INTEGRATED HATCHERY OPERATIONS TEAM

OPERATION PLANS FOR ANADROMOUS FISH PRODUCTION FACILITIES IN THE COLUMBIA RIVER BASIN
Volume III.

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Acronyms or Abbreviations Used in this Report

BPA: Bonneville Power Administration
cfs: Cubic feet per second.
CHF: Fall Chinook
CHS: Spring Chinook
CHR: Summer Chinook
CIS: Coordinated Information System
COH: Coho
CRITFC: Columbia River Inter-Tribal Fish Commission
ESA: Endangered Species Act
FERC: Federal Energy Regulatory Commission
IDFG: Idaho Department of Fish and Game
IHOT: Integrated Hatchery Operations Team
NMFS: National Marine Fisheries Service
ODFW: Oregon Department of Fish and Wildlife
PAC: Production Advisory Committee
PNFHPC: Pacific Northwest Fish Health Protection Committee
PP&L: Pacific Power and Light
PUD: Public Utility District
StS: Summer Steelhead
StW: Winter Steehead
SOC: Sockeye
TAC: Technical Advisory Committee
USFWS: U.S. Fish and Wildlife Service
WDF: Washington Department of Fisheries
WD W: Washington Department of Wildlife

Big Creek Hatchery

INTRODUCTION

Big Creek Hatchery is located 16 miles east of Astoria, Oregon and is approximately 3 miles upstream from Big Creek's confluence with the Columbia River. The site elevation is approximately 75 feet above sea level.

The facility includes 2 adult holding ponds, 30 raceways, 1 rearing pond, 64 troughs and 8 stacks of egg incubators. The adult collection and holding ponds are in poor condition and are inadequate to meet current program objectives.

There are four water sources for the hatchery: Big Creek, Mill Creek and two springs. Current water rights total 36,158 gpm plus an additional 4.2 cfs reservoir water right. All water supplies are delivered by gravity but can be pumped for reuse if required. The facility is staffed with 8.42 FTE's.

PURPOSE

Big Creek Hatchery began operation in 1941 as a state-funded facility. It was refurbished in 1957 under the Mitchell Act as part of the Columbia River Fisheries Development Program-a program to enhance declining fish runs in the Columbia River Basin. The facility is used for adult collection, egg incubation and rearing of sea-run cutthroat trout, winter steelhead, fall chinook and coho.

GOALS

Fall Chinook and Coho: Produce lower river fall chinook and coho that will contribute to NE Pacific and Columbia River Basin commercial and sport fisheries while providing adequate escapement for hatchery production.

Winter Steelhead: Help meet statewide management goals of creating consumptive steelhead fisheries. Production provides harvest objectives for the North Coast, lower Columbia and Willamette River tributaries as well as providing broodstock for hatchery production.

Sea-run Cutthroat: Provide a trout fishery in the spring as well as a sea-run cutthroat trout fishery in the summer and fall.

OBJECTIVES

Objective 1: Hatchery Production

Fall Chinook (Big Creek stock)
Produce 5,700,000 smolts (71,250 pounds) and 5,200,000 fingerlings (38,670 pounds) for on-station release.

Provide 6,810,000 eggs for ODFW programs.

Fall Chinook (Big Creek/Rogue stock)
Produce 800,000 smolts (41,670 pounds) for on-station release.

Provide eggs to produce 1,000,000 smolts for the Clatsop Economic Development Commission.

Coho
Produce 535,000 smolts (41,600 pounds) for on-station release.

Produce 60,000 smolts (4,000 pounds) for release into the Tualatin River.

Provide 10,000 eggs for ODFW programs.

Winter Steelhead
Produce 60,000 smolts (12,000 pounds) for on-station release.

Produce 63,000 fingerlings (7,875 pounds) for transfer to Klaskanine Hatchery.

Provide 690,000 eggs to ODFW programs.

Sea-run Cutthroat Trout
Produce 9,000 legal-sized fish (3,000 pounds) for release into Big Creek and the N. Fork Klaskanine River.

Produce 21,000 smolts (2,625 pounds) for transfer to other hatcheries.

Provide 15,000 eggs for Oregon's Salmon and Trout Enhancement Program.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices used at this facility. Because ODFW hatcheries are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

Big Creek Stock Fall Chinook: Adult fish arrive at the hatchery from late August through mid-October. Peak spawning occurs from late September to early October.

Rogue Stock Fall Chinook: Adults arrive at the hatchery from late August through mid-November. Peak spawning occurs from mid-October to mid-November.

Coho: Entry of adults into the subbasin occurs from early September to November. Spawning occurs from October to November with a peak from late-October to early November. Adults are collected at the hatchery.

Winter Steelhead: Adults arrive at the hatchery from late November through late February. Peak spawning occurs from mid-January through mid-February.

Sea-run Cutthroat: Adults arrive at the hatchery from late November through late February. Peak spawning occurs from mid-January through mid-February.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Bin Creek Stock Fall Chinook: A time- and size-at-release study is currently underway using the 10,900,000 smolts that are reared and acclimated at Big Creek Hatchery. This study involves the following on-station releases:

- Release 4,000,000 smolts in March at a size of 150 fish/pound
- Release 1,200,000 smolts in April at a size of 100 fish/pound
- Release 5,700,000 smolts in May at a size of 80 fish/pound

Portions of each group are coded-wire tagged.

Bin Creek/Rogue Stock Fall Chinook: Rear and acclimate 800,000 smolts. Release on-site according to the following schedule:

- 250,000 in July at 38 fish/pound or larger
- 300,000 in July at 19 fish/pound or larger
- 250,000 in August at 13 fish/pound or larger

All fish are fin-clipped and portions of the releases are also coded-wire tagged.

Coho: Two different size-at-release strategies are being tested. The first strategy involves rearing 355,000 acclimated smolts to a size of 15 fish/pound and releasing them on-station in June. The second release strategy involves rearing 180,000 acclimated smolts to a size of 10 fish/pound and also releasing them on-station in June. Portions of both releases are coded-wire tagged. Approximately 60,000 unmarked coho (15 fish/pound) are trucked for release into the Tualatin River.

Winter Steelhead: Rear and acclimate 60,000 smolts; release on-site in April at a size of 5 fish/pound. Mark all fish prior to release.

Sea-run Cutthroat: Rear and acclimate 9,000 smolts; release 5,000 into Big Creek and release the remaining 4,000 fish off-station.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the following interim practices are currently being used at Big Creek Hatchery:

Big Creek Stock Fall Chinook: Adults are collected throughout the run and spawned at a 1:3 male to female ratio. Any mainstem Columbia River tule stock is approved for broodstock use at this facility.

Big Creek/Rogue Stock Fall Chinook: The interim practice is to collect all returning adults and use only Big Creek/Rogue River stock for broodstock. Fish are spawned at a 1:2 male to female ratio, depending on run size.

Coho: All adults are collected at the trap and spawned at a 1:2 male to female spawning ratio. Any lower mainstem, Columbia River coho stock is acceptable for broodstock use.

Winter Steelhead: The winter steelhead stock is primarily from Big Creek. During years of low stock returns, however, adults (Big Creek stock) are also collected at Klaskanine Hatchery. Adults are spawned at a 1:1 male to female spawning ratio. The majority of the run is comprised of hatchery fish.

Sea-run Cutthroat: All adults are collected at the trap. Matrix spawning is used to maximize genetic diversity.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.

- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.

- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.

- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that cap occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Big Creek Hatchery

Health Monitoring

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each fish lot at the hatchery (bimonthly examinations from October through February). The sample includes a minimum of 10 moribund/dead fish (if available) and 4-6 live fish per lot.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each lot of adult fish. If prespawning mortality level is above normal, necropsies are conducted on dead adult fish for bacteria, parasites and other causes of death.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- One stock of adult fall chinook is injected with antibiotics for the control of bacterial diseases.

- At spawning, eggs are water-hardened in iodophor for disinfection.

- Juvenile fish are administered antibiotics orally, as needed, for the control of bacterial infections.

- Formalin is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as "low regulatory priority" are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor.

- All equipment (e.g., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.

- A separate mortality picker is kept for each pond or lot.

- Different lots of fish/eggs are physically segregated from each other by separate ponds, incubator units and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

- Total Suspended *Solids (TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable Solids* (W-measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- @-measured quarterly when settleable solids are measured.

- *Water Temperatures*-daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- *Dissolved* Oxygen *(DO)*—measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

Objective 6: Communicate effectively with other fish producers, managers and the public.

Coordination/Communication within ODFW

Annual Fish Production Meetings: ODFW conducts meetings throughout the state to set annual fish production goals for all public hatcheries in Oregon. These meetings involve the participation of ODFW research, management and fish culture staff as well as representatives from applicable federal agencies and tribes.

Record Keeping: The following records are kept at all ODFW hatcheries:

- *Egg and Fry* Report-records all egg and fry movements, treatments, etc.

- *Anadromous Adult Transaction Report*-details the collection and disposition of all adult fish.

- *Monthly Ponded* Report-updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).

- *Mark Recovery* Report-details sex, fish length and tag information from all marked adult fish that are captured.

- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish Loss and Treatment Report*-records disease problems and daily mortality.

- *Fish Liberation Reports*—details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap and Barrier* Log-records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly Progress* Report-document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

Hatcherv Management Information Svstem (HMIS): Computerized system to collect, report, summarize and analyze hatchery production data. This system is a tool to be used in production control at all hatchery management levels.

Coordinated Information Svstem (CIS): Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Interagency Coordination/Communication

Production Advisorv Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisorv Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatcherv Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Communication ‘with the General Public

Big Creek Hatchery receives approximately 5,000 visitors per year.

