- The present sliding scale of proportion of natural origin and hatchery origin adults passed above the Catherine Creek weir results in upstream passage of hatchery-origin adults under conditions when no supplementation is required to meet the escapement objective, resulting in excessive genetic influence of the hatchery environment on the naturally spawning population.

b) Ecological conflicts (e.g. competition between hatchery fish and wild fish, predation,)

- See the Lookingglass Creek Spring Chinook section for ecological risks associated with rearing at Lookingglass FH.
- Amplification of disease within the hatchery program poses a disease risk to the Catherine Creek spring Chinook population.

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- Anadromous fish in Catherine Creek above the satellite facility intake pose a minor fish health risk to the Chinook held at the Catherine Creek trap and acclimation facility.

4. Other conflicts between the hatchery program, or fish produced by the program, and other non-hatchery issues

None noted here.

IIID. Lostine-Wallowa River Spring/Summer Chinook, Lookingglass FH

A. General information

Lookingglass Hatchery is used for spawning, incubation and rearing of listed Snake River spring/summer progeny from the endemic adult supplementation program and endemic captive broodstock program in the Grande Ronde River Basin and endemic spring Chinook in the Imnaha River Basin. The Lostine River Chinook program is one of five spring Chinook stocks reared at Lookingglass Creek Fish Hatchery, and is similar in goals and operations to the programs at Catherine Creek and Upper Grande Ronde River for spring Chinook.

Hatchery mitigation goal (Currently Permitted Program) for the Grande Ronde spring/summer chinook salmon is 900,000 smolts. Up to 250,000 smolts of the total are progeny of the endemic Lostine River stock released into Lostine River.

The Lostine River program is the portion of the overall Grande Ronde Endemic Spring Chinook Salmon Supplementation Program (GRESOSP) that focuses on supplementation of the indigenous spring Chinook population in the Lostine River.

B. Stock/Habitat/Harvest Program Goals and Purpose

1. Purpose and justification of program

Lookingglass Hatchery was constructed in 1982 as part of the Lower Snake River Compensation Program (LSRCP)—a program to mitigate for spring chinook and summer steelhead losses caused by the four federal dams constructed on the lower Snake River. The Lostine portion of the Lookingglass Creek Fish Hatchery program focuses on the indigenous spring Chinook salmon stock of the Lostine River. Wild anadromous adults from this stock are incorporated within the broodstock annually and portions of hatchery origin adults are allowed to spawn naturally in the target tributary each year. All adults returning from the captive brood origin smolts are allowed to spawn naturally.

2. Goals of program

The short-term goal is to use captive broodstock technology and conventional supplementation to prevent the extinction (preservation/conservation) of the wild chinook population in the Lostine River, provide a future basis to reverse the decline in stock abundance of Lostine River chinook salmon, and ensure a high probability of population persistence well into the future once the causes of basin wide population declines have been addressed. Associated objectives include:

- To prevent extinction of native wild chinook populations in the Lostine River,

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- Maintain genetic diversity of indigenous artificially propagated chinook populations,
- Maintain genetic diversity in wild chinook populations specifically the Minam and Wenaha rivers,

An intermediate goal of this program is the restoration of spring chinook salmon in the Grande Ronde sub-basin using three indigenous stocks.

The long-term goal of this program is recovery, de-listing, and to mitigate for fish losses occurring as a result of the construction and operation of the four Lower Snake River Dams.

3. Objectives of program

The short-term goal is to use captive broodstock technology and conventional supplementation to prevent the extinction (preservation/conservation) of the wild chinook population in the Lostine River, provide a future basis to reverse the decline in stock abundance of Grande Ronde River chinook salmon, and ensure a high probability of population persistence well into the future once the causes of basin wide population declines have been addressed. Associated objectives include:

- To prevent extinction of native wild chinook populations in the Lostine River,
- Maintain genetic diversity of indigenous artificially propagated chinook populations,
- Maintain genetic diversity in wild chinook populations specifically the Minam and Wenaha rivers,

An intermediate goal of this program is the restoration of spring chinook salmon in the Grande Ronde sub-basin using three indigenous stocks.

The long-term goal of this program is recovery, de-listing, and to mitigate for fish losses occurring as a result of the construction and operation of the four Lower Snake River Dams.

4. Type of program (Integrated or Segregated)

The Lostine River supplementation program is planned with an integrated recovery model, based on the indigenous Lostine River stock. The current operation includes both an integrated conventional broodstock and a captive broodstock produced by parr collected in the Lostine River and reared to adults for spawning. Long term expectation is for about 170 adults to be collected at random from the return with 500 adults allowed to spawn naturally in habitat upstream from the Lostine adult trap weir.

5. Alignment of program with ESU-wide plan

Same as Upper Grande Ronde.

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6. Habitat description and status where fish are released.

The Lostine River release site is in the lower reach of the Lostine River. The habitat upstream from the release site is in National Forest and Wilderness and is in fair to excellent condition. Habitat downstream from the release site has been substantially degraded by past land use practices, primarily agriculture and grazing, and by water diversions including inter-basin transfers.

7. Size of program and production goals (No. of spawners and smolt release goals)

The current program is sized at 250,000 smolts with emphasis on conventional broodstock when available. Shortfalls in egg takes are made up with captive broodstock. Excess smolts or parr from the captive program may also be released into under-stocked habitat in the Lostine River area and tributaries of the Wallowa River. The long term requirement is 80 to 85 pairs of adults for broodstock, 500 adults for natural spawning escapement and additional fish for tribal and non-tribal fisheries.

C. Description of program and operations

1. Broodstock goal and source

A target of 83 pairs (approximately 170 fish) should be collected to produce 250,000 smolts. This is based on a female survival of 92%, fecundity of 4,062, and 81% survival from green egg to smolt. Trapping will begin in March 2008 to monitor steelhead abundance. Overnight staffing will occur after April 15 and trapping will continue, if river conditions allow, through July 31. The Lostine River conventional program calls for collection of 50% of natural fish and up to 100% conventional returns. Protocols include passing 100% of captive broodstock progeny for natural spawning above the weir.

2. Adult collection procedures and holding

Same as for Upper Grande Ronde Spring Chinook. See that section.

3. Adult spawning

a) Spawning protocols

Same as Upper Grande Ronde

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b) No. of males and females spawned each year over past 10 years (table)

Table: Lostine River spring/summer Chinook salmon spawning data, 1997-2007 (Grande Ronde and Imnaha AOP 2009)

Brood Year	Marked Females Spawned	Unmarked Females Spawned	% Un-marked	Spawning Ratio F/M	Average Fecundity	Egg Take	Fry Poned	Smolt releases (1,000's)
1997	0	4	100%	0.92:1	4,496	17,000	12,000	11,871
1998	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0
2000	0	8	100%	0.66:1	4,329	34,630	32,000	31,490
2001	11	25	69%	1.06:1	4,463	*160,680	105,000	101,012
2002	1	27	96%	1.03:1	4,766	133,444	130,000	116,370
2003	0	21	100%	1.31:1	5,078	106,646	103,000	102,557
2004	29	22	43%	1.30:1	4,351	221,888	206,421	199,716
2005	39	17	30%	1.37:1	4,182	234,192	207,291	205,000
2006	45	12	21%	1.26:1	4,393	241,715	206,313	195,500
2007	38	20	34.4%		4,512	261,719	227,838	
	163	156	48.9%		4,426	1,411,914		963,516

*Inventory correction due to large losses with egg shipment;
In 2004, eggs have been electronically counted
Numbers in blue current inventory
2001-06 brood, estimate survival from green egg to smolt at 83.8%

4. Fertilization

a) Protocols

Same as for Upper Grande Ronde Spring Chinook. See that section.

b) Number of eggs collected and fertilized each year over past 10 years (table)

See table in Section C3b) above.

