

Infrastructure and Operations Audit: Wallowa Fish Hatchery, 2024



Wallowa Fish Hatchery

- **Lower Snake River Compensation Plan (LSRCP)**

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Executive Summary

On March 27, 2024, Nathan Wiese – Program Coordinator Lower Snake River Compensation Plan (LSRCP), Chris Starr – Facility Coordinator/Asset Manager LSRCP, Ron Harrod – Hatchery Manager, and Justin Herold – Assistant Hatchery Manager, conducted a comprehensive one-day infrastructure and operations assessment of the ODFW managed Wallowa Fish Hatchery (Enterprise, OR). A secondary facility assessment addressing steelhead trout (*Oncorhynchus mykiss*) production at Wallowa was completed on September 11, 2024, by Shawn Sanders – LSRCP/FWS Fish Biologist and Justin Herold – Assistant Hatchery Manager.

This document provides the LSRCP and stakeholders appropriate conceptual-level information and documentation to address the infrastructure challenges at this facility. The Audit findings are subsequently incorporated into the 10-year strategic plan for LSRCP. The audit results provide the documentation to develop solutions which logically and methodically allocate resources, budgets, and supportive programs to meet program goals, improved long-term fish escapement to all program facilities.

A program-wide assessment was completed for steelhead rearing facilities prior to the 10-year spring/summer Chinook Program Review of the Independent Scientific Review Panel (ISRP), scheduled for January 2025.

Outlet Structure and Net Pen Rearing

The Outlet/Dam structure at Wallowa hatchery is failing and needs to be replaced. This project has been identified for over a decade, but issues with ownership/transfer between ODFW/USFWS have stalled replacement. During replacement, the existing pond should be dredged and remediated for future use of Net Pen Rearing/Acclimation for up to 400,000 steelhead smolts.

Cost of dam replacement is estimated at \$1.3M.

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1 Scope

On March 27, 2024, Nathan Wiese – Program Coordinator Lower Snake River Compensation Plan (LSRCP), Chris Starr – Facility Coordinator/Asset Manager LSRCP, Ron Harrod – Hatchery Manager, and Justin Herold – Assistant Hatchery Manager, conducted a comprehensive one-day infrastructure and operations assessment of the ODFW managed Wallowa Fish Hatchery located in Enterprise, OR (Figure 1). A secondary facility assessment addressing steelhead trout (*Oncorhynchus mykiss*) production at Wallowa was completed on September 11, 2024, by Shawn Sanders – LSRCP/FWS Fish Biologist and Justin Herold – Assistant Hatchery Manager.

This document provides the Lower Snake River Compensation Plan (LSRCP) and stakeholders appropriate conceptual-level information regarding current infrastructure challenges at this facility. Audit findings are incorporated into a 10-year strategic plan for LSRCP to maximize in-house and external improvement opportunities by developing solutions which logically allocate resources, budgets, and support programs. Resource allocation and planning will significantly improve water quality, program capacity, efficiency, and site flexibility, thereby strengthening potential opportunities for LSRCP to ultimately meet adult mitigation targets.

Historically, LSRCP adult spring/summer steelhead escapement (returns) goals were met between 2006 and 2013, however between 2014 and present escapement has precipitously dropped. During the period of 2014 to present, steelhead escapement (returns) did not meet the annual 55,100 mitigation target. The average LSRCP escapement for 2006-2017 was 65,777, while between the 2014-2021 the average escapement was 26,418, respectively.

The LSRCP assessed all steelhead rearing facilities within the program, prior to the 10-year spring/summer Chinook Program Review of the Independent Scientific Review Panel (ISRP), scheduled for January 2025. During this review process, the LSRCP will identify strategies towards optimizing performance to achieve project area goals of 55,100 adult steelhead returns.