PERFORMANCE STANDARDS-BIG CREEK HATCHERY

Objective 1

Measures	Species	Hatchery Goal[1]	5-Year Average	Range	Constraints
Adult Capture	Big Cr. CHF	7,150	9,360[2]	4,524-20,510[2]	2,3,6,7,13
	Rogue CHF	700	516	237-684	2,3,6,7,13
	Coho	870	6,160	1,705-10,014	2,3,6,7,13
	W. Steelhead	480	527	412-739	2,3,6,7,13
	SR Cutthroat	180	216	171-287	2,3,6,7,13
Adult Prespawning Survival	Big Cr. CHF	95%	86.0%	79.0-96.0%	3,6,13
	Rogue CHF	95%	88.0%	73.0-97.8%	3,6,13
	Coho	95%	85.2%	77.0-91.6%	3,6,13
	W. Steelhead	95%	98.0%	96.0-100%	3,6,13
	SR Cutthroat	95%	97.5%	94.2-100%	3,6,13
Egg-take	Big *Cr.* CHF	16,084,000	15,957,000	12,281K-21,727K	3,7,8
	Rogue CHF	900,000	556,000	68K-1,039K	3,7,8
	Coho	800,000	3,263,000	886K-5,888K	3,7,8
	W. Steelhead	920,000	947,000	698K-2,207K	3,7,8
	SR Cutthroat	65,000	86,000	56K-124K	3,7,8
Green Egg-to-Fry Survival	Big Cr. CHF	95%	91.1%	88.6-92.7%	2,4,7
	Rogue CHF	95%	89.5%[3]	86.6-94.1%[3]	2,4,7
	Coho	95%	84.7%	62.5-97.1%	2,4,7
	W. Steelhead	95%	87.5%	78.3-93.0%	2,4,7
	SR Cutthroat	95%	68.7%	63.0-75.3%	2,4,7
Fry-to-Smolt Survival	Big Cr. CHF	95%	96.0%	93.3-99.0%	2,4,7,10,12-14,18
	Rogue CHF	95%	92.4%	87.8-98.9%	2,4,7,10,12-14
	Coho	95%	86.9%	82.0-91.4%	2,4,7,10,12-14,18
	W. Steelhead	95%	71.4%	43.9-91.2%	2,4,7,10,12-14,18
Fish Releases	Big Cr. CHF	10,900,000	6,913,525	5,357K-9,747K	1,2,7,10,11
	Rogue CHF	800,000	448,620	154K-786K	12,14,17
	Coho	595,000	673,600	581K-730K	12,14,17
	W. Steelhead	60,000	62,260	58K-67K	12,14,17
	SR Cutthroat	9,000	10,000	7K-17K	12,14,17

NA=Not applicable.
[1] Based on 1992 fish production goals.
[2] Includes jack counts.
[3] Four year average.

Objective 1 (continued)

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Egg Transfers	Big Cr. CHF	6,810,000	--[4]	--[4]	7,9
	Rogue CHF	0	--[4]	--[4]	7
	Coho	20,000	--[4]	--[4]	7
	W. Steelhead	689,850	--[4]	--[4]	7
	SR Cutthroat	15,000	--[4]	--[4]	7
Fish Transfers	Big Cr. CHF	0	--[4]	--[4]	7,12
	Rogue CHF	0	--[4]	--[4]	7,12
	Coho	0	--[4]	--[4]	7,12
	W. Steelhead	63,000	--[4]	--[4]	7,12
	SR Cutthroat	21,000	--[4]	--[4]	7,12
Adults Passed Upstream	Big Cr. CHF	NA	NA	NA	3,20,21
	Rogue CHF	NA	NA	NA	3,20,21
	Coho	NA	NA	NA	3,20,21
	W. Steelhead	NA	NA	NA	3,20,21
	SR Cutthroat	NA	NA	NA	3,20,21
Percent Survival	Big Cr. CHF	NA	0.17%[5]	Unknown	8
	Rogue CHF	NA	3.02%	2.04-4.74%	
	Coho	NA	3.95%	2.21-8.10%	
	W. Steelhead	NA	Unknown	unknown	
	SR Cutthroat	NA	Unknown	Unknown	

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Big Cr. CHF	80	78.1	71.8-87.1	12,,5,7,10-15
	(fingerling)	100-150	141	136-176	1,,,,,2 5 7 10-15
	Rogue CHF	13-38	19.6	15.0-28.5	,,,,
	Coho	10-15	13.4	12.0-14.4	125710-15 ,,,,
	W. Steelhead	5-8	4.9	4.8-5.0	12 5 7 IO-15
	SR Cutthroat	3	3.2	2.8-3.5	1,2,5,7,10-15
Acclimation	Big Cr. CHF	Yes	Yes	--	
	Rogue CHF	Yes	Yes	--	
	Coho	Yes	Yes	--	
	W. Steelhead	Yes	Yes	--	
	SR Cutthroat	Yes	Yes	--	

[4] Not estimated for this report.
[5] Does not include data from all five years.

Obiectrve 3

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Big Cr. CHF	Yes	Yes	--	
	Rogue CHF	Yes	Yes	--	
	Coho	Yes	Yes	--	
	W. Steelhead	Yes	Yes	--	
	SR Cutthroat	Yes	Yes	--	
Spawning Pop. >500	Big Cr. CHF	Yes	Yes	--	
	Rogue CHF	Yes	No	--	
	Coho	Yes	Yes	--	
	W. Steelhead	Yes	Yes	--	
	SR Cutthroat	No	No	--	
Spawning Ratio Male:Female	Big Cr. CHF	1:3	Yes	--	
	Rogue CHF	1:2	NA	--	
	Coho	1:2	Yes	--	
	W. Steelhead	1:1	Yes	--	
	SR Cutthroat	Matrix	Matrix	--	

Obiecfive 4

Measures	Species	Hatcherv Goal	5-Year Averaee	Range	Constraints
Adhere to Disease Policy	Big Cr. CHF	Yes	Yes	--	
	Rogue CHF	Yes	NA	--	
	Coho	Yes	Yes	--	
	W. Steelhead	Yes	Yes	--	
	SR Cutthroat	Yes	Yes	--	

Ob'ective 5

Measures	Species	Ha tcherv Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes	--	2,15,16
TSS Max Effluent	All	<15 mg/l	Yes	--	2,15,16
SS Effluent	All	co.1 ml/l	Yes	--	2,15
SS Max Effluent	All	<0.2 ml/l	Yes	--	2,15
Downstream Temp	All	Varies	Yes	--	
PH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	Yes	--	

Objective 6

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	7

Cons train ts/Commen ts—Big Creek Hatchery

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. The current water delivery system limits the amount of water to the rearing pond which reduces fish rearing potential.

2. Logging in the watershed has caused water quality concerns (siltation and water turbidity) at the hatchery. The existing sediment settling pond is too small and does not keep sediment out of the rearing ponds during roily water conditions. During high flows, siltation in the rearing ponds is a major problem and potential cause of fish mortality. Sedimentation in egg incubation units is a potential detriment to egg-to-fry survival

3. The adult holding and spawning area is inefficient and inadequate for handling the several species and large numbers of adult fish that return to this facility. Adult fish must be handled several times resulting in some stress-related mortality.

4. Pathogen-free water is needed, especially for egg development and early rearing.

5. Need heated or chilled water to improve egg incubation or early rearing conditions to better meet management needs.

6. Periodic low instream flows for returning adults and holding.

7. Office facilities are inadequate for conducting hatchery business.

8. At times, there are insufficient numbers of returning broodstock to make the fall chinook program.

9. Antiquated and inadequate egg incubation facilities prevent the hatchery from meeting current program goals.

10. Oxygen supplementation is needed to significantly increase fish production, especially during low water flow periods.

11. Design and condition of old ponds makes pond management both labor and time intensive and difficult to clean.

12. Need avian predator control measures for all ponds.

13. Surveillance devices are needed for the hatchery building and ponds. A security gate would be of some use.

14. Battery 2 ponds (13-21) are poorly designed and need more water supply capacity.

15. Pollution abatement facilities, as installed, are inadequate and require extra work and time to clean the ponds (i.e., pond drains are too small, lift station needs frequent attention).

16. Need equipment to conduct the suspended solids test.

17. A fingerling release channel, that is designed for fish passage, is needed.

18. Water intake design could be improved to facilitate cleaning.

19. Lack of funding for the past decade has created serious deferred maintenance and equipment backlog.

20. The fishway at the water intake diversion dam requires improvements to efficiently pass adults upstream.

21. The present fish barrier lacks an operable fishway.

Bonneville Hatchery

INTRODUCTION

Bonneville Hatchery is located just west of Cascade Locks, Oregon at Bonneville Dam on the Columbia River. Site elevation is approximately 46 feet above sea level.

The rearing facilities include 30 raceways, 28 Burrows or converted Burrows ponds, and 3 adult holding ponds (also used for fish rearing). The condition of the rearing facilities ranges from fair to good.

The hatchery water supply is obtained from two sources: Tanner Creek and wells. Water from Tanner Creek is supplied by gravity; however, it sometimes freezes in December and January so it is not a reliable water supply during those months. Water is reused through the adult capture and holding system. The facility is staffed with 13 FTE's .

PURPOSE

Bonneville Hatchery was constructed in 1909 and was originally funded by the state of Oregon. In 1957, the facility was remodeled and expanded as part of the Columbia River Fisheries Development Program (Mitchell Act)-a program to enhance declining fish runs in the Columbia River Basin. The hatchery underwent another renovation in 1974 as part of the U.S. Army Corps of Engineers' (COE) mitigation of fish losses from the construction of the John Day Dam. The hatchery currently receives funding from both the National Marine Fisheries Service (NMFS) and COE.

Bonneville Hatchery is Oregon Department of Fish and Wildlife's largest hatchery facility and has a diverse fish production program. It is used for adult collection, egg incubation and rearing of two fall chinook stocks-lower river tules and upriver brights (URB). It is also used for rearing of spring chinook and coho (spawning and egg incubation usually occurs at Cascade Hatchery). The hatchery has excellent egg and fingerling quarantine facilities which are often used to assist other hatchery programs in the basin.

GOALS

Tule Fall Chinook and Coho: Hatchery goal associated with the Mitchell Act funding is to produce lower river fall chinook and coho that will contribute to NE Pacific and Columbia River Basin commercial and sport fisheries.

URB Fall Chinook: The COE's mitigation agreement is to produce no more than 263,000 pounds of juvenile fall chinook, a production level equivalent to the loss of

15,000 wild fall chinook spawners caused by John Day Dam. The remaining mitigation for John Day Dam (production for 15,000 fall chinook spawners) is achieved at Spring Creek National Fish Hatchery.

OBJECTIVES

Objective 1: Hatchery Production

URB Fall Chinook
Provide 2,900,000 eggs to Umatilla Hatchery.

Produce 3,030,000 fingerlings (37,875 pounds) for release into the Columbia River.

Produce 5,325,000 smolts and fingerlings (112,750 pounds) for on-station release.

Produce 2,500,000 fingerlings (41,670 pounds) for the NMFS Fish By-Pass Study at Bonneville Dam.

Produce 225,000 smolts (28,125 pounds) for release into the Umatilla River.

Tule Fall Chinook
Produce 10,200,000 fry (34,000 pounds) for transfer to Stayton Ponds.

Produce 8,000,000 fingerlings (123,080 pounds) for on-station release.

Produce 2,000,000 fingerlings (40,000 pounds) for release into Tanner Creek from the Stayton Ponds.

Spring Chinook
Produce 350,000 Carson stock smolts (32,500 pounds) for release into the Umatilla River.