5. Incubation

Same as for Upper Grande Ronde Spring Chinook. See that section.

6. Ponding

a) Protocols

Same as for Upper Grande Ronde Spring Chinook. See that section.

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b) Number of fry ponded each year, including % hatch each year

See section C3b) above.

7. Rearing/feeding protocols

See Lookingglass Spring Chinook Section C.

8. Fish growth profiles

See Lookingglass Spring Chinook Section C.

9. Fish health protocols and issues

See Lookingglass Spring Chinook Section C.

10. Chemotherapeutant use

Same as Upper Grande Ronde

11. Tagging and marking of juveniles

Same as Upper Grande Ronde

12. Fish Release

a) Protocols

- Due to the limited capacity of the Lostine acclimation facility, Lostine spring/summer Chinook are acclimated and released in two phases. The first group is transferred to the Lostine acclimation facility in early March and the second group in late March.
- The current strategy is to acclimate smolts for 2 weeks, followed by a one to two week volitional release. At the end of the volitional release period, fish remaining in the pond are forced out. The time frame for smolt acclimation and release is from early March to mid-April. In 2009, 124,500 fish were released for the early group and 123,900 for the late group.

b) Number of fish released each year (subyearlings?; yearlings?; other?)

See table in Section C3b) above.

D. Program benefits and performance

See list of program performance standards in Section D of the Lookingglass spring Chinook section.

1. Adult returns

a) Numbers of adult returns (need data for the past 10-20 years)

- See Tables and information in Upper Grande Ronde section.
- According to the ICTRT, historic (1952-2005) abundance of spring Chinook for this subbasin has ranged from 37 to 1,463 fish, with a recent 10-year geometric run size of 276. The Nez Perce Tribe reports that current escapement of Lostine River Chinook salmon (natural- and hatchery-origin) from 1997 to 2007 ranged from 100 fish in 1999 to 1,555 fish in 2004. Spawner abundance of natural-origin spring Chinook in the Lostine River has ranged from 93 fish (1999) to 400 fish (2001) and comprised from 20.2% (2005) to 100% (1998) of all spawners in the Lostine River.

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Table 1. Lostine River spring Chinook Salmon abundance data for total escapement and fish upstream of weir (all age classes). Fish upstream of weir differs from total escapement due to fish retained for broodstock, mortalities at the weir, adult outplants, and harvest. Proportion Natural Influence based on escapement upstream of weir fecundity or ultimate disposition of progeny. Estimates are based on data reconciliation completed October 26, 2009 (Cleary et al. in prep).

Year	Total Escapement	Natural-origin Escapement	Hatchery-origin Escapement	Total Above Weir Pop. Estimate	95% C.I.	Natural-origin Above Weir Pop. Estimate	95% C.I.	Hatchery -origin Above Weir Pop. Estimate	95% C.I.	Hatchery - origin Percentage Escapement	Hatchery - origin Percentage Above Weir (pHOS)	Natural-origin Percentage Conventional Broodstock (pNOB)	Natural-origin Percentage Captive and Conv. Broodstock (pNOB)	Proportion Natural Influence Captive and Conv. Program (PNI)
2001	700	439	261	414	43	291	27	124		0.37	0.30	0.81	0.97	0.77
2002	850	444	405	664	57	356	63	308		0.48	0.46	0.91	0.99	0.68
2003	826	471	355	479	66	273	67	206		0.43	0.43	0.91	0.99	0.70
2004	1,339	356	983	598	69	240	60	358		0.73	0.60	0.42	0.81	0.57
2005	916	174	742	484	20	122	0	362		0.81	0.75	0.33	0.75	0.50
2006	634	213	421	424	41	169	32	254		0.66	0.60	0.24	0.70	0.54
2007	593	198	395	335	0	152	0	183		0.67	0.55	0.34	0.78	0.59

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b) Return timing and age-class structure of adults

Adult spring Chinook enter the Columbia River in March through May. Movement into summer holding areas ranges from April through July. Age 4 fish typically dominate returns to the Grande Ronde Basin. Spawning occurs from early August through mid-September and generally peaks in late August (Grande Ronde Basin Spring/Summer Chinook Draft HGMP 2009, Section 2.2.1).

c) Smolt-to-adult return rates

Table. Appendix Q. Preliminary juvenile abundance and adult return data, and smolt-to-adult return rates for Lostine River Chinook salmon as estimated by NPT. Hatchery smolt-to-adult return rates were based on estimates of total escapement and does not account for in-river post release mortality. Natural smolt abundance estimates were provided by ODFW (unpublished data) and were calculated using escapement above the weir/screw trap. (ODFW AOP 2008).

Brood Year	Release / Migration Year	Origin	Smolts	Brood Year Adult Returns (estimated)				Smolt-to-Adult Return (%)
				Age 3	Age 4	Age 5	Total	
1997	1999	Conventional	11,738	78	124	27	229	1.95%
		Natural	25,554	40	378	66	484	1.89%
1998	2000	Captive	34,977	39	431	108	578	1.65%
		Natural	7,900	10	324	144	478	6.05%
1999	2001	Captive	133,982	34	247	27	308	0.23%
		Natural	8,183	15	234	29	278	3.40%
2000	2002	Conventional	31,464	66	202	6	274	0.87%
		Captive	77,551	105	624	32	761	0.98%
		Natural	10,112	18	362	22	402	3.98%
2001	2003	Conventional	100,916	168	299	12	479	0.47%
		Captive ¹	141,860	107	320	8	435	0.31%
		Natural	20,415	24	165	18	207	1.01%
2002	2004	Conventional	116,471	28	196	21	245	0.21%
		Captive	133,780	53	186	11	250	0.19%
		Natural	NA	11	200	36	247	NA
2003	2005	Conventional	102,655	12	151		163	0.16%
		Captive	62,124	10	82		92	0.15%
		Natural	33,646	26	167		NA	NA
2004	2006	Conventional	199,586	134			134	0.07%
		Captive	40,982	8			8	0.02%
		Natural	30,202	37			NA	NA
2005	2007	Conventional	205,406				NA	NA

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Captive	24,604	NA	NA
Natural	NA	NA	NA

¹Does not include 4,600 parr released into Bear Creek.

d) Stock productivity (e.g. recruits per spawner)

- The hatchery program has achieved a R/S value of 11.00 (HSRG 2009).
- Habitat capacity estimated at 1,300 adults (HSRG 2009).

2. Contributions to harvest and utilization (e.g. food banks)

- Contribution to harvest is low at this time.
- In 2001 and 2002, artificially propagated endemic Catherine Creek, Lostine River, and Upper Grande Ronde River stocks, as well as, the Rapid River/Carson composite stock were available to sport harvest from the ocean to the mouth of the Grande Ronde River. Also, the composite stock was available for harvest in a 2.2 mile section of Lookingglass Creek.