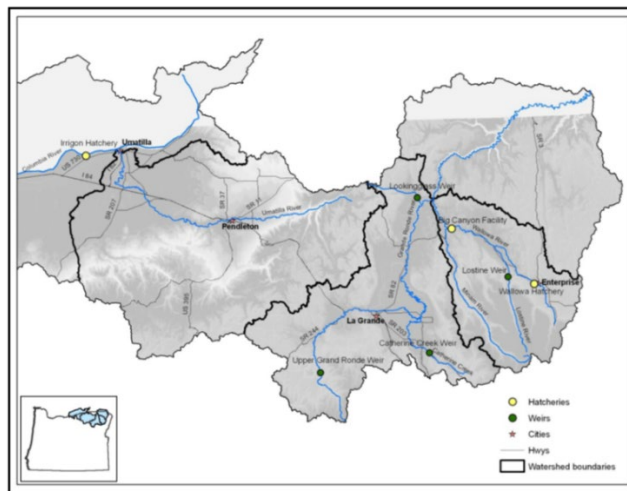


Figure 1. A Map of the Wallowa Hatchery within the Grande Ronde Basin.

2 Background

Wallowa Hatchery is located along Creek, a tributary of the Wallowa River (Grande Ronde River Subbasin, Figure 2), 1 mile west of Enterprise, Oregon. The site is at an elevation is 3,700 feet above sea level, at latitude 45.4583 and longitude -117.2933. The site area is 11 acres and is owned by the Oregon Department of Fish and Wildlife (ODFW) and by the United States Fish & Wildlife Service (USFWS) - Lower Snake River Compensation Plan (LSRCP). ODFW operates this facility and two other associated satellite acclimation facilities, Little Sheep and Big Canyon.

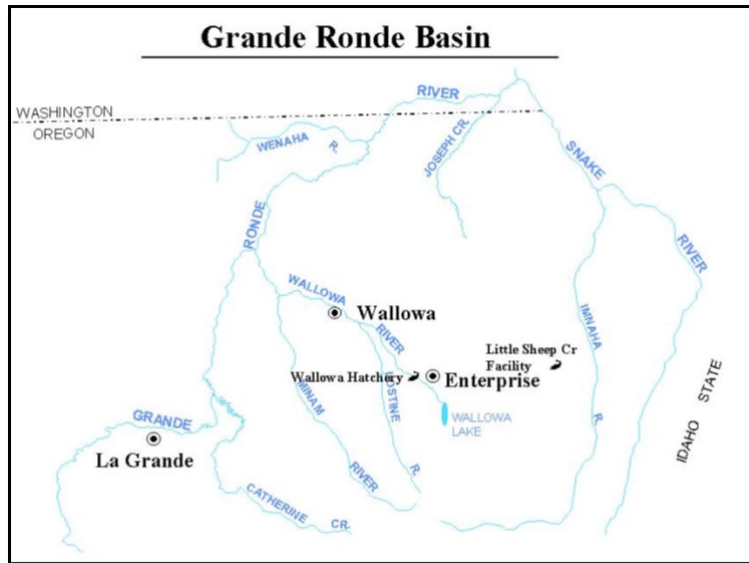


Figure 2. Map of the greater Grande Ronde Basin with specific hatchery site information for the Wallowa Hatchery, off-site rearing facilities, and watersheds within the basin.

The hatchery's multifaceted goal is to produce fish to mitigate for harvest opportunities which were lost from construction of four Lower Snake River dams, while minimizing potential impacts to listed fish populations in the Snake and Columbia River Basins. To meet these mitigation goals Grand Ronde Summer Steelhead and Rainbow Trout are cultured with the latter providing recreational sport fishing opportunity in northeast Oregon lakes, ponds, and reservoirs.