Produce 158,000 Deschutes stock fry (1,200 pounds) for transfer to Oxbow Hatchery.

Produce 125,000 Deschutes stock smolts (15,625 pounds) for release into the West Fork Hood River.

Coho
Produce 2,000,000 smolts for on-station release.

<u>Summer Steelhead</u>
Incubate eggs from IHNV-positive parents as backup to the Leaburg and South Santiam steelhead programs.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices associated with anadromous fish production at this facility. Because ODFW hatcheries are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

URB Fall Chinook: Adults arrive at the hatchery between August and November. Peak spawning occurs during November.

Tule Fall Chinook: Adults arrive at the hatchery between August and early October. Peak spawning occurs during late September.

Spring; Chinook: No adults are collected at Bonneville Hatchery.

Coho: Adult coho needed to fulfill egg-take goals are collected and transferred to Cascade Hatchery for spawning. Coho juveniles are later transferred back to Bonneville Hatchery for rearing.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

URB Fall Chinook

- Rear 3,030,000 fish to a size of 80 fish / pound and release off-station (nonacclimated) into the Columbia River in June. A portion of the release is coded-wire tagged.

- Rear 3,735,000 fish to a size of 40 fish / pound and release on-station into Tanner Creek in August. (Some fish may be released into the Umatilla River to assist with development of the Umatilla River program.) A portion of the release is coded-wire tagged.

- Rear 225,000 fish to a size of 8 fish / pound and release off-station into the Umatilla River in March. All fish are coded-wire tagged and fin clipped. The 1992 releases were not acclimated.

- Rear 2,500,000 fish to a size of 60 fish / pound and release into the Columbia River as part of the NMFS fish by-pass study. The time of release and marking have not yet been established.

Tule Fall Chinook

- Rear 8,000,000 fish to a size of 65 fish / pound and release on-station in late May or early June. A portion of the release is coded-wire tagged.

- Transfer 2,000,000 fish from Stayton Ponds at a size of 50 fish / pound; acclimate for ten days at Bonneville Hatchery; release on-station into Tanner Creek in June. A portion of the release is coded-wire tagged. (See South Santiam Hatchery Plan for additional information.)

Carson Stock Spring Chinook

- Rear 150,000 fish to a size of 12 fish / pound and release off-station into the Umatilla River System in November. All of the fish are either coded-wire tagged or fin clipped. Approximately 75,000 fish are acclimated for two weeks at Bonifer Pond prior to release. The remaining 75,000 are released nonacclimated into Meecham Creek.

- Rear 200,000 fish to a size of 10 fish / pound and release nonacclimated into the Umatilla River in mid-March. All of the fish are either a coded-wire tagged or fin clipped.

Deschutes Stock Spring Chinook: Rear 125,000 fish to a size of 8 fish / pound and release nonacclimated into the West Fork Hood River in April. All fish are coded-wire tagged.

Coho: 2,000,000 fish to a size of 13 fish / pound and release on-station into Tanner Creek. Approximately 1,175,000 fish are released in April and the remaining 825,000 are released in June. A portion of each release is coded-wire tagged. These fish are part of a time-of-release study.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the following interim practices are currently being used at Bonneville Hatchery:

URB Fall Chinook: Adults are collected throughout the run and spawned at 1:2 or 1:3 male to female spawning ratio depending upon run size (i.e., a 1:2 spawning ratio is used if the run size is between 600-1,000 spawners). Any mainstem Columbia River URB stock is approved for broodstock use at this facility.

Tule Fall Chinook: Adults are collected throughout the run and spawned at 1:2 or 1:3 male to female spawning ratio depending upon run size (i.e., a 1:2 spawning ratio is used if the run size is between 600-1,000 spawners). Any mainstem Columbia River tule stock is approved for broodstock use at this facility.

Spring Chinook: No adults are spawned at Bonneville Hatchery (see Umatilla and Round Butte hatchery plans).

Coho: No adults are spawned at Bonneville Hatchery (see Cascade Hatchery Plan).

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-Ail Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.

- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.

- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.

- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Bonneville Hatchery

<u>Health Monitoring</u>

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each fish lot at the hatchery. More frequent monitoring is necessary from April through August. Monitoring samples includes a minimum of 10 moribund/dead fish (if available) and 4-6 live fish per lot.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each salmon lot. If prespawning mortality is above normal, necropsies are conducted on dead adult fish for bacteria, parasites and other causes of death.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- Adult fall chinook are injected with antibiotics for the control of bacterial diseases.

- At spawning, eggs are water-hardened in iodophor for disinfection. A second iodophor disinfection is given to eggs which are incubated in mass in the deep troughs. This treatment is given after the eggs are shocked and is administered as a flush treatment.

- Juvenile fish are administered antibiotics orally as needed for the control of bacterial infections and for prevention of diseases.

- Formalin is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as "low regulatory priority" are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor.

- All equipment (e.g., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.

- Different lots of fish/eggs are physically segregated from each other by separate ponds, incubator units and water supplies. Some of the incubators have sheet-metal splash guards to decrease cross contamination between incubator stacks.

- Fish transport trucks are disinfected between the hauling of different fish lots.

- From November through June, effluents from raceway batteries A and B are diverted past the adult holding ponds where yearling coho are reared.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODPW hatcheries:

- *Total* Suspended Solids *(TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable Solids (SS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- @-measured quarterly when settleable solids are measured.

- *Water Temperatures*-daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- *Dissolved Oxygen (DO)*—measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*—maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

Objective 6: Communicate effectively with other fish producers, managers and the public.

Coordination/Communication within ODFW

Annual Fish Production Meetings: ODFW conducts meetings throughout the state to set annual fish production goals for all public hatcheries in Oregon. These meetings involve the participation of ODFW research, management and fish culture staff as well as representatives from applicable federal agencies and tribes.

Record Keeping: The following records are kept at all ODFW hatcheries:

- *Egg and Fry* Reporf-records all egg and fry movements, treatments, etc.

- *Anadromous Adult Transaction Report*-details the collection and disposition of all adult fish.

- *Monthly Ponded Report*-updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).

- *Mark Recovery Report*-details sex, fish length and tag information from all marked adult fish that are captured.

- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish Loss and Treatment Report*-records disease problems and daily mortality.

- *Fish Liberation Reports*—details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap and Barrier Log*—records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly Progress Report*-document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

Hatchery Management Information System (HMIS): Computerized system to collect, report, summarize and analyze hatchery production data. This system is a tool to be used in production control at all hatchery management levels.

Coordinated Information Svstem (CIS): Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Interagency Coordination/Communication

Production Advisorv Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisorv Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the U.S. *v.* Oregon *Agreement.* Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, US. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Communication with the General Public

Bonneville Hatchery receives approximately 1 million visitors each year.

PERFORMANCE STANDARDS—BONNEVILLE HATCHERY

Objective 1

Measures	Species	Hatchery Goal[1]	5-Year Average	Range	Constraints
Adult Capture	Tule CHF	5,687	13,429	5,33630,674	6,10
	URB CHF	6,656	9,353	4,700-13,938	
	Coho	NA	NA	NA	
	Spr. Chinook	NA	NA	NA	
Adult Prespawning Survival	Tule CHF	95%	86.9%	82-91%	2,15
	URB CHF	95%	73.6%	70-82%	2,15
	Coho	NA	NA	NA	
	Spr. Chinook	NA	NA	NA	
Egg-take	Tule CHF	19,000,000	16,510,000	10,192K-21,704K	11
	URB CHF	17,500,000	12,006,149	6,721K-19,707K	11
	Coho	NA	NA	NA	
	Spr. Chinook	NA	NA	NA	
Green Egg-to-Fry Survival	Tule CHF	95%	90.9%	89.9-91.2%	11
	URB CHF	95%	86.9%	80.8-93.6%	11
	Coho	NA	NA	NA	
	Spr. Chinook	NA	NA	NA	
Fry-to-Smolt Survival	Tule CHF	95%	94.6%	89.7-99.3%	2,8,9,14
	URB CHF	95%	84.5%	63.6-97.6%	2,8,9,14
	Coho	95%	98.4%	96.1-99.9%	
	Spr. Chinook	NA	NA	NA	
Fish Releases	Tule CHF	10,000	7,110,120	8,756K-9,844K	8
	URB CHF	11,080,000	5,612,725	2,264K-9,119K	8
	URB (Umatilla)		970,990	821K-3,228K	
	Coho	2,000,000	1,768,625	1,650-1,884K	
	Spr. Chinook	475,000	446,500	189K-588K	
Egg Transfers	Tule CHF	0	--[2]	--[2]	
	URB CHF	2,900,000	--[2]	--[2]	
	Coho	0	--[2]	--[2]	
	Spr. Chinook	0	--[2]	--[2]	
Fish Transfers	Tule CHF	10,200,000	--[2]	--[2]	
	URB CHF	0	--[2]	--[2]	
	Coho	0	--[2]	--[2]	
	Spr. Chinook	158,000	--[2]	--[2]	

NA=Not applicable.
[1]Based on 1991 fish production goals.
[2]Not estimated for this report.

Ob'ective 1 (Continued)

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adults Passed Upstream	Tule CHF	NA	NA	NA	
	URB CHF	NA	NA	NA	
	Coho	NA	NA	NA	
	Spr. Chinook	NA	NA	NA	
Percent Survival	Tule CHF	NA	0.86%[3]	0.03-2.72%	
	URB CHF	NA	2.04%	0.97-3.49%	
	URB (Umatilla)	NA	1.30%	0.08-2.64%	
	Coho	NA	3.37%	1-66-6.91 %	
	Spr. Chinook	NA	0.15%	0.08-0.22%	

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Tule CHF	65	79.2	61-112	9,13
	URB CHF	8.0-80.0	35.6	14.4-51.1	9,13
	URB (Umatil'a)	8.0	11.4	7.8-12.6	
	Coho	13.0	13.9	12.8-15.2	
	Spr. Chinook	8.0-12.0	10.8	9.84-11.7	
Acclimation	Tule CHF	Yes	Yes	--	15
	URB CHF	Partial	Partial	--	15
	Coho	Yes	Yes	--	
	Spr. Chinook	Partial	Partial	—	

[3] Only two years of data for Carson stock and 5 years of data for Lookingglass stock.