3. Contributions to conservation

- Salmon supplementation contains uncertainties. Cuenco et al. (1993) and Waples (1995) outlined potential benefits that include:
 1. Reduce short-term extinction risk
 2. Provide survival advantage for depressed stocks
 3. Speed recovery or rebuilding to carrying capacity
 4. Help maintain population while factors for decline are being addressed
 5. Establish a reserve population for use if wild/natural population suffers a catastrophic loss
 6. Reseed vacant or barren habitat
 7. Provide scientific information for use of supplementation in conservation of wild/natural populations
- **Conservation Objective from Draft HGMP** - Conserve genetic and life history diversity of spring Chinook within the Grande Ronde River Basin.
- **Endemic Program (Conventional Broodstock)**--This portion of the program is directed by NOAA to supplement Grande Ronde Chinook with stocks indigenous to the basin.
- **Captive Broodstock**-- This program was initiated as a conservation measure in response to severely declining abundance of Chinook salmon in the Grande Ronde Basin.

(Grande Ronde Basin Spring/Summer Chinook Draft HGMP 2009, Section 3.5)

4. Other benefits

Research Benefits—Opportunity for improving our understanding of the role of supplementation in the recovery of Chinook populations can be gained from this project. Data from acclimated release studies will increase our knowledge of smolt migration and survival rates. Information on adult escapement and interaction between hatchery and naturally reared Chinook may also be gained. In addition, the trapping facilities and monitoring and evaluation components of the program will improve our knowledge of abundance and life history of Grande Ronde Basin spring Chinook salmon (from Grande Ronde Basin Spring/Summer Chinook Draft HGMP 2009).

E. Research, monitoring, and evaluation programs

- The Catherine Creek, Lookingglass, Lostine, and Upper Grande Ronde River spring Chinook are part of a Snake River basin-wide assessment of supplementation that has generated a long-term data set.
- See ODFW 2007 Annual Progress Report to LSRCP: Feldhaus et al. 2010 for research, monitoring and evaluation objectives as shown in Lookingglass Creek section of this report.

F. Program conflicts

1. Biological conflicts (e.g. propagated stock maladapted to hatchery water source)

- Extreme cold water conditions at the acclimation site may result in diminished or complete water flow loss resulting in catastrophic fish loss.
- The transfer of fish from hatchery raceways to extreme cold water conditions at the acclimation site may pose a physiological (stress) risk for the fish.
- Transportation of juveniles and adults long distances for long periods may pose a stress condition on the fish leading to higher incidence of disease, or egg loss in the case of adult females.

2. Harvest conflicts (e.g. mixed stock fishery on hatchery and wild fish limits harvest opportunities on hatchery fish)

None identified.

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3. *Conservation conflicts and risks*

a) Genetic conflicts associated with straying and natural spawning of hatchery fish (Stray rates, proportion of hatchery-origin fish on natural spawning grounds, etc. Provide tables or figures where appropriate)

- The comparatively low recruit to spawner ratio for naturally spawning fish coupled with the high proportion of hatchery-origin spring Chinook spawning in Catherine Creek inhibits development of a properly integrated program, which poses a genetic domestication risk to the Catherine Creek spring Chinook population.
- The present sliding scale of proportion of natural origin and hatchery origin adults passed above the Catherine Creek weir results in upstream passage of hatchery-origin adults under conditions when no supplementation is required to meet the escapement objective, resulting in excessive genetic influence of the hatchery environment on the naturally spawning population.

b) Ecological conflicts (e.g. competition between hatchery fish and wild fish, predation,)

- Amplification of disease within the hatchery program poses a disease risk to the Catherine Creek spring Chinook population.
- Anadromous fish in Catherine Creek above the satellite facility intake pose a minor fish health risk to the Chinook held at the Catherine Creek trap and acclimation facility.

4. *Other conflicts between the hatchery program, or fish produced by the program, and other non-hatchery issues*

- Outplanting surplus Catherine Creek spring Chinook into Lookingglass and Indian Creek poses fish health risks to naturally spawning spring Chinook.
- Outplanting surplus Catherine Creek spring Chinook into Indian Creek poses an ecological risk to the survival and growth of any naturally-produced spring Chinook in this area.
- Amplification of disease within the hatchery program poses a disease risk to other native fish populations in the Catherine Creek when smolts are transferred and released from the Catherine Creek acclimation facility.

IIIE. Imnaha River Spring/Summer Chinook, Lookingglass FH

A. General information

The Imnaha Spring Chinook program produces smolts of the indigenopus stock of Chinook salmon for mitigation and conservation purposes. The program is part of the federally mandated Lower Snake River Compensation Plan (LSRCP) mitigation program funded through the US Fish and Wildlife Service and designed to mitigate for fish losses at the Lower Snake River dams. The LSRCP spring/summer chinook program in Northeast Oregon includes Lookingglass Hatchery, integrated with Grande Ronde chinook basin program, Irrigon and Oxbow hatcheries. Irrigon Hatchery, also a LSRCP facility, has no funding allocated directly for the Imnaha program although eggs are received and shipped from this facility. Oxbow and Lookingglass hatchery staff is shared between two programs at an approximately 30% Imnaha basin and 70% Grande Ronde basin level. Combined program staff includes: (1) Hatchery Manager at Lookingglass Hatchery and (7 ³/₄) technician and laborer positions. Annual operation and maintenance costs for the Imnaha portion of the FY 2001 program were estimated at \$225,479 for Lookingglass Hatchery and \$4,434 for Oxbow Hatchery (estimations do not include overhead and capital outlay).

Lookingglass hatchery is located 18 miles north of the town of Elgin, Oregon adjacent to Lookingglass Creek (ODFW watershed code 080440000) 2.2 miles above its confluence with the Grande Ronde River at about river mile 86. Elevation at the hatchery is 2,550 feet above sea level. Adult facilities consist of two adult traps, two adult concrete raceways (4,560 ft³), and three adult circular holding tanks 942 ft.³ (20'x3'). Incubation is in 288 vertical incubator trays with a capacity of 1.3 million eggs (4,500 eggs/tray) to hatching. There are 32 Canadian troughs for early rearing fish each with a capacity of 100 to 125 pounds of fish. Final rearing is in 18 concrete raceways (3,500 ft³) each with a capacity of 4,000 lb (Lewis 1996).

Oxbow Hatchery is located 2 miles east of the town Cascade Locks, Oregon, adjacent to the Bonneville River. Elevation at the hatchery is 100 feet above sea level. Incubation facilities consist of 240 trays, 10 deep and 11 shallow troughs. Eleven Canadian troughs are used for inside rearing. One outside raceway (3,500 ft³) is available.

Imnaha adult collection and smolt acclimation facility is located two to three hours from Lookingglass hatchery, approximately 30 miles south from the town of Imnaha, Oregon adjacent to the Imnaha River (ODFW watershed code 0800200000) at river mile 45.5. Elevation at the Imnaha facility is 3,760 feet above sea level. Facilities consist of an adult trap, spawning area and one pond (13,000 ft³). The pond can be used for adult holding in the summer and juvenile acclimation and release in the spring. Capacity for juveniles is about 19,500 pounds (390,000 fish at 20 fpp).

The U.S. Fish and Wildlife Service, through the Lower Snake River Compensation Plan (LSRCP), funds operation and maintenance expenditures at Lookingglass hatchery and Imnaha satellite facility. The Nez Perce Tribe, Oregon Department of Fish and Wildlife, and the Confederated Tribes of the Umatilla Indian Reservation are co-managers of the Imnaha River spring/summer chinook salmon program.

B. Stock/Habitat/Harvest Program Goals and Purpose

1. Purpose and justification of program

The Imnaha River hatchery program provides adult chinook for hatchery broodstock and limited recreational and tribal harvest within the Lower Snake River Compensation Plan mitigation area (Snake River and tributaries above Ice Harbor Dam). The program also provides fish for harvest in Columbia River fisheries. The program utilizes an endemic chinook hatchery stock that was founded on spring/summer chinook indigenous to the Imnaha River. Wild adults from Imnaha are incorporated within the broodstock annually and hatchery origin adults are allowed to spawn naturally in Imnaha River each year. A portion of returning adults is also released into Big Sheep Creek and Lick Creek to "supplement" natural adult escapement numbers.