Grande Ronde basin summer steelhead are typical of A-run steelhead from the mid-Columbia and Snake basins, which is a slightly smaller strain as compared to B-run fish. Adult Steelhead returns are based on years of rearing in saltwater, with fish returning after one year referred to as 'one-salt' (two-salt, etc.), so these fish reared for one rearing season in saltwater. Approximately 60% of adults return to the Grande Ronde and Imnaha basins as one-salt adults. The remainder consists of two-salt adults with an occasional yet rare three-salt fish. Historically, females generally dominate adult returns with an average 60:40 (F:M) sex ratio. However, in 2020 sex ratios were equal and preliminary data suggests that the average sex ratio has shifted to a 60:40 split with males dominating escapement values. Adult Grand Ronde steelhead range in size from 45 to 91 cm and 1.4 to 6.8 kg, respectively. Adults generally enter the Columbia River

from May through August, and subsequently enter the Grande Ronde River between September through April. Adults utilize accessible spawning habitat throughout the Grande Ronde basin including Deer Creek above the facility weir. The Wallowa trap and ladder (25'x8.6'x4.33') collect adult from Mid-February to June from the Spring Creek a tributary to the Wallowa River. Adults are held at maximum densities of 2.5 ft³/fish with water flow of approximately 2 gallons per minute (gpm) per fish. The peak collection is between late March to early April.

Wild fish generally do not stray into Spring Creek from the Wallowa River and are seldom observed or collected in the Wallowa Hatchery trap. Steelhead spawning typically begins in March within lower elevation streams and spring-fed tributaries and continues until early June within higher elevation snowmelt driven systems. Juvenile steelhead utilize a wide range of habitats throughout the basin including areas adjacent to smolt release locations. The majority of naturally produced smolts out-migrate after two years of instream rearing. A significantly lower percentage emigrate seaward after one or three years. Smolt out-migration from the Grande Ronde basin extends from late-winter until late-spring, and peak movement is typically associated with increased flow events between mid-April and mid-May (HGMP 2011)

Wallowa and its acclimation hatchery programs provide 1,015,000 million steelhead smolts toward the LSRCP project area goal of 2,000 adults to the Imnaha Basin and 9,184 adults to the Grande Ronde basin.

3 Big Canyon

The Big Canyon acclimation facility (Figure 3) is located at the junction of Deer Creek and the Wallowa River, just east of Minam, Oregon.

Deer Creek provides 8 cubic feet per second (cfs) of flow for the Big Canyon acclimation site. The Big Canyon trap and ladder (30'x10'x4.5') collect adults from Mid-February to June. The peak collection period is late-March into early-April. Adults are held at maximum densities of 2.5 ft³/fish and 2 gpm per fish with a range of 0.11 to 0.16 Density Index (DI) and 0.9 to 1.2 Flow Index (FI).

The two Big Canyon acclimation ponds are 150' x 30' x 3.5' or 15,750 ft³ each. Additionally, there is a third acclimation pond measuring 70' x 30' x 3.5' or 7,350 ft³, respectively.



Figure 3. Aerial view of the off-site acclimation facility at Big Canyon

4 Little Sheep

Water for the Little Sheep Creek facility (Figure 4) is conveyed from Little Sheep Creek (Christianson 1994). Water use for those facilities includes 4,000 gpm for acclimation and 2,300 gpm for adult holding, well within the existing water rights. Water quality at acclimation is generally good. Occasionally, within basin freshets increase sediment loads and resultant degraded water quality of inflow water at the acclimation facility.



Figure 4. Aerial view of the off-site acclimation facility at Little Sheep

In 1998, 1,112,000 surplus eggs were reared at a temporary facility at river km 26 on the Imnaha River with the intent of releasing fry into the Imnaha River and Big sheep Creek. However, a potentially catastrophic flood event occurred during spring thaws and resulted in early release of the fry, 287,511 were released into Big Sheep Creek and 39,074 were released into the Imnaha River. This was a rare unplanned occurrence and is not expected to happen again. Adults are held in a 40' x 20' x 4' concrete pond or 3200 ft³ at target maximum densities of 2.5 ft³/fish and 2 gpm/fish. Little Sheep acclimation pond is a concrete pond 195' long 50' wide and 3.5' deep or 34,125 ft³.

Due to recent wildfires and subsequent habitat losses have increased the potential for flooding at the Little Sheep acclimation site (Figures 5 and 6). These flood events are potentially catastrophic to fish health.



Figure 5. Sedimented raceway following flood event. Figure 6. Clogged Intake Structure.