Ob'ective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Tule CHF	Yes	Yes	--	
	URB CHF	Yes	Yes	--	6,7,10
	Coho	Yes	Yes	--	
	Spr. Chinook	NA	NA	--	
Spawning Pop. >500	Tule CHF	Yes	Yes	--	
	URB CHF	Yes	Yes	--	
	Coho	NA	NA	--	
	Spr. Chinook	NA	NA	--	
Spawning Ratio Male:Female	Tule CHF	1:3	Yes	--	
	URB CHF	1:3	Yes	--	
	Coho	NA	NA	--	
	Spr. Chinook	NA	NA	--	

Objective 4

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	All	Yes	Yes	--	

Objective 5

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes	--	
TSS Max Effluent	All	<15 mg/l	Yes	--	
SS Effluent	All	co.1 ml/l	Yes	--	
SS Max Effluent	All	<0.2 ml/l	Yes	--	
Downstream Temp	All	Varies	Yes	--	
PH	All	6.0-9.0	Yes		
Continuous Monitoring of Other Parameters	All	Yes	Yes		

Objective 6

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constraints/Comments-Bonneville Hatchery

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. Tanner Creek cannot be used as a water source during the winter and late summer.

2. Fungal infections and bacterial gill disease (BGD) on adults have been recurring problems.

3. Cold water disease is a chronic problem and bacterial epizootics also cause concern.

4. The hatchery has had major disease problems including infectious hematopoietic necrosis (IHN) and erythrocytic inclusion body syndrome (EIBS).

5. Poor survival rates related due to excess handling of adult chinook during transport and spawning operations.

6. The adult holding pond has poor flow patterns and requires the use of reuse water. It is also poorly designed.

7. Lack of funding for the past decade has created a serious deferred maintenance and equipment backlog.

8. Predation in the reservoirs during downstream smolt migration causes fish losses.

9. Avian/furbearer predation control is needed at the hatchery.

10. Spawning areas need modifications and improvements.

11. Need heated or chilled water to improve egg incubation or early rearing conditions.

12. Need better water intake screens to meet statewide screening criteria.

13. Modification or new development of rearing ponds is needed to meet fish management needs.

14. Need the ability to mass mark the hatchery fish production.

15. Additional water is needed to fully utilize the existing facility.

Cascade Hatchery

INTRODUCTION

Cascade Hatchery is located along Eagle Creek near the town of Cascade Locks, Oregon. Site elevation is 100 feet above sea level. It is staffed with 6.5 FTE's.

Facilities include 30 raceways, 1 adult holding pond and 40 troughs. These facilities are in fair to poor condition.

Water is supplied by gravity flow from Eagle Creek. The total water right is 20,197 gpm and the average water usage is about 7,117 gpm.

PURPOSE

Cascade Hatchery was authorized under the Mitchell Act and began operating in 1959 as part of the Columbia River Fisheries Development Program-a program to enhance declining fish runs in the Columbia River Basin. The facility is used for adult collection, egg incubation and rearing of coho. It is also used for adult collection of fall chinook.

GOALS

Produce coho to help meet the goals of the Columbia River Fish Management Plan (U.S. *v. Oregon Agreement).*

OBJECTIVES

Objective 1: Hatchery Production

Produce 700,000 coho smolts (46,665 pounds) for release into the Yakima River System.

Produce 1,000,000 coho smolts (66,670 pounds) for release into the Umatilla River System.

Provide 1,100,000 coho eggs to Oxbow Hatchery.

Produce 2,100,000 coho fingerlings (14,000 pounds) for transfer to Upper Herman Creek Ponds (Oxbow Hatchery).

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices used at this facility. Because ODFW hatcheries are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

Coho: Adult coho (Eagle Creek/Tanner Creek stock) return to Eagle Creek from late September to mid-November. Spawning occurs in October and November with a peak in November. Few fish are collected at the hatchery. Most adult coho are transferred from Bonneville Hatchery and are spawned along with the hatchery-returning adults. There is some adult salmon escapement above the hatchery.

Fall Chinook: Adult fall chinook are also occasionally collected at this facility. These fish are used as a backup for other programs.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Coho: Rear 1,700,000 fish to size of 15 fish/pound. Directly release 700,000 smolts into Washington's Yakima River System in early March and 1,000,000 smolts into the

Umatilla River System in mid-April. The Yakima River releases are tentatively scheduled for acclimation beginning with the 1993 smolt releases,

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the interim practice at Cascade Hatchery is to collect adult coho throughout the entire run and spawn at a 1:1 or 1:2 male to female ratio depending upon annual coho run size, The Eagle Creek/Tanner Creek stock is the primary broodstock used for coho production at this facility. Sandy, Bonneville and Klaskanine coho stocks are used if there inadequate hatchery returns.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-Ail Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults. to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.

- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.

- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.

- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Cascade Hatchery

Health Monitoring

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each fish lot at the hatchery. The sample includes a minimum of 10 moribund/dead fish (if available) and 4-6 live fish per lot.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each salmon lot. If prespawning mortality level is above normal, necropsies are conducted on dead adult fish to identify bacteria, parasites and other causes of death.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor for disinfection.

- Juvenile fish are administered antibiotics orally, as needed, for the control of bacterial infections.

- Formalin is dispensed into water for control of parasites and fungus on coho salmon eggs and juveniles. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as "low regulatory priority" are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor.

- All equipment (e.g., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.

- Different lots of fish/eggs are physically segregated from each other by separate ponds, incubator units and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

- Total Suspended Solids *(TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable* Solids (W-measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- @-measured quarterly when settleable solids are measured.

- *Wa t e r Temperatures*—daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- Dissolved Oxygen (DO)-measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

Objective 6: Communicate effectively with other fish producers, managers and the public.

Coordination/Communication within ODFW

Annual Fish Production Meetings: ODFW conducts meetings throughout the state to set annual fish production goals for all public hatcheries in Oregon. These meetings involve the participation of ODFW research, management and fish culture staff as well as representatives from applicable federal agencies and tribes.

Record Keeping: The following records are kept at all ODFW hatcheries:

- *Egg and Fry Report*-records all egg and fry movements, treatments, etc.

- *Anadromous Adult Transaction Report*-details the collection and disposition of all adult fish.

- *Monthly Ponded Report*-updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).

- *Mark Recovery Report*-details sex, fish length and tag information from all marked adult fish that are captured.

- *Length Frequency Record*-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish Loss and Treatment Report*-records disease problems and daily mortality.

- *Fish Liberation Reports*—details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap and Barrier* Log-records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly Progress Report*—document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

Hatchery Management Information System (HMIS): Computerized system to collect, report, summarize and analyze hatchery production data. This system is a tool to be used in production control at all hatchery management levels.

Coordinated Information System (CIS): Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, US. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Communication with the Genera/ Public

Cascade Hatchery receives approximately 5,000 visitors per year.

PERFORMANCE STANDARDS-CASCADE HATCHERY

Objective I

Measures	Species	Hatchery Goal[1]	5-Year Average	Range	Constraints
Adult Capture	Coho	5,910	1,838	823-3,689	1,9
Adult Prespawning Survival	Coho	95%	64.7%	52.7-73.9%	1,4,9
Egg-take	Coho	4,900,000	5,601,000	4,438K-6,673K	2,5
Green Egg-to-Fry Survival	Coho	95%	85.9%	76.3-90.1%	2,5
Fry-to-Smolt Survival	Coho	95%	83.8%	67.0-98.9%	
Fish Releases	Coho	1,700,000	1,538,215	1,139K-1,720K	7,8,9
Egg Transfers	Coho	1,100,000	--[2]	--[2]	
Fish Transfers	Coho	2,100,000	--[2]	--[2]	7,8
Adults Passed Upstream	Coho	NA	NA	NA	1
Percent Survival	Coho Wmatilla R.)	NA	2.40%[3]	0.88-4.15%	9
	Coho (Yakima R.)	NA	1.49%[4]	0.91-1.98%	9

NA=Not applicable.
[1] Based on 1991 fish production goals.
[2] Not estimated for this report.
[3] Based on four years of data.
[4] Based on three years of data.

Objective 2

Measures	Species	Hatcher-v Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Coho	15.0	15.9	14.0-17.9	2
Acclimation	Coho	No	No	--	

Objective 3

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Coho	Yes	Yes	--	1,4,9
Spawning Pop. >500	Coho	Yes	Yes	--	
Spawning Ratio Male:Female	Coho	1:1	Yes		

Objective 4

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	Coho	Yes	Yes	--	

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes	--	
TSS Max Effluent	All	<15 mg/l	Yes	--	
SS Effluent	All	<0.1 ml/l	Yes	--	
SS Max Effluent	All	<0.2 ml/l	Yes	--	
Downstream Temp	All	Varies	Yes	--	
PH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	Yes	--	

Objective 6

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constraints/Comments-Cascade Hatchery

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. A new fish weir is needed for trapping adults.

2. Extremely cold water temperatures during egg incubation and early rearing slows egg development and fish growth. Capabilities for heating water are needed.

3. The water intake occasionally ices-up which restricts the water supply. Slush ice can be delivered to the raceways where it can displace water and cause severe fish losses.

4. The adult holding pond is an unusual shape and there is no easy way to keep adults separated.

5. A new water supply box installed at higher elevation is needed for proper operation of the egg incubation system.

6. Incubators are needed to replace the troughs. This would provide extra room in the hatchery house to install Canadian-style troughs. Coho fry could then be started in these troughs rather than the rearing ponds.

7. Avian predator protection measures are needed.

8. Widening of the east pond avenue is needed to provide trucks with better access for liberating fish.

9. Predation in the reservoirs during out-migration reduces fish survival.

10. Lack of funding over the past decade has created a serious deferred maintenance and equipment backlog.

Clackamas Hatchery and Satellites

INTRODUCTION

Clackamas Hatchery is located on the Clackamas River, approximately 5 miles west of Estacada, Oregon. Site elevation is 313 feet above sea level. The hatchery is operated with 4.5 FTE's.

Rearing units are in good condition and consist of 3 rearing ponds, 10 raceways and 2 adult holding ponds. The adult holding ponds are not used to rear juveniles.

Water rights total 44,354 gpm from the Clackamas River and a well. The Clackamas River provides the majority of water used for hatchery operations. All ponds and raceways receive single-pass water.

PURPOSE

Clackamas Hatchery began operation in 1979 and is operated from four funding sources: Oregon Department of Fish and Wildlife (ODFW), National Marine Fisheries Service (NMFS), Portland General Electric (PGE) and the City of Portland. The NMFS funding is part of the Columbia River Fisheries Development Program (Mitchell Act)-a program to enhance declining fish runs in the Columbia River Basin. PGE and the City of Portland provide funding as mitigation for fishery losses caused by hydroelectric development in the Sandy and Clackamas river systems.

Clackamas Hatchery is used for adult collection, egg incubation and rearing of spring chinook. It is also used for rearing of winter steelhead (spawning occurs at Eagle Creek National Fish Hatchery). An experimental net pen rearing program for summer steelhead destined for the Clackamas River is also being conduced on the N. Fork Clackamas Reservoir. This is operated as a satellite to Clackamas Hatchery.