2. Goals of program

The goal of this program is the restoration of spring/summer chinook salmon in the Imnaha River using the indigenous stock and to mitigate for fish losses occurring as a result of the construction and operation of the four Lower Snake River Dams. The program mitigation goal is to return 3,210 hatchery adults to the area above Ice Harbor Dam. Based upon this adult goal and an estimated 0.65% smolt-to-adult survival rate the target for smolt production was set at 490,000 fish.

Program specific goals include:

- Establishing an annual supply of brood fish that can provide an egg source capable of meeting mitigation goals.
- Restore and maintain the natural spawning population.
- Reestablish sport and tribal fisheries.
- Establish a total return of adult fish resulting from LSRCP activities in Oregon that meets the mitigation goal.

Minimize the impacts of the program on resident stocks of game fish

3. Objectives of program

The objective of this program is to collect sufficient broodstock and produce sufficient smolts to accomplish the mitigation goals. Annual adult collection is not expected to exceed 166 males and 166 females. Age composition and fecundity of adults varies from year to year. However, given normal program adult survival, female fecundity and egg to smolt survival 332 adults (1:1 sex ratio) will produce approximately 490,000 smolts. For the year 2002, co-managers targeted a collection of 118 males and 118 females to produced 360,000 smolts.

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Mitigation hatchery production goal for Imnaha spring/summer chinook salmon is 490,000 smolts. Production includes:

- 420,000 smolts released into the Imnaha River.
- 70,000 smolts released into the Big Sheep and Lick creeks (Imnaha Sub-basin).

Actual production is based on adults collected from the adult sliding scale and the resultant egg numbers. The Imnaha River release is first priority. The hatchery production target has been lowered to 360,000 smolts for the Imnaha River due to space limitations at Lookingglass Hatchery and foregone hatchery production to Big Sheep and Lick creeks.

4. Type of program (Integrated or Segregated)

Integrated Recovery. The Imnaha River spring/summer chinook salmon (stock 029) fish propagation program is funded through LSRCP "mitigation" and managed for "supplementation" and in some years, integrated harvest.

5. Alignment of program with ESU-wide plans¹²

The Upper Grande Ronde supplementation program relates to other plans and policies regarding the management and restoration of anadromous fish resources in the Pacific Northwest. Artificial propagation, including the use of captive broodstocks and artificial supplementation programs as part of a strategy to recover depleted salmon populations is described in the Basinwide Salmon Recovery Strategy, which was developed by the Federal government to restore ESA-listed salmon and steelhead throughout the Columbia River basin (Federal Caucus 2000).

In addition, the Proposed Action is consistent with on-going ESA recovery planning. Recovery plans are being developed in most sub-basins in the Columbia River system. These recovery plans will contain: (1) measurable goals for delisting, (2) a comprehensive list of the actions necessary to achieve delisting goals, and (3) an estimate of the cost and time required to carry out those actions. All factors that have been identified as leading to the decline of ESA-listed species will be addressed in these recovery plans. For ESA-listed salmon and steelhead, these factors include hydroelectric operations, harvest, habitat use, and artificial propagation.

Other Federal, state, and Tribal plans and policies that would potentially address effects on fish populations in the Snake River basin apply within or near the action area. Federal actions include Forest Service and Bureau of Land Management land and resource management plans that are designed to foster sustainable ecosystems and resilient watersheds. State initiatives include legislative measures to facilitate the recovery of listed species and their habitats, as well as the overall health of watersheds and ecosystems. State land management, environmental quality, water resources, and agriculture agencies all have policies and plans that address water quality and land use practices that are designed to achieve desirable water

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quality and resource conditions, some specific to protected species, some more generally addressing water and resource quality. Regional programs are being developed that designate priority watersheds and facilitate development of watershed management plans. Tribes have developed a joint restoration plan for anadromous fish in the Columbia River basin, known as the Wy-Kan-Ush-Mi Wa-Kish-Wit or *Spirit of the Salmon* plan (CRITFC 1995). The Proposed Action is expected to be compatible with the goals and objectives of other regional actions.

6. Habitat description and status where fish are released.

The Imnaha River Subbasin was historically an important producer of spring chinook. Escapement to the river prior to the settlement of the area by non-Indians is unknown, but today's runs are probably a small fraction of the prehistoric runs. Overfishing in the lower Columbia River in the late 1800s and early 1900s, and the construction of power dams on the mainstem Columbia and Snake Rivers, beginning in the 1930s and ending in the mid-1970s, were the major causes of the decreased runs. Fisheries managers have estimated that, prior to construction of the four lower Snake River dams, 6,700 spring chinook escaped to the subbasin annually (COE 1975).

Spring chinook spawn in the mainstem (a 30-mile section from Freezeout Creek to the Blue Hole), Big Sheep Creek (an 11.5-mile section from Coyote Creek to 0.25 miles above Lick Creek) and Lick Creek (a 2.8-mile section from the confluence to the crossing of Forest Service Road 39) (Thompson and Haas 1960, Carmichael and Boyce 1986). Spawning historically occurred in Little Sheep Creek (Thompson and Haas 1960) and was documented for the first time in the South Fork Imnaha River in 1988.

The riverine habitat today is considered to be relatively pristine. Sedimentation rates have increased somewhat due to logging, road building, and farming and ranching practices, but that is not the major factor limiting production (Carmichael and Boyce 1986). The fact that the runs are not rebuilding (in-subbasin harvest rates are considered to be negligible) implies that out-of-subbasin smolt-to-adult survivals are still the major problem. For fish not being transported, there is a 73 percent cumulative loss of downstream migrants (smolts) in subbasins located above eight dams (15 percent per dam), although this loss is expected to decrease somewhat with installation of smolt bypass systems.

Steep gradients in the headwater reaches of the mainstem above the Blue Hole and in the tributaries form the only serious blockages to the passage of anadromous fish. A rock slide in the winter of 1952 and 1953 resulting from road construction along the Imnaha River posed a serious barrier, but was subsequently removed (Thompson and Haas 1960). During most summers, low flows and warm water temperatures prevail in the lower reaches of Big Sheep Creek. These conditions are due primarily to the diversion of Big Sheep Creek water into the Wallowa Valley Improvement Canal; with other factors being additional irrigation withdrawals, stream channelization, and riparian habitat degradation.

Historically, chinook were thought to have spawned throughout the mainstem from the Blue Hole to the mouth, with primary concentration from the Blue Hole to Freezeout Creek, throughout Big Sheep Creek, and in the lower five miles of Lick Creek. Presently, spring chinook spawn from the Blue Hole downstream to Freezeout Creek, with most of the spawning occurring from the Blue Hole to Crazyman Creek. In recent years there has been

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very limited spawning in Lick or Big Sheep creeks, except in years when hatchery adults were outplanted from the Imnaha River weir. Juvenile rearing historically occurred and presently occurs throughout the mainstem Imnaha River and Big Sheep and Lick Creeks. Smolt releases have occurred primarily at the acclimation location and in the lower mainstem Imnaha River. Presmolts were released throughout the basin, including tributaries.