4.1 Infrastructure

4.1.1 Hatchery Water Supply

Hatchery water rights from several sources at Wallowa Hatchery total 23,813 gpm. These sources include the Spring Creek, Wallowa River, Lower & Upper Spring, and two wells. Spring run-off and water releases from Wallowa Lake are dynamic and fluctuate widely. Wallowa River water temps can range from low 30's °F to upper 60's °F. Spring Creek water ranges from mid-30's °F to Upper 60's °F.

Wallowa Hatchery sits at 3700 feet above mean sea level and the seasonal temperatures of different water sources vary widely.

Incubation from green to eyed eggs is accomplished by utilizing both spring water surface flows from the spring creek and well water sources which account for 250 gpm. Spring Creek provides 12 cfs of water for use in the Wallowa acclimation pond as a flow through system.

4.1.2 Broodstock Collection

Approximately, 110 Broodstock are collected at Little Sheep for spawning and a total of 410 broodstock are collected at Wallowa for spawning (Table 3). Average fecundity is 5000 eggs/female, and average eye-up is 90%. Currently, angler-caught fish are integrated into the Wallowa broodstock collection planning. These fish are caught on the Grande Ronde in October, transported to Wallowa Hatchery, and held until spawning begins in early March. Approximately 30% of the Wallowa broodstock are collected from angler-caught broodstock which is approximately 120 adult fish. An equal sex ratio is targeted for spawning.

Following fertilization, eggs are water hardened in 100 ppm iodophor for 15 minutes. Formalin treatments (1667 ppm for 15 minutes) are administered as a flow through operation three times per week. Eyed eggs are disinfected with 100 ppm iodophor for 15 minutes when transferred.

4.1.3 Incubation

Wallowa Hatchery has 228 vertical incubation trays (19 stacks with 12 trays in each stack). Eggs are incubated to the eyed stage, shocked, cleaned, enumerated, and transferred to Irrigon Hatchery for rearing. Eggs from each female are incubated in separate trays (5,000 eggs/female) and after eye-up they are shipped to Irrigon Hatchery. Irrigon then loads 10,000 eyed eggs per tray and supplies a flow of 4 gpm.

Incubation water temp at Wallowa well is 54-56 F with dissolved oxygen of 8.4 parts per million (ppm). Spring water supplies range from 44-48 F with dissolved oxygen of 9.8 ppm.

Little Sheep incubation trays are loaded with 3 females per tray (15,000 average eggs per tray at 4 gpm). Little Sheep has five 12-tray stacks, for a total of 60 trays and total incubation of approximately 900,000 eyed eggs.

4.1.4 Nursery Rearing

Early rearing occurs at Irrigon Fish Hatchery.

4.1.5 Outdoor Rearing

Smolts are transported from Irrigon Hatchery to acclimation facilities via tanker trucks that range from 2,000 to 5,000-gallon capacity. Transportation criteria are described in the Oregon State Liberation Manual. Loading density is maintained at approximately 1 pound of fish per gallon of water.

Program goals: (Tables 4 and 5)

- 5.67 lbs./gpm; Flow Index 0.68 (Piper)
- 1.20 lbs./ft³; Density Index 0.14 (Piper)

4.1.6 Release

Release timing is designed to match natural fish out-migration and normal increase in flow. Typically, this occurs in mid-April to mid-May at the peak of the spring run.

The early release group at Wallowa Hatchery was transferred in mid-February and held five to seven weeks. Fish are transferred in mid-November, to Wallowa Hatchery Acclimation. Fish are allowed to voluntarily release for 48 hours after which time they are forced into the river. The late group at Wallowa Hatchery is transferred in Mid-April

and held 3 weeks until mid-May. This group has a 12-day volitional release period after which time all fish are forced out.