GOALS

The PGE mitigation agreement calls for the annual production of no more than 37,209 pounds of salmon and steelhead. The City of Portland mitigation goal is for no more than 32,000 pounds of spring chinook and steelhead. The remaining hatchery production is to contribute to the Columbia River sport and commercial fisheries, and to meet subbasin fishery management goals.

OBJECTIVES

Objective 1: Hatchery Production

Spring Chinook

Provide 1,871,000 eggs for ODFW hatcheries and the Salmon and Trout Enhancement Program.

Produce 976,670 smolts (98,880 pounds) for on-station release.

Produce 460,000 smolts (51,110 pounds) for release into the Sandy River.

Produce 50,000 smolts (5,000 pounds) for release into the Clackamas River from the Oregon City Lagoon net pen.

Produce 30,000 smolts (3,000 pounds) for release into the Willamette River from the River Place Marina experimental net pens.

Winter Steelhead

Produce 30,000 smolts (5,000 pounds) for release into the Clackamas River.

Produce 30,000 smolts (5,000 pounds) for release into the Sandy River.

Rear 40,000 fry (225 pounds) for transfer to Oak Springs Hatchery (wild Clackamas River stock).

Summer Steelhead

Produce 40,000 smolts (8,000 pounds) for release into the Clackamas River from the N. Fork Clackamas Reservoir net pens.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources,

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices used at this facility. Because ODFW hatcheries are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

Spring Chinook: Adults arrive in the Clackamas River from May through September. Peak spawning occurs in late September. Adults are collected at the hatchery.

Winter Steelhead: Wild steelhead adults arrive in the Clackamas River from February through May, with peak spawning in May. These adults are collected at the Faraday Dam fish collection facility and transported to Clackamas Hatchery for spawning.

Summer Steelhead: No adults are collected at this facility (see South Santiam Hatchery Plan for additional information).

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

<u>Spring: Chinook</u>

- Rear 306,700 fish to a size of 11 fish/pound and release on-station in mid-August. A portion of the release is coded-wire tagged.
- Rear 310,000 fish to a size of 10 fish/pound and release on-station in mid-September. A portion of the release is coded-wire tagged.
- Rear 360,000 fish to a size of 9 fish/pound and release on-station in mid-March. A portion of the release is coded-wire tagged.
- Rear 460,000 fish to a size of 9 fish/pound and release into the Sandy River in mid-March.
- Rear 50,000 fish to a size of 10 fish/pound; transfer to the Oregon City Lagoon experimental net pens in late February; acclimate for three weeks and release directly into the Clackamas River.
- Rear 30,000 fish to a size of 10 fish/pound; transfer to the River Place Marina experimental net pens; acclimate for two weeks and release into the Willamette River in late February.

<u>Winter Steelhead</u>: Rear 60,000 fish to a size of 6 fish/pound; make off-station releases into the Clackamas River (30,000) and Sandy River (30,000) in mid-April. All steelhead are marked (fin clipped) prior to release. The Sandy River releases are not acclimated.

<u>Summer Steelhead</u>: Transfer 40,000 fish from Oak Springs Hatchery to the N. Fork Reservoir net pens in November; rear to a size of 5 fish/pound; release into the Clackamas River in April. Approximately one-third are released into the reservoir, the rest are released above the reservoir. All fish are marked (fin clipped) prior to release. This is an experimental program.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock *Selection and Spawning*

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the following interim practices are currently being used at Clackamas Hatchery:

Spring Chinook: Adults are collected throughout the entire run and spawned at a 1:2 male to female ratio. The Willamette River spring chinook is the accepted broodstock.

Winter Steelhead: Adults are collected throughout the run and spawned at a 1:1 male to female ratio. Only wild Clackamas River winter steelhead are used for spawning.

Summer Steelhead: No spawning is conducted at this facility (see South Santiam Hatchery Plan for further information).

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

<u>Disease Control</u> (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.

- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.

- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

- Conduct applied research on new and existing techniques to control disease epizootics.

<u>Disease Prevention</u> (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.

- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Clackamas Hatchery

<u>Health Monitoring</u>

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each fish lot at the hatchery. The sample includes a minimum of 10 moribund/dead fish (if available) and 4-6 live fish per lot.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each salmon lot. If prespawning mortality level is above normal, necropsies are conducted on dead adult fish for bacteria, parasites and other causes of death.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

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Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- Adult spring chinook are injected with antibiotics for the control of bacterial diseases.

- At spawning, eggs are water-hardened in iodophor for disinfection.

- Juvenile fish are administered antibiotics orally as needed for the control of bacterial infections.

- Formalin is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as "low regulatory priority" are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor.

- All equipment (e.g., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.

- Different lots of fish/eggs are physically segregated from each other by separate ponds, incubator units and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

- Ozone-disinfected water is provided for incubation and early rearing of winter steelhead to be shipped to Oak Springs Hatchery.

- Spring chinook juveniles are not held at Clackamas Hatchery from mid-September to early November to avoid exposure to IHN virus in the water supply.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

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- *Settleable Solids (SS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *pH*—measured quarterly when settleable solids are measured.

- *Water Temperatures*-daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- Dissolved Oxygen *(DO)*—measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

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- Mark *Recovery Report*-details sex, fish length and tag information from all marked adult fish that are captured.

- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish Loss and Treatment Report*-records disease problems and daily mortality.

- *Fish Liberation Reports*—details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap and Barrier* Log-records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly Progress Report*-document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

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In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Other: A meeting which includes staff from Portland General Electric, City of Portland and ODFW is held each year to discuss hatchery operations.

Communication with the General Public

Clackamas Hatchery receives approximately 20,000 visitors per year.

PERFORMANCE STANDARDS-CLACKAMAS HATCHERY AND SATELLITES

Objective 1

Measures	Species	Hatcher-v Goal[1]	5-Year Average	Range	Constraints
Adult Capture	Spr. Chinook	750	1,549	865-2,776	1
	W. Steelhead	40	43[2]	NA	
	S. Steelhead	NA	NA	NA	
Adult Prespawning Survival	Spr. Chinook	95%	84.2%	70-93%	4,5
	W. Steelhead	95%	85.0%	NA	
	S. Steelhead	NA	NA	NA	
Egg-take	Spr. Chinook	1,961,000	1,992,000	1,411K-2,493K	
	W. Steelhead	52,000	62,000[2]	NA	
	S. Steelhead	NA	NA	NA	
Green Egg-to-Fry Survival	Spr. Chinook	95%	--[3]	--[3]	
	W. Steelhead	95%	94.2%[2]	--[3]	
	S. Steelhead	NA	NA	NA	
Fry- to-Smol t Survival	Spr. Chinook	95%	96.4%	91.5-99.8%	1,2,3,4,5,7
	W. Steelhead	95%	84.5%	80.6-93.3%	1,2,3,4,5,7
	S. Steelhead	NA	NA	NA	
Fish Releases	Spr. Chinook	1516,670	1,454,990	939K-1,750K	6,7
	W. Steelhead	60,000	64,460	59K-70K	6,8
	S. Steelhead	40,000	NA	NA	
Egg Transfers	Spr. Chinook	1,871,000	--[3]	--[3]	
	W. Steelhead	0	--[3]	--[3]	
	S. Steelhead	0	--[3]	--[3]	
Fish Transfers	Spr. Chinook	0	--[3]	--[3]	
	W. Steelhead	40,000	--[3]	--[3]	
	S. Steelhead	0	--[3]	--[3]	
Adults Passed[4] Upstream	Spr. Chinook	NA	NA	NA	
	W. Steelhead	NA	NA	NA	
	S. Steelhead	NA	NA	NA	
Percent Survival	Spr. Chinook	NA	0.23%[5]	0.07-0.36%	
	W. Steelhead	NA	Unknown	Unknown	
	S. Steelhead	NA	NA	NA	

NA=Not applicable.
[1] Based on 1991 fish production goals.
[2] One year of data.
[3] Not estimated for this report
[4] No hatchery barriers.
[5] Three years of data.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Spr. Chinook	9.0-11.0	10.1	9.4-10.7	
	W. Steelhead	6.0	6.1	5.4-6.0	
	S. Steelhead	5.0	NA[6]	NA	9
Acclimation	Spr. Chinook	Partial	Partial	--	6
	W. Steelhead	Partial	Partial	--	6
	S. Steelhead	Yes	NA	--	

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Spr. Chinook	Yes	Yes	--	
	W. Steelhead	NA	NA	NA	
	S. Steelhead	NA	NA	NA	
Spawning Pop. >500	Spr. Chinook	Yes	Yes	--	
	W. Steelhead	NA	NA	NA	
	S. Steelhead	NA	NA	NA	
Spawning Ratio Male:Female	Spr. Chinook	1:2	Yes	--	
	W. Steelhead	1:1	NA	NA	
	S. Steelhead	NA	NA	NA	

Objective 4

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	Spr. Chinook	Yes	Yes	--	
	W. Steelhead	Yes	NA	--	
	S. Steelhead	Yes	NA	--	

[6] New program.

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes		
TSS Max Effluent	All	<15 mg/l	Yes		
SS Effluent	All	<0.1 ml/l	Yes		
SS Max Effluent	All	<0.2 ml/l	Yes	--	
Downstream Temp	All	Varies	Yes		
PH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	Yes		

Objective 6

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Cons train ts/Commen ts-Clackamas Hatchery

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. High water temperatures and plankton blooms produce periodic water quality problems during summer flows.

2. Additional water pumps and a new water supply pipeline are needed to permit use of all 10 raceways. Only 5 of the 10 raceways can now be used.

3. A water supply line from River Mill Dam is needed to alleviate high costs of electricity for pumping water. This alternative would reduce electricity costs and the costs for pump and backup generator maintenance.

4. High water temperatures and water-borne diseases have reduced the hatchery production.

5. Need for fish therapeutants is high.

6. Smolt acclimation facilities are needed for fish that are trucked to the Sandy and Salmon river systems.

7. Adult spring chinook returns could be increased if more fish were released in March. An additional facility is needed to rear spring chinook fingerlings from the eyed-egg stage to a size of 20 fish/pound by November.

8. Adult survival of the late Clackamas River winter steelhead stock could be increased by eliminating downstream trucking of smolts at release time.

9. Cold water temperatures during the winter inhibit growth of summer steelhead rearing in the North Fork Reservoir.

Gnat Creek Hatchery and Satellite
(Trojan Ponds)

INTRODUCTION

Gnat Creek Hatchery is located along Gnat Creek, a lower Columbia River tributary approximately 17 miles east of Astoria, Oregon. Facility elevation is about 90 feet above sea level. It is operated with 5.0 FTE's. Trojan Rearing Ponds is operated as a satellite facility with the same personnel.