7. Size of program and production goals (No. of spawners and smolt release goals)

Annual adult collection is not expected to exceed 166 males and 166 females. Age composition and fecundity of adults varies from year to year. However, given normal program adult survival, female fecundity and egg to smolt survival 332 adults (1:1 sex ratio) will produce approximately 490,000 smolts. For the year 2002, co-managers targeted a collection of 118 males and 118 females to produce 360,000 smolts.

C. Description of program and operations

1. Broodstock goal and source

The broodstock for the Imnaha River spring Chinook program consists of anadromous adult returns to the trap and weir at rm 49 on the Imnaha River. The origin of this brood stock is natural fish collected at this site starting in 1982. The current program collects both unmarked natural-origin fish and marked hatchery fish known to be progeny of the local broodstock.

2. Adult collection procedures and holding

- Install trap as soon as river conditions allow and operate until September 11 or until the last schedule survey. The trap will be worked on Mondays or more often if needed.
- Fish retained for broodstock, will be opercle punched, injected intraperitoneally (IP) with erythromycin and oxytetracycline. If sport or Tribal fishery occurs, only fish retained for broodstock will be injected. Hatchery-origin jacks and hatchery-origin adults, collected above broodstock needs, can be held at Wallowa Hatchery for 21-days and provided to the Tribes for C/S.
- Fish will be inspected for tumors along the gum line. If a tumor is suspected, fish will be held for consultation.
- Up to 300 hatchery-origin adults can be outplanted. Adults collected prior to July 15th and targeted for outplanting, will be held at Lookingglass Hatchery. Adults collected after July 15th, and targeted for outplanting, can be direct stream released.
- Trapping mortalities will be processed as kept fish and the carcasses provided to Fish health for examination, if possible. Other pre-spawning mortalities discovered during weir-effect surveys will also be sent to Fish Health. Biological data will be sent to ODFW

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Fish Research (Monzyk). Following examination, the carcasses may be disposed of by Tribal distribution, habitat or landfill.

- The Imnaha spring/summer chinook program uses the endemic population for hatchery broodstock. Because fish spawn below the weir location and some fish pass above the weir prior to installation, we trap an average of 65% of the Imnaha River adult escapement. Broodstock collection guidelines (sliding scale) are based on estimated escapement to the mouth of Imnaha River. The sliding scale was developed cooperatively with NPT (Table 5.1).
- The following management guidelines were used to form the basis for implementation of the sliding scale. For adult escapement of 51-700, three uses of hatchery and natural fish are identified:
 1. Collect for hatchery broodstock and spawn
 2. Release above the weir to spawn naturally
 3. Tribal ceremonial use

For adult escapement above 700, six potential uses of hatchery and natural fish are identified:

1. Collect for hatchery broodstock and spawn
2. Release above the weir to spawn naturally
3. Out plant up to 150 adult hatchery fish each (300 total) into Big Sheep and Lick Creeks
4. Tribal ceremonial use
5. Tribal subsistence purposes
6. Recreational fishing on hatchery origin fish

In addition, surplus jacks have been releases into Big Sheep and Lick Creek for nutrient enrichment.

Table. Sliding Scale Management Plan for the Imnaha River Spring Chinook Artificial Propagation Program.

Estimated total adult escapement to the Imnaha River mouth (hatchery plus natural)	Ratio of hatchery to natural adults at the mouth	Maximum % of natural adults to retain for broodstock	% of hatchery adults to retain for broodstock	% of adults released above the weir can be of hatchery origin	Minimum % of broodstock of natural origin
<50	Any	0	0	A	NA
51-700	Any	50	≤50	A	A
701-1,000	Any	40	A	70	20
1,001-1,400	Any	40	A	60	25
>1,400	Any	30	A	50	30

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A—Percentage determined as result of implementing other criteria, therefore not a decision factor

3. Adult spawning

a) Spawning protocols

To meet production goals the Egg take Needed is 439,000 green eggs at 82% survival from green egg to smolt and estimated five-year fecundity average of 4,503.

Adult Collection numbers are as follows, Based on adult survival of 90%:

Males – 108 (spawn 97)

32 natural (spawn 30)

76 hatchery (spawn 67-6 jacks equal one male)

Females – 108 (spawn 97)

32 natural (spawn 30)

76 hatchery (spawn 67)

The adult holding trap is 1,040 ft.³. The water flow of 4,000 to 6,000 gpm used to operate the ladder also flows through the adult trap. Fish are transported weekly or as needed to Lookingglass Hatchery in 800-gallon transport tank. Tanks are equipped with supplemental oxygen, aeration, and alarms.

The Lookingglass Hatchery consists of one Hatchery building complex (11,588 ft.²). The complex includes an office, spawning room, incubation, rearing, cold storage, shop, lab, visitor center and dormitory. The spawning room consists of an anesthetizing tank, bail, spawning table, fish health and fish research stations, and adult return tubes to holding pond. All Imnaha origin adults are held in one adult pond 6,400 ft.³ (20'x80'x4') with a maximum inflow of 3,990 gpm. Maximum holding capacity is 560 adults (1 adult/8 ft.³).

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b) No. of males and females spawned each year over past 10 years (table)

Table: Imnaha Spring/Summer Chinook spawning data, 1990-2008 (Grande Ronde and Imnaha AOP 2009)

Imnaha River spring/summer Chinook salmon spawning data, 1990-2008.

Brood Year	Marked Males Spawned	Marked Females Spawned	Unmarked Males Spawned	Unmarked Females Spawned	% Unmarked	Spawning Ratio F/M	Average Fecundity	Egg Take (1,000's)	Fry Ponded (1,000's)	Smolts releases (1,000's)
1990	35	49	39	25	43.2%	1.00	4,414	327	270	263
1991	11	24	27	15	54.5%	1.03	4,954	193	163	158
1992	46	86	69	28	42.4%	0.99	4,754	542	465	439
1993	134	139	58	54	29.1%	1.01	5,425	1,047	1,010	873
1994	15	13	6	9	34.9%	1.05	5,082	112	96	91
1995	16	9	30	6	59.0%	0.33	4,541	68	51	51
1996	15	7	37	17	71.1%	0.46	4,276	103	102	93
1997	54	50	8	7	12.6%	0.92	4,962	283	206	195
1998	53	33	31	28	40.7%	0.59	5,059	309	183	180
1999	183	31	14	6	8.5%	*0.16	4,566	169	126	123
2000	240	58	46	10	15.8%	*0.19	5,048	334	311	304
2001	114	56	54	49	37.8%	*0.38	4,371	459	275	268
2002	117	83	14	14	12.3%	0.62	4,695	455	397	398
2003	125	72	24	26	20.2%	0.65	5,081	498	434	435
2004	74	79	32	25	27.1%	0.98	4,652	488	447	442
2005	108	88	21	29	20.3%	0.90	4,545	532	437	433
2006	85	74	28	24	24.6%	0.86	4,138	406	363	349
2007	82	72	23	21	15.7%	0.88	4,391	408	300	
2008	123	82	82	22	33.6%	0.50	4,627	472		

4. Fertilization

a) Protocols

Same as Upper Grande Ronde. See section above.

b) Number of eggs collected and fertilized each year over past 10 years (table)

See table in Section 3Cb), above.

5. Incubation

Eggs are spawned into colanders to remove ovarian fluid, fertilized, and then water-hardened with 100ppm iodophor for a minimum of 15 minutes.

6. Ponding

a) Protocols

Same as Upper Grande Ronde. See section above.

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b) Number of fry ponded each year, including % hatch each year

See table in Section 3Cb), above.