Transferring the mid-November smolts frees up space and much needed water for Irrigon Fish Hatchery. Smolts are transferred at 8-10 fish per pound (lb.) (fpp) with a DI of 0.12. Weather and water temperatures at Wallowa during the winter, create an environment which can be difficult for fish to efficiently feed and reach the target goal of 5 fpp. Preliminary escapement data indicates the 2nd transfer group from Wallow and the Big Canyon group return at a higher rate compared to other groups. These groups are larger at release (size comp?). The rearing groups are larger at release because Irrigon reared fish are on the facility for a longer period, along with warmer water temperatures during winter and spring rearing. Total weight gain is limited through the winter and short acclimation of 3-4 weeks, with the longest acclimation period of 5 months.

The release group at Big Canyon is transferred in mid-March and held three weeks. This group has a 72-hour volitional release period. At the end of the volitional period, fish remaining in the acclimation pond are sampled to determine sex ratio. If males comprise $\geq 70\%$ of fish remaining, up to 2,500 fish are transferred to a standing water body. If the remaining fish are $< 70\%$ males, the group is forced out of the acclimation pond.

4.1.7 NPDES (National Pollution Discharge and Effluent Survey) Water Quality

The NPDES permit requires that the maximum biomass for this facility shall not exceed 300,000 pounds on hand at any point. The highest amount of biomass at any time for Wallowa Hatchery ranged from 74,104 to 118,516 pounds during the last 10 years (Table 6).

- Total Suspended Solids (TSS) – Composite samples are collected once per week during normal operations and each time a cleaning event occurs during the month of highest production for each calendar quarter. Samples are also taken during severe disturbance of stream due to storms, run-off, etc.
- Settleable Solids (SS) – Grab samples are collected once per week during normal operations and each time a cleaning event occurs during the month of highest production for each calendar quarter.
- pH – measured once during normal operations for the month of highest production for each calendar quarter.
- Dissolved Oxygen (DO) – measured only when conditions warrant (e.g., periods of low flows and high temperatures).
- Flow Logs – Measurements are taken once per week during normal operations and during each cleaning event for the month of highest production for each

calendar quarter. Flows are also recorded when using a chemical which discharges into the effluent, to follow prescribed dilution rates.

5 Operational/Infrastructure Changes for Program Efficiency

5.1.1 Incubation

The Wallowa Incubation system requires repair and updates. The Old piping system is aging and requires patching to prevent leaks, creating unnecessary risks. A new system may not need temperature isolation between stacks creating extra space to utilize the 16-tray systems rather than 12-tray system for increased capacity.

The repair cost is estimated at \$150,000.



Figure 7. Incubation system at Wallowa Hatchery.

5.1.2 Valves

Several old valves need to be replaced and repaired on the facility. That work should be completed as soon as possible to reduce risk of catastrophic failure.

Estimated cost - \$15,000

5.1.3 November Acclimation

Acclimating early (in November) provides additional rearing water and space at Irrigon Fish Hatchery. Continued monitoring should occur to determine the success of this program and also identify what additional production space could be utilized at Irrigon Fish Hatchery by moving fish earlier. Alternatively, consideration should be made to using Wallowa space over the winter for alternative programs if the move from Irrigon isn't the most efficient use of space.

6 References

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7 Appendix A. Water Quality Parameters