Rearing units include 15 raceways which are in fair to poor condition. Water rights total 21,643 gpm from Gnat Creek, an unnamed stream and a well. Hatchery water is delivered by gravity flow from Gnat Creek. Water flows range from a high of 15,700 gpm to a low 1,200 gpm. Well water is used for domestic purposes and the unnamed stream is not currently used for fish culture.

PURPOSE

Gnat Creek Hatchery was constructed in 1960 as part of the Columbia River Fisheries Development Program (Mitchell Act)-a program to enhance declining fish runs in the Columbia River Basin. The facility is used for egg incubation and rearing of summer and winter steelhead. Most of the production is release off-station. The facility is also used for rearing sea-run cutthroat.

Trojan Ponds have been used as an experimental acclimation site for winter steelhead and coho. Fish disease concerns, however, have interrupted this program.

GOALS

Hatchery production is designed to meet harvest objectives of creating consumptive steelhead and cutthroat trout fisheries for the North Coast, lower Columbia and Willamette River tributaries.

OBJECTIVES

Objective 1: Hatchery Production

Winter Steelhead
Produce 450,000 smolts (90,000 pounds) for release into Clackamas, Sandy, Tualatin, Gales Creek, N. Fork Scappose, Clatskanie, Lewis and Clark, and Gnat Creek river systems.

Summer Steelhead
Produce 210,000 smolts (42,050 pounds) for release into the Clackamas, Salmon and Molalla river systems.

Sea-run Cutthroat
Produce 19,000 trout (6,335 pounds) for release into Gnat Creek, N. Fork Scappose Creek and Coffenbury Lake.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices used at this facility. Because ODFW hatcheries are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

There are no adult fish collected at this hatchery. Eggs or fingerlings are transferred in from other facilities.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Winter Steelhead: Receive eggs from Big Creek Hatchery; rear 450,000 fish to a size of 5 fish/pound; make April releases into the Clackamas (140,000), Sandy (200,000), Tualatin (10,000), Gale Creek (20,000), N. Fork Scappose (10,000), Lewis and Clark (20,000), Gnat Creek (30,000) and Clatskanie (20,000) river systems. Only the Gnat Creek releases are acclimated. All fish are fin-clipped prior to release.

Summer Steelhead: Receive fingerlings from Oak Springs Hatchery; rear 210,000 fish to a size of 5 fish/pound; make April releases into the Clackamas (135,000), Salmon/Zigzag (40,000) and Molalla (35,000) river systems. None of these fish are acclimated. All fish are fin-clipped prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the following interim practices are currently being used at Gnat Creek Hatchery:

Winter Steelhead: No spawning is conducted at this facility. Winter steelhead are spawned at Big Creek Hatchery utilizing Big Creek stock (see Big Creek Hatchery Plan for further details). Occasionally, winter steelhead from Klaskanine Creek is used as a backup stock. No other stocks are acceptable.

Summer Steelhead: No spawning is conducted at this facility. Summer steelhead are spawned at Oak Springs Hatchery utilizing South Santiam stock (see Oak Springs Hatchery Plan for further details). Any Willamette or Skamania summer steelhead stock is also acceptable for broodstock use.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

<u>Disease Control</u> (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.

- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.

- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

- Conduct applied research on new and existing techniques to control disease epizootics.

<u>Disease Prevention</u> (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.

- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Gnat Creek Hatchery and Satellite

Health Monitoring

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each fish lot at the hatchery. The sample includes a minimum of 10 moribund/dead fish (if available) and 4-6 live fish per lot.

- Prior to transfer or release, fish are given a health exam. This exam may be in . conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- Juvenile fish are administered antibiotics orally as needed for the control of bacterial infections.

- Formalin is dispensed into water for control of parasites and fungus on eggs and juveniles. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as “low regulatory priority” are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor.

- All equipment (e.g., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.

- Different lots of fish/eggs are physically segregated from each other by separate ponds, incubator units and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

- A barrier prevents adult steelhead from entering Gnat Creek above the hatchery intake.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

- Total *Suspended Solids (TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable Solids* (W-measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- @-measured quarterly when settleable solids are measured.

- *Water Temperatures*-daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- *Dissolved* Oxygen *(DO)*—measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air* Temperatures- maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

Objective 6: Communicate effectively with other fish producers, managers and the public.

Coordination/Communication within ODFW

Annual Fish Production Meetings: ODFW conducts meetings throughout the state to set annual fish production goals for all public hatcheries in Oregon. These meetings involve the participation of ODFW research, management and fish culture staff as well as representatives from applicable federal agencies and tribes.

Record Keeping: The following records are kept at all ODFW hatcheries:

- *Egg and Fry* Report-records all egg and fry movements, treatments, etc.

- *Anadromous Adult Transaction Report*-details the collection and disposition of all adult fish.

- *Monthly Ponded* Report-updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).

- *Mark Recovery Report*-details sex, fish length and tag information from all marked adult fish that are captured.

- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish Loss and Treatment Report*-records disease problems and daily mortality.

- *Fish Liberation Reports*—details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap and* Barrier Log-records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly Progress* Report-document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

Hatcherv Management Information Svstem (HMIS): Computerized system to collect, report, summarize and analyze hatchery production data. This system is a tool to be used in production control at all hatchery management levels.

Coordinated Information Svstem (CIS): Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Interagency Coordination/Communication

Production Advisorv Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisorv Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatcherv Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. MOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Communication with the General Public

Gnat Creek Hatchery receives approximately 350 annual visitors.

PERFORMANCE STANDARDS-GNAT CREEK HATCHERY AND SATELLITE

Objective 1

Measures	Species	Hatchery Goal[1]	5-Year Averaee	Range	Constraints
Adult Capture	W. Steelhead	NA	NA	NA	
	S. Steelhead	NA	NA	NA	
Adult Prespawning Survival	W. Steelhead	NA	NA	NA	
	S. Steelhead	NA	NA	NA	
Egg-take	W. Steelhead	NA	NA	NA	
	S. Steelhead	NA	NA	NA	
Green Egg-to-Fry Survival	W. Steelhead	95%	97%	--[2]	
	S. Steelhead	NA	NA	NA	
Fry-to-Smolt Survival	W. Steelhead	95%	91%	88-96%	1,2
	S. Steelhead	95%	93%	84-99%	1,2
Fish Releases	W. Steelhead	450,000	501305	450K-523K	1,2,3
	S. Steelhead	210,000	214,030	192K-256K	1,2,3
Egg Transfers	W. Steelhead	0	--[2]	--[2]	
	S. Steelhead	0	_[2]	--[2]	
Fish Transfers	W. Steelhead	0	--[2]	--[2]	
	S. Steelhead	0	--[2]	--[2]	
Adults Passed Upstream	W. Steelhead	NA	NA	NA	
	S. Steelhead	NA	NA	NA	
Percent Survival	W. Steelhead	NA	Unknown	Unknown	
	S. Steelhead	NA	Unknown	Unknown	

NA=Not applicable.
[1] Based on 1992 fish production goals.
[2]Not estimated for this report.

Obiecfiwe 2

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	W. Steelhead	5.0	5.6	5.2-6.0	1,2,3
	S. Steelhead	5.0	6.0	5.0-7.3	1,2,3
Acclimation	W. Steelhead	Partial	Partial	--	
	S. Steelhead	No	No	--	

Objective 3

Measures	Species	Hatcherv Goal	5-Year Averaee	Range	Constraints
Collect Adults Throughout Run	W. Steelhead	NA	NA	NA	
	S. Steelhead	NA	NA	NA	
Spawning Pop. >500	W. Steelhead	NA	NA	NA	
	S. Steelhead	NA	NA	NA	
Spawning Ratio Male:Female	W. Steelhead	NA	NA	NA	
	S. Steelhead	NA	NA	NA	

Objective 4

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	W. Steelhead	Yes	Yes	--	
	S. Steelhead	Yes	Yes	--	

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes	--	
TSS Max Effluent	All	<15 mg/l	Yes	--	
SS Effluent	All	<0.1 ml/l	Yes	--	
SS Max Effluent	All	co.2 ml/l	Yes	--	
Downstream Temp	All	Varies	Yes	--	
PH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	Yes	--	

Obiecfive 6

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constraints/Comments-Gnat Creek Hatchery

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. Inadequate water supplies in the summer and fall lead to rearing density concerns.

2. Oxygen supplementation is needed to significantly increase fish production, especially during periods of low water flow.

3. Lack of funding over the past decade has created a serious deferred maintenance and equipment backlog.

Irrigon Hatchery

INTRODUCTION

Irrigon Hatchery is located along the Columbia River above John Day Dam near Irrigon, Oregon. Elevation of the facility is 277 feet above sea level. The facility is staffed with 8 FTE's.

Facility rearing units include 32 raceways and 68 circular starting tanks, all in excellent condition. The hatchery water supply is provided from two wells which 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.

PURPOSE

Irrigon Hatchery began operation in 1984 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. This facility serves as an egg incubation and rearing facility for summer steelhead destined for the Grande Ronde and Imnaha river systems. In addition, Irrigon is also used as a final rearing site for legal-sized rainbow trout destined for northeast Oregon waters.

GOALS

The LSRCP agreement is to produce up to 2,000 summer steelhead adults for in-place in-kind mitigation in the Imnaha River System and up to 9,184 adults for in-place in-kind mitigation in the Grande Ronde River System.

OBJECTIVES

Objective 1: Hatchery Production

Summer Steelhead
Produce 1,350,000 smolts (270,000 pounds) for release into the Grande Ronde River System.

Produce 330,000 smolts (66,000 pounds) for release into the Imnaha River Sys tern.

Winter Steelhead
Rear 45,000 fry (225 pounds) for transfer to Oak Springs Hatchery.

Rainbow Trout
Hold 46,500 legal-sized rainbow trout produced in central Oregon hatcheries for final distribution to northeast Oregon waters.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices used at this facility. Because ODFW hatcheries are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

There are no adult fish collected at Irrigon Hatchery. Eggs, fry or fingerlings are transferred in from other facilities as described below.

Wallowa Stock Summer Steelhead: Wallowa stock is used as the broodstock for hatchery releases into the Grande Ronde River System. Entry of adults into the subbasin occurs between early March and late May. Peak spawning occurs in April. Fish are collected and spawned at both the Wallowa Hatchery and the Big Canyon Acclimation Pond. Eggs are transferred to Wallowa Hatchery for eye-up and then transferred to Irrigon Hatchery for incubation and rearing.