7. *Rearing/feeding protocols*

- Fish in the outdoor raceways are fed using automated feeders. During cold weather (Jan-March), the fish are fed by hand because the automated feeders are inoperable.
- Every attempt is made not to exceed 0.75 DI in the indoor tanks. However, at times, DI's exceed 0.85 due to the limited early rearing space.
- The flow index can reach approximately 2.4 when the fish are 250 fpp. However, the water temperature at this time is between 35 and 40 degrees.
- Once the fish reach 250 fpp, they are transferred to the outdoor raceways to be reared on raw creek water (late April to early May). Juvenile fish are retained indoors until high spring flows and subsequent sediment/turbid water decreases.

8. *Fish growth profiles*

No information provided.

9. *Fish health protocols and issues*

Every female is screened for BKD. If the titer is above 0.2 optical density (OD) as measured by ELISA, then the eggs from those females are destroyed. Eggs are held separately by female until the disease profiles and screening are complete. If needed, eggs are consolidated after eye-up. From 2004 through 2008, 97 - 100% of the females spawned at Lookingglass Hatchery had BKD levels below 0.213 OD.

10. *Chemotherapeutant use*

- Every female is screened for BKD. If the titer is above 0.2 optical density (OD) as measured by ELISA, then the eggs from those females are destroyed. Eggs are held separately by female until the disease profiles and screening are complete. If needed, eggs are consolidated after eye-up. From 2004 through 2008, 97 - 100% of the females spawned at Lookingglass Hatchery had BKD levels below 0.213 OD.
- Adults collected for broodstock receive an erythromycin injection (20mg/kg) and an oxytetracycline injection (10 mg/kg) at capture to control BKD and Furunculosis, respectively. The second treatment only occurs if BKD is found in the earlier taken prespawning mortalities.
- Adults that are outplanted do not receive erythromycin or oxytetracycline injections.

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- The adults receive a formalin treatment 3 times per week. Treatment is typically concluded in mid-August.

11. Tagging and marking of juveniles

In October, Imnaha spring/summer Chinook are PIT tagged.

12. Fish Release

a) Protocols

- The Imnaha spring/summer Chinook are transferred to the Imnaha Satellite Facility's acclimation pond in mid March. The expected size at transfer is 22 fpp. The release size is 20 fpp.
- The Imnaha Satellite Facility's acclimation pond capacity is 390,000 fish at 20 fpp.
- The maximum density index is 0.26 at 20 fpp. The flow index is 0.85.
- The current strategy is to acclimate smolts for 2 to 3 weeks. After 2 to 3 weeks, the pond screens are removed and smolts allowed to volitionally release for a two week period. At the end of the two weeks, fish remaining in the pond are forced out. The time frame for smolt acclimation and release is from the second week in March to mid-April.

b) Number of fish released each year (subyearlings?; yearlings?; other?)

See table in Section 3Cb), above.

D. Program benefits and performance

1. Adult returns

a) Numbers of adult returns (need data for the past 10-20 years)

- See Previous Table in Upper Grande Ronde Section (Table 6 from Feldhaus et al. 2010) and Figure 3 below.
- From HSRG (2009):
- Recently (1949-2005), the abundance of spring/summer Chinook for this subbasin has ranged from 160 to 10,992 fish, with a recent 10-year geometric run size of 395 fish. According to the ICTRT, the mean percentage of out-of-ESU strays over the last ~12

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years has been 0.2%. Natural-origin spawners have comprised approximately 35% of the total escapement over the last 10 years.

- Historically, it is estimated that the Imnaha River supported one of the largest spring Chinook runs in Wallowa County. Prior to the construction of the four lower Snake River dams, maximum run size to the basin was 6,700 fish (NPPC 2004 as cited in HSRG 2009).

b) Return timing and age-class structure of adults

- See table from Appendix R below for recent age composition data, which shows similar results to the previous observation that the hatchery stock has a consistent pattern of earlier age at return in comparison to the natural stock (Carmichael and Messmer 1995).
- Hatchery and wild spring Chinook were monitored at the Imnaha River weir from week 23 through week 38. From 1990-2003, with the exceptions of 1994 and 1998 (in which sample sizes were low), natural salmon arrived at the weir earlier than hatchery salmon (Hoffnagle et al. 2005: ODFW Information Report 2005-03).

c) Smolt-to-adult return rates

- Smolt-to-adult return rates for natural-origin fish have ranged from 0.32 to 2.94 for brood years 1996 – 2001 (Michaels and Espinoza 2007 as cited in HSRG 2009).

Table. Appendix R. Preliminary data from Imnaha River releases between 1982 and 2007 (ODFWAOP 2008).

Brood Year	Release Year	Release Type	Number	Returns			Total Return	SAR Percent
				Age 3	Age 4	Age 5		
1982	1984	Conventional	24,920	195	48	4	247	0.9911
		Natural-Redds	129	358	704	147	1,209	
1983	1985	Conventional	115,830	24	18	38	80	0.0691
		Natural-Redds	95	77	406	580	1,063	
1984	1986	Conventional	35,035	55	40	16	111	0.3168
		Natural-Redds	119	14	129	154	297	
1985	1987	Conventional	123,530	101	96	9	206	0.1668
		Natural-Redds	462	40	189	81	310	
1986	1988	Conventional	199,066	183	269	46	498	0.2502
		Natural-Redds	284	59	184	97	340	
1987	1989	Conventional	142,320	69	228	65	362	0.2544
		Natural-Redds	183	15	133	91	239	

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1988	1990	Conventional ¹	253,042	260	551	440	1,251	0.4944
		Natural-Redds	237	19	150	349	518	
1989	1991	Conventional	267,670	100	472	98	670	0.2503
		Natural-Redds	116	18	133	71	222	
1990	1992	Conventional	262,500	24	64	12	100	0.0381
		Natural-Redds	115	5	65	7	77	
1991	1993	Conventional	157,659	11	76	12	99	0.0628
		Natural-Redds	178	2	95	35	132	
1992	1994	Conventional	438,699	102	94	7	203	0.0463
		Natural-Redds	240	140	289	40	469	
1993	1995	Conventional ²	394,255	91	351	62	504	0.1278
		Natural-Redds	468	14	106	154	274	
1994	1996	Conventional	91,240	7	31	4	42	0.0460
		Natural-Redds	154	6	104	48	158	
1995	1997	Conventional	50,911	161	585	32	778	1.5282
		Natural-Redds	60	31	155	46	232	
1996	1998	Conventional	93,108	689	530	131	1,350	1.450
		Natural-Redds	136	88	318	314	719	
Brood Year	Release Year	Release Type	Number	Returns			Total Return	SAR Percent
				Age 3	Age 4	Age 5		
1997	1999	Conventional	194,967	1,091	2,479	343	3,913	2.007
		Natural-Redds	224	340	2,245	359	2,944	
1998	2000	Conventional	179,716	1,153	3,212	1,077	5,442	3.028
		Natural-Redds	143	107	633	709	1,449	
1999	2001	Conventional	123,014	469	1,162	67	1,698	1.380
		Natural-Redds	189	111	862	82	1,055	
2000	2002	Conventional	303,737	1616	1199	106	2,921	0.9617
		Natural-Redds	261	113	345	75	533	
2001	2003	Conventional	268,426	747	957	33	1,737	0.6471
		Natural-Redds	635	27	225	29	281	
2002	2004	Conventional	398,185	238	1006		1,244	0.3124
		Natural-Redds	1,111	14	213		227	
2003	2005	Conventional	435,186	156			156	
		Natural-Redds	726	15			15	
2004	2006	Conventional	448,268					

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		Natural-Redds	495
2005	2007	Conventional Natural-Redds	349
2006	2008	Conventional Natural-Redds	235

¹ Includes only Ad marked hatchery releases and returns.