		Hagerman National- Main Spring	Magic Valley	Irrigon	Lyons Ferry	Wallowa
Primary IOC Contaminants	Clearwater					
Arsenic	ND			<0.005	<0.030	<0.005
Barium	0.009			ND	0.024	<0.30
Cadmium	ND	<0.001	<0.001	ND	<0.003	<0.002
Chromium	ND	0.00284	0.00138		<0.007	<0.010
Mercury	ND	<0.01 ug/L	<0.0001	ND	No Data	<0.001
Nickel	ND			ND	<0.005	<0.020
Selenium	ND	<0.001	0.00143	ND	No Data	<0.020
Sodium	1.780			23.0	20.0	5.000
Flouride	ND			ND	0.33	0.600
Secondary and Other IOC Contaminants						
Chloride	0.228			27	12	<0.5
Iron	0.099	<0.01	<0.01	ND	0.050	0.152
Manganese	0.002			17.240	0.030	0.004
Dissolved Solids	36.000	200.000	340.000	300	246	170
Zinc	ND			ND	0.030	0.010
Silver	ND			ND	No Data	<0.002
Sulfate	0.563			43	16	13.000
Calcium	4.100		62.800	67.0	21.0	46.9
Hardness (as CaCO ₃)	14.000	137.000	222.000	240	108	140
Magnesium	0.924	15.000	24.200	17.2	14.0	4.93
pH	7.920	7.670	7.210	7.4	10.4	7.7
Potassium	0.633	3.510	5.360	5.1	5.0	2.9
Lead	ND	<0.001	<0.001	ND	<0.004	<0.002
Copper	ND	<0.001	<0.001	ND	<0.01	<0.004
Comments						
Alkalinity (mg/l)	16.0 to pH 4.2	124.000	182.000	140	140	130.000
Ammonia (mg/l)		<0.05	<0.05	No Data	No Data	No Data
Gasoline (mg/l)				No Data	No Data	No Data
Lube Oil (mg/l)				No Data	No Data	No Data
Diesel (mg/l)				No Data	No Data	No Data
Nitrate/N		1.000	2.650	10.0	0.1	0.6
Nitrite/N				ND	No Data	<0.5
Flow (cfs)	74	62.00	80.00	31	119	12.5
Temperature (°F)		59	59	56	52	36-56

Table 1. Annual Wallowa Smolt to Adult Survival Rate, by brood year and site

Brood Year	Little Sheep	Wallowa/Big Canyon
2000	1.0%	0.8%
2001	1.7%	2.0%
2002	1.5%	1.8%
2003	1.3%	1.8%
2004	1.0%	1.4%
2005	1.7%	2.0%
2006	1.2%	1.4%
2007	3.3%	4.4%
2008	1.5%	1.8%
2009	1.6%	2.1%
2010	0.9%	0.6%
2011	2.3%	1.7%
2012	2.2%	1.4%
Avg	1.6%	1.8%

Table 2. Acclimation site stocking and release goals for each respective acclimation site within Wallowa Hatchery including transfer dates.

Release Site	Stock	Release Goal	Size (fpp)	Transfer
Wallowa Acclimation Early	Wallowa	400,000	5.5	Nov 21
Wallow Acclimation Late	Wallowa	160,000	5	April 5
Big Canyon Acclimation	Wallowa	240,000	5	March 15
Little Sheep Acclimation	Imnaha	215,000	5	Feb 21
	Total	1,015,000		

Table 3. Average broodstock collection values for both male and female Grande Ronde Steelhead Trout at Wallowa Fish Hatchery sites.

Location	Brood	Green Eggs	Eyed Eggs
Wallowa	410	965,000	909,000
Little Sheep	110	275,000	247,500

Table 4. Annual fish sizing table among the entire brood year and average weight calculated as fish per lb. (FPP).

Month	FPP
June	1155
July	343
Aug	97
Sept	44
Oct	23
Nov	13
Dec	7.3
Jan	5.7
Feb	5.5
Mar	4.4
Apr	4

Table 5. Site specific pond sizes and volumetric measurements with flow maximum flow rates for each respective rearing site at Wallowa Hatchery.

Location	Number of Ponds	Pond Size	Volume (ft3)	Flow
Wallowa	2	300' x 42' x 3.5'	88,200	12 cfs
Little Sheep Acclimation	1	195' x 50' x 3.5'	34,125	8 cfs
Big Canyon Acclimation	2	150' x 30' x 3.5'	31,500	8 cfs
Big Canyon Acclimation	1	70' x 30' x 3.5'	7,350	This is off the same 8 cfs used for the big ponds.

Table 6. Maximum fish biomass (lbs.) at Wallowa Hatchery 2009-2018.

Year	Biomass (lbs.)
2009	74,104
2010	106,116
2011	118,516
2012	107,710
2013	86,824
2014	98,031
2015	102,509
2016	93,315
2017	88,482
2018	93,540