Imnaha Stock Summer Steelhead: Entry of adults into the Imnaha River Subbasin occurs between early March and late May. Adults are collected and spawned at Little Sheep acclimation facility. Eggs are transferred to Wallowa Hatchery for eye-up and then transferred to Irrigon Hatchery for incubation and rearing.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

The Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future rearing and release strategies for some fish stocks. Until these policies are fully implemented, the following interim practices are being used at Irrigon Hatchery:

Wallowa Stock Summer Steelhead: Rear 1,350,000 fish to size of 5 fish / pound at Irrigon Hatchery. Transfer 612,500 smolts to the Wallowa Hatchery acclimation ponds and 375,000 smolts to the Big Canyon acclimation facility. Acclimate smolts at these facilities for approximately four weeks and release during April and May. Directly release all remaining smolts in April as follows:

- 50,000 smolts into Deer Creek
- 200,000 smolts into the Upper Grande Ronde River
- 62,500 smolts into Catherine Creek

All fish are marked prior to release. A portion of the releases is also coded-wire tagged.

Imnaha Stock Summer Steelhead: Rear 330,000 fish to size of 5 fish / pound at Irrigon Hatchery. Transfer 200,000 to the Little Sheep Creek acclimation facility; acclimate for a minimum of three weeks; release in April and May. Directly release the remaining smolts into the Imnaha River (80,000 smolts in April) and Little Sheep Creek (50,000 smolts in May). All fish are marked prior to release. A portion of the releases is also coded-wire tagged.

Winter Steelhead: Incubate green eggs from wild Hood River stock; transfer 45,000 fish (200 fish / pound) to the Oak Springs Hatchery for final rearing.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the following interim practices are currently being used at Irrigon Hatchery:

Summer Steelhead: No spawning is conducted at Irrigon Hatchery. Broodstock selection and spawning occurs at Wallowa Hatchery and its satellite facilities (see Wallowa Hatchery Plan for additional information).

Winter Steelhead: Spawning of winter steelhead occurs at a temporary facility at Powerdale Dam near Parkdale, Oregon.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

<u>Disease Control</u> (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.

- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.

- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

- Conduct applied research on new and existing techniques to control disease epizootics.

<u>Disease Prevention</u> (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.

- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Irrigon Hatchery

<u>Health Monitoring</u>

- Monthly fish health examinations are conducted on each lot of juvenile steelhead. A minimum of five healthy-appearing fish and a combination of ten moribund, fresh-dead cr frozen fish (if available) are sampled per fish lot.

- Pretransfer and preliberation health examinations are conducted on all steelhead lots according to transfer or liberation strategies. These examinations are far more extensive than monthly monitoring, however, monthly monitoring protocols are included.

- Clinical examinations are made whenever increased losses or abnormal behavior are reported to or observed by fish health personnel. The examination results are used to recommend appropriate remedial or preventative measures.

- Clinical findings and results of monthly monitoring, pretransfer/preliminary examinations and loss investigation are reported on ODFW Fish Health Examination forms and in the Lower Snake River Compensation Plan monthly reports.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Fish and Egg Transfers

- Fish and egg transfers are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.

- Formalin is dispensed into incubator, tank or raceway water influents to control fungus on eggs and juveniles, and for external parasite control on juveniles. The dosage, frequency and exposure time depends upon the species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration or those classified as “low regulatory priority” are used for treatments.

Sanitation

- All eggs transferred into the facility are surface-disinfected with iodophor.

- All equipment and personal rain gear are disinfected with iodophor between uses with different fish/egg lots.

- Different lots of fish/eggs are physically segregated from each other by separate incubator units, tanks, raceways and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities ‘to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

- *Total Suspended Solids (TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable Solids* (W-measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *pH*—measured quarterly when settleable solids are measured.

- *Water Temperatures*-daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- *Dissolved Oxygen* (DO)--measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

Objective 6: Communicate effectively with other fish producers, managers and the public.

Coordination/Communication within ODFW

Annual Fish Production Meetings: ODFW conducts meetings throughout the state to set annual fish production goals for all public hatcheries in Oregon. These meetings involve the participation of ODFW research, management and fish culture staff as well as representatives from applicable federal agencies and tribes.

Record Keeping: The following records are kept at all ODFW hatcheries:

- *Egg and Fry* Report-records all egg and fry movements, treatments, etc.

- *Anadromous Adult Transaction Report*-details the collection and disposition of all adult fish.

- *Monthly Ponded* Report-updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).

- *Mark Recovery Report*-details sex, fish length and tag information from all captured adult fish that are marked.

- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish Loss and Treatment Report*-records disease problems and daily mortality.

- *Fish Liberation* Reports-details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap and Barrier Log*—records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly Progress Report*—document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

Hatcherv Management Information Svstem (HMIS): Computerized system to collect, report, summarize and analyze hatchery production data. This system is a tool to be used in production control at all hatchery management levels.

Coordinated Information Svstem (CIS): Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Interagency Coordination/Communication

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Integrated Hatcherv Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Other: ODFW holds periodic meetings with the U.S. Fish and Wildlife Service and appropriate Indian tribes to discuss hatchery operations.

Communication with the General Public

Irrigon Hatchery receives approximately 4,000 annual visitors.

PERFORMANCE STANDARDS—IRRIGON HATCHERY

Objective 1

Measures	Species	Hatchery Goal[1]	5-Year Averaee	Range	Constraints
Adult Capture	Wallowa StS	NA	NA	NA	
	Imnaha StS	NA	NA	NA	
Adult Prespawning Survival	Wallowa StS	NA	NA	NA	
	Imnaha StS	NA	NA	NA	
Egg-take	Wallowa StS	NA	NA	NA	
	Imnaha StS	NA	NA	NA	
Green Egg-to-Fry Survival	Wallowa StS	NA	NA	NA	
	Imnaha StS	NA	NA	NA	
Fry-to-Smolt Survival	Wallowa StS	95%	80%	69-91%	
	Imnaha StS	95%	68%	60-88%	
Fish Releases	Wallowa StS	1,350,000	1,154,159	990K-1,521K	
	Imnaha StS	333,000	104,372	73K-137K	1
Egg Transfers	Wallowa StS	0	NA	NA	
	Imnaha StS	0	NA	NA	
Fish Transfers	Wallowa StS	0	NA	NA	
	Imnaha StS	0	NA	NA	
	W. Steelhead	45,000	--[2]	--[2]	
Adults Passed Upstream	Wallowa StS	NA	NA	NA	
	lmnaha StS	NA	NA	NA	
Percent Survival	Wallowa StS	0.68%	0.86%[3]	0.49-l .35%	
	lmnaha StS	0.61%	0.47%[3]	0.18-0.76%	

NA=Not applicable.
[1] Based on 1992 fish production goals.
[3] Based on three years of data.

Objective 2

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Wallowa StS	5.0	4.8	4.5-5.0	1
	Imnaha StS	5.0	5.8[4]	5.0-6.7	1
Acclimation	Wallowa StS	Yes	Yes	--	
	Imnaha StS	Yes	Yes	--	

Objective 3

Measures	Species	Hatcherv Goal	5-Year Averaee	Range	Constraints
Collect Adults Throughout Run	Wallowa StS	NA	NA	NA	
	Imnaha StS	NA	NA	NA	
Spawning Pop. >500	Wallowa StS	NA	NA	NA	
	Imnaha StS	NA	NA	NA	
Spawning Ratio Male:Female	Wallowa StS	NA	NA	NA	
	Imnaha StS	NA	NA	NA	

Objective 4

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	Wallowa StS	Yes	Yes	--	
	Imnaha StS	Yes	Yes	--	

[4] Four year average.

Ob'ective 5

Measures	Species	Hatcherv Goal	5-Year Average	Ranee	Constraints
TSS Effluent	All	<5 mg/l	Yes		
TSS Max Effluent	All	<15 mg/l	Yes	--	
SS Effluent	All	co.1 ml/l	Yes	--	
SS Max Effluent	All	co.2 ml/l	Yes	--	
Downstream Temp	All	Varies	Yes	--	
pH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	Yes	--	

Objective 6

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constraints/Comments-Irrigon Hatchery

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. The primary source of water for the hatchery is wells which have flows that fluctuate depending upon the Columbia River water levels. During low water flows, the fish must be transferred to other facilities earlier than programmed, which may not be beneficial to program goals.

Klaskanine Hatchery

INTRODUCTION

Klaskanine Hatchery is located along the North Fork Klaskanine River approximately 12 miles southeast of Astoria, Oregon. Site elevation is about 25 feet above sea level.

Rearing facilities consist of 17 raceways and 1 concrete rearing pond. There are also 19 rearing troughs and 40 single-stack egg incubators located inside the hatchery building. The rearing facilities and main water supply lines are in poor, deteriorating condition. The facility is staffed with 4.75 FTE's.

Water is supplied by gravity flow and from three intakes located on the North Fork Klaskanine River and North Fork of the North Fork River. The current water right is for 22,442 gpm (50 cfs) although the maximum water usage is 11,000 gpm. Summer/fall water flows are a limiting factor and the hatchery utilizes the entire flow available from the river during this period (about 1,000 gpm). The water delivery system limits the amount of water that can be supplied during high flows.

Water is reused in raceways from the large rearing pond during low flow periods. Recirculation pumps also are used in the large rearing pond during this period.

PURPOSE

Klaskanine Hatchery was first operated in 1911 by the state of Oregon. In 1959 the hatchery was enlarged and renovated under the Columbia River Fisheries Development Program (Mitchell Act)-a program to enhance declining fish runs in the Columbia River Basin. The facility is currently used for adult collection, egg incubation and rearing of coho. It also serves as an egg incubation facility for fall chinook and a rearing facility for winter steelhead.

GOALS

Coho and Fall Chinook: Produce lower river fall chinook and coho that will contribute to NE Pacific and Columbia River basin commercial and sport fisheries while providing adequate escapement for hatchery production.

Winter Steelhead: Create a consumptive, winter steelhead fishery in the Klaskanine River.

OBJECTIVES

Objective 1: Hatchery Production

Fall Chinook
Incubate and hatch 3,200,000 eggs for Big Creek Hatchery (fry are transferred back to Big Creek Hatchery).

Coho
Produce 1,125,000 smolts (93,750 pounds) for on-station release.

Provide 850,000 green coho eggs to the Clatsop Economic Development Commission.

Provide 20,000 eyed eggs to Oregon's Salmon and Trout Enhancement Program.

Winter Steelhead
Produce 60,000 smolts (12,000 pounds) for on-station release.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices used at this facility. Because ODFW hatcheries are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

Tule Fall Chinook: Adults arrive in the subbasin from late August through mid-October. Few fall chinook are collected at this facility because of low river flows during the time they return. Eggs are received from Big Creek Hatchery.