² Does not include 195,814 smolts released with LV mark.

d) Stock productivity (e.g. recruits per spawner)

- The hatchery program has an R/S value of 11.0 and Habitat Capacity is estimated at 1,500 adults (HSRG 2009).
- Recovery Goal for Abundance: To achieve the ICTRT adult target value of 1,250 fish (HSRG 2009).

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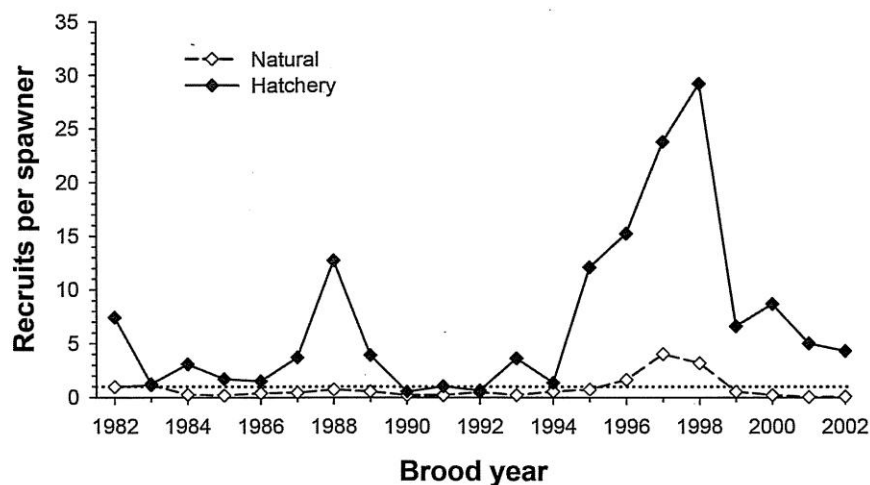


Figure 1. Recruits-per-spawner ratios (including jacks) for completed brood years (1982-2002) of Imnaha River Chinook salmon. Note: dotted line indicates recruits-per-spawner ratio=1.

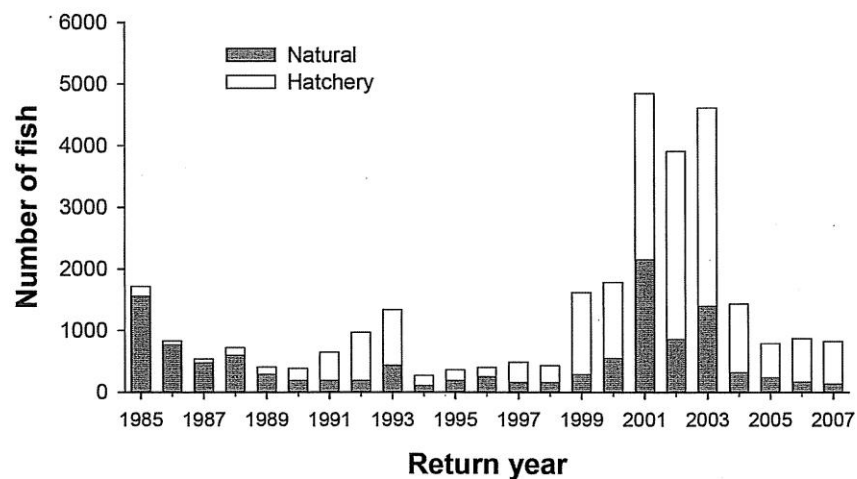


Figure 3. Estimated numbers of natural- and hatchery-origin spring/summer Chinook salmon (including jacks) that spawned naturally in the Imnaha River, 1985-2007.

Figures 1 and 3 from ODFW 2007 Annual Progress Report to LSRCP: Feldhaus et al. 2010.

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2. Contributions to harvest and utilization (e.g. food banks)

- The Imnaha spring/summer Chinook program contributes to tribal, commercial, and recreational fisheries in downstream fisheries, including the lower Columbia River. Harvest is limited. Estimates of Imnaha River spring/summer Chinook harvest outside the project area include; 257 fish in 2006 (3-ocean, 74 fish in the Columbia River treaty net fishery, 32 fish in the Columbia River non-treaty net fishery, and 148 fish in the Columbia River sport fishery), 122 fish in 2005 (11-ocean, 17- Columbia River treaty net, 12- Columbia River non-treaty net, and 82-Columbia River sport), 180 fish in 2004 (10-ocean, 101-Columbia River treaty net, 5-Columbia River non-treaty net, 63-Columbia River sport, and 1- Deschutes River sport), 155 fish in 2003 (3-ocean, 25-Columbia River ceremonial/subsistence, 36-Columbia River treaty net, 9-Columbia River non-treaty net, and 82-Columbia River sport), 139 fish in 2002 (12-ocean, 10-Columbia River ceremonial/subsistence, 3- Columbia River treaty net, 11-Columbia River non-treaty net, 97-Columbia River sport, and 6-Deschutes River sport), 228 fish in 2001 (9-ocean, 82- Columbia River ceremonial/subsistence, 47-Columbia River treaty net, 6-Columbia River non-treaty net, 70-Columbia River sport, 1-Columbia River test fishery, and 13-Deschutes River sport.
- Prior to 2001, sport fishing for salmon had been closed in the Imnaha basin since 1979. Before 1979 a modest fishery occurred during the late spring and early summer. Estimates of harvest, from punch card returns adjusted for non-response bias and reports of catch outside of the spring season, ranged from 0 to 201 Chinook from 1957 through 1978 (Beamesderfer et al. 1997). (Appendix N - Lower Snake River Fish and Wildlife Compensation Plan Grande Ronde and Imnaha Basins Annual Operation Plan 2008):

Table . Imnaha River Spring Chinook Sport fisheries impact for years 2001 through 2005.

Year	Sport Season	Escapement to River (H/W)	Harvest (95% CI)	Released (95%CI)		Impact	
						N	%
		(H)	(H)	(W)	(W)	(H/W)	
2001	6/2-6/21	3,488/2,618	302 (226-378)	21 (8-34)	433 (306-560)	43	8.7/1.6
2002	6/1-6/30	3,876/1,104	152 (73-231)	9 (1-17)	15 (6-24)	2	3.9/0.2
2003	6/7-7/1	3,813/1,699	125 (43-207)	22 (4-56)	83 (20-156)	8	3.3/0.5
2004	6/19-7/5	1,866/465	192 (81-303)	21 (5-39)	29 (9-56)	3	10.4/0.6
2005	6/25-7/4	1,273/311	22 (2-23)	54 (5-123)	22 (2-50)	2	2.1/0.6

(H) = Hatchery fish, (W) = Wild fish

Sport impact includes an 10% fishery mortality for both hatchery and wild fish caught and released

(ODFW AOP 2008. Appendix N)

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3. Contributions to conservation

- Naturally spawning spring/summer Chinook in the Imnaha River, Big Sheep Creek, and Lick Creek are expected to enhance ecological processes in the watershed.
- There is a potential, but undocumented demographic and/or ecological benefit to the naturally spawning populations in the Big Sheep Creek and Lick Creek where adults are outplanted.
- Conservation Objectives:
 1. Prevent extinction of Imnaha River, Lostine River, Catherine Creek, and upper Grande Ronde River Chinook salmon populations and ensure a high probability of population persistence well into the future, once causes of basin-wide declines have been addressed.
 2. Operate the hatchery program so that the genetic and life history characteristics of hatchery fish mimic those of wild fish, while achieving mitigation goals.
 3. Maintain genetic and life-history characteristics of natural Chinook salmon populations in the Imnaha River, Lostine River, Catherine Creek, and upper Grande Ronde River.
 4. Provide a future basis to reverse the decline in abundance of endemic Chinook salmon populations in the Imnaha and Grande Ronde river basins.

4. Other benefits

- Tribal harvest provides ceremonial, cultural and subsistence benefits to Columbia River tribes.
- The program provides research and information on supplementation issues.

E Research, monitoring, and evaluation programs

- Imnaha spring/summer Chinook are 100% adipose-fin clipped. Approximately 180,000 are adipose fin-clipped and coded-wire tagged. 21,000 are PIT tagged. Tags are apportioned equally across raceways.
- Coded wire tags are used to assess contribution to fisheries and estimate smolt to adult survival.
- PIT tag data provides information regarding downstream migration timing and comparative performance of wild, captive brood, and conventional juveniles.
- The pHOS and pNOB are monitored constantly and used to guide the program.
- Observations indicate that there may be a divergence in run timing forming between the hatchery and wild fish. The mean of the hatchery return is shifting later than the natural return. The spawn timing may also be shifting; however, this is harder to determine.

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- Imnaha spring/summer Chinook are monitored as part of the Comparative Survival Study.
- The Nez Perce Tribe conducts Lower Snake River Compensation Plan Hatchery evaluation studies and the Imnaha River Smolt Monitoring in the Imnaha River, Oregon. These studies are closely coordinated and provide information about juvenile natural and hatchery spring/summer Chinook salmon and steelhead biological characteristics, emigrant timing, survival, arrival timing and travel time to the Snake River dams and McNary Dam on the Columbia River. These studies also provide information on listed Chinook salmon and steelhead for the Federal Columbia River Power System Biological Opinion.
- LSRCP hatchery evaluation studies in the Imnaha River determine natural and hatchery Chinook salmon and steelhead smolt performance, emigration characteristics and survival. A long term monitoring effort was established to document smolt emigrant timing and post release survival within the Imnaha River, estimate smolt survival downstream to McNary Dam, compare natural and hatchery smolt performance, and collect smolt-to-adult return information.
- This project collects information for, and is part of, a larger effort entitled Smolt Monitoring by Federal and Non-Federal Agencies (BPA Project No. 198712700). This larger project provides data on movement of smolts out of major drainages and past dams on the Snake River and Columbia River. In season indices of migration strength and migration timing are provided for the run-at large at key monitoring sites. Marked smolts are utilized to measure travel time and estimate survival through key index reaches. Fish quality and descaling measures are recorded at each monitoring site and provide indicators of the health of the run.
- Co-managers in the Imnaha River subbasin have identified the need to collect information on life history, migration patterns, juvenile emigrant abundance, reach specific smolt survivals, and Smolt-to-Adult Return rates (SAR.s) for both steelhead and Chinook salmon smolts. The current study provides information related to the majority of the high priority data needs. Current funding does not allow for determination of a total (annual) juvenile emigrant abundance and installation of adult passive integrated transponder (PIT) tag detectors at the mouth of the Imnaha River to calculate tributary specific SAR.s.
- See ODFW 2007 Annual Progress Report to LSRCP: Feldhaus et al. 2010 for research, monitoring and evaluation objectives as shown in the Lookingglass Creek spring Chinook section of this document.

F. Program conflicts

1. Biological conflicts (e.g. propagated stock maladapted to hatchery water source)

- Extreme cold water conditions at the acclimation site may result in diminished or complete water flow loss resulting in catastrophic fish loss.
- The transfer of fish from hatchery raceways to extreme cold water conditions at the acclimation site may pose a physiological (stress) risk to the fish

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2. *Harvest conflicts (e.g. mixed stock fishery on hatchery and wild fish limits harvest opportunities on hatchery fish.)*

- The Imnaha River fishery is mixed stock fishery. Incidental take restrictions for the natural-origin Imnaha spring Chinook limits harvest of hatchery-origin Chinook.

3. *Conservation conflicts and risks*

a) Genetic conflicts associated with straying and natural spawning of hatchery fish (Stray rates, proportion of hatchery-origin fish on natural spawning grounds, etc. Provide tables or figures where appropriate)

- The comparatively low recruit to spawner ratio for naturally spawning fish in some years coupled with the high proportion of hatchery-origin spring/summer Chinook spawning in the Imnaha River inhibits development of a properly integrated program, which poses a genetic domestication risk to the Imnaha River spring/summer Chinook population.
- Proper management of the hatchery and natural population is not possible because the current weir structure cannot be installed until high spring flows subside, after a large portion of the spring/summer Chinook return to the Imnaha River.
- The return timing of the natural population appears to be shifting to a later date since hatchery broodstock can currently only be collected from the later portion of the run since the weir cannot be installed until high spring flows subside and the large proportion of naturally spawning fish is composed of hatchery-origin adults.
- Although the intent is to manage the Imnaha population as integrated, the return timing of the hatchery-origin broodstock is separating from the return timing of the natural population since hatchery broodstock can currently only be collected from the later portion of the run since the weir cannot be installed until high spring flows subside.
- Hatchery-origin adults pass above the Imnaha weir site in uncontrolled numbers during periods of high flow in some years, thereby resulting in an uncontrolled genetic influence of the hatchery environment on the naturally spawning population.
- The present sliding scale of proportion of natural origin and hatchery origin adults passed above the Imnaha weir results in upstream passage of hatchery-origin adults under conditions when no supplementation is required to meet the escapement objective, resulting in excessive genetic influence of the hatchery environment on the naturally spawning population.
- Outplanting surplus Imnaha River spring/summer Chinook into Big Sheep and Lick creeks poses a genetic risk to any naturally-produced spring/summer Chinook in this area.

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b) Ecological conflicts (e.g. competition between hatchery fish and wild fish, predation,)

- Amplification of disease within the hatchery program poses a disease risk to the Imnaha River spring/summer Chinook population.
- The spawning and rearing habitat may be limited, in which case, large numbers of hatchery fish spawning naturally would reduce the productivity or mean recruit per spawner of the natural-origin fish. Based upon habitat capacity, the ICTRT indicated that the intermediate recovery goal for the Imnaha River is 700 adults.
- Anadromous fish in the Imnaha River above the satellite facility intake pose a minor fish health risk to the Chinook held at the Imnaha Satellite facility.
- Outplanting surplus Imnaha River spring/summer Chinook into Big Sheep and Lick creeks poses fish health risks and an ecological risk to the survival and growth of any naturally-produced spring/summer Chinook in these areas .
- Amplification of disease within the hatchery program poses a disease risk to other native fish populations in the Imnaha River when smolts are transferred and released from the Imnaha Satellite facility

4. *Other conflicts between the hatchery program, or fish produced by the program, and other non-hatchery issues*

- Research conflict: Since the weir cannot be installed until high spring flows subside, the inability to sample adults during the full distribution of the run in most years prevents accurate estimation of abundance, return timing and composition (hatchery versus natural) of adult spring/summer Chinook

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IV. References

Reference/supporting documents can be found at the Columbia River Basin Hatchery Review website <<http://www.fws.gov/pacific/Fisheries/Hatcheryreview/index.html>> under “Reports & Publications”.

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Pacific Region Fishery Resources
911 NE 11th Avenue
Portland, OR 97232
503/872.2763
E-Mail: Don_Campton@fws.gov

U.S. Fish and Wildlife Service
www.fws.gov

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