Coho: Entry of adults into the subbasin occurs from early September to November. Spawning occurs from October to December with a peak usually in late October. Adults are collected at the hatchery.

Winter Steelhead: Adult winter steelhead are not usually collected at this facility; fingerlings are received from Big Creek Hatchery. On occasion, some adults are collected as a backup to the Big Creek Hatchery program.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Tule Fall Chinook: Transfer eyed eggs from Big Creek Hatchery for incubation; rear 3,200,000 fish to a swim-up stage and transfer back to Big Creek Hatchery in January.

Coho: Rear 1,125,000 smolts to a size of 12 fish/pound; acclimate and release on-station in early May. Mark and tag (CWT) a portion of the release.

Winter Steelhead: Transfer fingerlings from Big Creek Hatchery in December; rear 60,000 fish to a size of 5 fish/pound; acclimate, mark and release on-station in mid-April.

Objective 3: Maintain stock integrity and genetic diversity.

Broods tock Selection and Spawning

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policy are fully implemented, the following interim practices are currently being used at Klaskanine Hatchery:

Tule Fall Chinook: No fall chinook are spawned at this facility. Fall chinook eggs are received from Big Creek Hatchery (Big Creek stock).

Coho: The entire run is comprised of hatchery fish. The interim practice is to collect adults throughout the entire run and maintain a 1:2 male to female spawning ratio. Only Klaskanine coho are used for broodstock. Big Creek coho stock is used in years with low adult returns.

Winter Steelhead: No steelhead are spawned at this facility. Eggs are received from Big Creek Hatchery (Big Creek stock).

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

<u>Disease Control</u> (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.

- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.

- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

- Conduct applied research on new and existing techniques to control disease epizootics.

<u>Disease Prevention</u> (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.

- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Klaskanine Hatchery

Health Monitoring

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each fish lot at the hatchery. The sample includes a minimum of 10 dead fish (if available) and 4-6 live fish per lot.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each salmon lot. If prespawning mortality level is above normal, necropsies are conducted on dead adult fish for bacteria, parasites and other causes of death.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor for disinfection.

- Juvenile fish are administered antibiotics orally as needed for the control of bacterial infections. Oxytetracycline is administered in August and September to prevent botulism.

- Formalin is dispensed into water for control of parasites and fungus on eggs and juveniles. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as “low regulatory priority” are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor.

- All equipment (e.g., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.

- Different lots of fish/eggs are physically segregated from each other by separate ponds, incubator units and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

- *Total Suspended Solids (TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable Solids (SS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *pH*—measured quarterly when settleable solids are measured.

- *Water Temperatures*-daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- *Dissolved* Oxygen *(DO)*—measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

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- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish Loss and Treatment Report*—records disease problems and daily mortality.

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- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly Progress* Report-document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

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In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Communication with the General Public

Klaskanine Hatchery receives approximately 5,000 annual visitors. The hatchery also provides two local high school classes the opportunity to participate in the annual coho spawning operations. Eggs from the Salmon and Trout Enhancement Program are reared in the classroom at these two schools.

Klaskanine Hatchery has also provided the opportunity for new NMFS law enforcement recruits to learn about fish culture techniques.

PERFORMANCE STANDARDS-KLASKANINE HATCHERY

Objective 1

Measures	Species	Hatchery Goal[1]	5-Year Average	Range	Constraints
Adult Capture	Fall Chinook	--	292	11-67	2
	Coho	3,360	6,648	5,090-8,768	2
	W. Steelhead	--	409	284-512	
Adult Prespawning Survival	Fall Chinook	--	42.0%[2]	56.7-58.0%	
	Coho	95%	95.3%	92.0-99.2%	2
	W. Steelhead	--	98.4%	95.0-100%	
Egg-take	Fall Chinook	0[3]	2,000[2]	NA	
	Coho	2,800,000	1,925,000	226K-3,436K	
	W. Steelhead	--	620,000	464K-824K	
Green Egg-to-Fry Survival	Fall Chinook	--	95.5%[2]	NA	1,2,4,6
	Coho	95%	85.9%	77.1-94.8%	1,2,4,6
	W. Steelhead	--	85.0%	58.2-91 .1%	
Fry-to-Smolt Survival	Fall Chinook	95%	93.2%	88.0-98.3%	
	Coho	95%	63.5%	61 .O-92.7%	2,3
	W. Steelhead	95%	90.5%	79.2-97.8%	
Fish Releases	Fall Chinook	NA	NA	NA	
	Coho	1,125,000	1,251,420	840K-1,670K	5,7
	W. Steelhead	60,000	60,560	56K-67K	
Egg Transfers	Fall Chinook	35,000	--[4]	--[4]	
	Coho	1,200,000	--[4]	--[4]	
	W. Steclhead	0	--[4]	--[4]	
Fish Transfers	Fall Chinook	3,200,000	--[4]	--[4]	
	Coho	0	--[4]	--[4]	
	W. Stcclhcad	0	--[4]	--[4]	
Adults Passed Upstream	Fall Chinook	NA	NA	NA	
	Coho	NA	NA	NA	
	W. Steelhead	NA	NA	NA	
Percent Survival	Fall Chinook	NA	NA	NA	
	Coho	NA	4.15%	l-47-7.81 %	
	W. Steelhead	NA	Unknown	Unknown	

NA=Not applicable.
[1] Based on 1992 fish production goals.
[2] Only 4-year average.
[3] Fall chinook egg-take program discontinued in 1992.
[4] Not estimated for this report.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Fall Chinook	NA	NA	NA	
	Coho	12.0	12.8	9.2-15.2	
	W. Steelhead	5.0	5.2	4.8-5.5	
Acclimation	Fall Chinook	NA	NA	NA	
	Coho	Yes	--	--	
	W. Steelhead	Yes	--	--	

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Fall Chinook	NA	NA	NA	
	Coho	Yes	Yes	--	2
	W. Steelhead	Yes	Yes	--	2
Spawning Pop. >500	Fall Chinook	NA	NA	--	
	Coho	Yes	Yes	--	
	W. Steelhead	No	No	--	
Spawning Ratio Male:Female	Fall Chinook	NA	NA	--	
	Coho	1:2	Yes	--	
	W. Steelhead	NA	NA	--	

Objective 4

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	Fall Chinook	Yes	Yes	--	
	Coho	Yes	Yes	--	
	W. Steelhead	Yes	Yes	--	

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes	--	
TSS Max Effluent	All	45 mg/l	Yes	--	
SS Effluent	All	<0.1 ml/l	Yes	--	
SS Max Effluent	All	co.2 ml/l	Yes	--	
Downstream Temp	All	Varies	Yes	--	
PH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	Yes	--	

Objective 6

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constrain ts/Comments-Klaskanine Hatchery

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. Water turbidity is sometimes a problem.
2. Low water flows during the summer months have contributed to fish losses. Low flows also cause overcrowding and limit egg incubation and rearing potential.
3. Oxygen supplementation is needed to significantly increase fish production, especially during low water flow periods.
4. The egg incubation water (pipeline) delivery system limits fish production capability.
5. The concrete rearing lake design makes it difficult to obtain accurate fish release figures.
6. The egg incubation system needs to be upgraded.
7. The release pipe at the rearing lake outlet needs improvement.
8. Lack of funding over the past decade has created a serious deferred maintenance and equipment backlog.

Leaburg Hatchery

INTRODUCTION

Leaburg Hatchery is located along the McKenzie River (Willamette Basin) approximately 23 miles east of Springfield, Oregon. Site elevation is 740 feet above sea level. The facility is staffed with 7.5 FTE's.

Facility production units include 40 concrete raceways of 7,320 cubic feet each, 1 concrete raceways of 3,660 cubic feet, 6 concrete circular ponds, 20 aluminum incubation troughs, and 13 Canadian-style troughs used as starting tanks. Two of the raceways are used for adult capture and holding. Only four raceways are used to rear anadromous fish; the remaining facilities are utilized for the resident trout program.

Water rights total 56,100 gpm from the McKenzie River. Water use varies with need throughout the year and is delivered by gravity. All rearing facilities use single-pass water.

PURPOSE

Leaburg Hatchery was constructed in 1953 by the U.S. Army Corps of Engineers (COE) to mitigate for lost trout habitat caused by construction of Blue River and Cougar dams and other Willamette Valley projects. The hatchery is used for egg incubation and rearing of summer steelhead and cutthroat trout, and for rearing trout.

GOALS

Summer Steelhead: Help achieve the McKenzie River Subbasin Plan's objective to provide an average sport catch of 1,200 adult summer steelhead in the McKenzie River.

Trout: The COE mitigation agreement requires the annual production of no more than 277,000 pounds of trout.

OBJECTIVES

Objective 1: Hatchery Production

Summer Steelhead
Produce 108,000 smolts (24,000 pounds) for release into the McKenzie River.

Produce 118,500 smolts (10,000 pounds) for transfer to Dexter Hatchery.

Rainbow Trout
Produce 723,900 legal-sized trout (241,300 pounds) for release into reservoirs, streams and standing water bodies in the Willamette River Basin.

Cutthroat Trout
Produce 45,000 fingerlings (150 pounds) for transfer to Fall River Hatchery for the Cascade High Lakes airstocking program.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices associated with anadromous fish production at this facility. Because ODFW hatcheries-are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

Summer steelhead adults arrive in the McKenzie River from April through December. Spawning occurs from late February through mid-March. Adults are collected at Leaburg Hatchery and at McKenzie Hatchery. All adults are held for spawning at Leaburg Hatchery.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations.The specific rearing and release strategies used at this hatchery are outlined below.

Summer Steelhead: Rear 108,000 fish to a size of 4.5 fish / pound; release 27,000 on-station and truck 81,000 for release into the McKenzie River in mid-April. All fish are marked prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the following interim practices are currently being used at Leaburg Hatchery:

Summer Steelhead: Adult summer steelhead are collected from May through October to maintain a broad run timing and are spawned at 1:1 male to female ratio. In times of inadequate fish returns to the McKenzie River, summer steelhead from the Middle Fork Willamette River (Dexter Dam) or the South Santiam River (Foster Dam) are used for broodstock, in that order of preference.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.

- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.

- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.

- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Leaburg Hatchery

Health Monitoring

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each fish lot at the hatchery. The sample includes a minimum of 10 dead fish (if available) and 4-6 live fish per lot.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each fish lot. If prespawning mortality level is above normal, necropsies are conducted on dead adult fish for bacteria, parasites and other causes of death.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- Adult summer steelhead are injected with antibiotics for the control of bacterial diseases. Brood cutthroat trout are vaccinated for furunculosis and administered antibiotics orally as needed for the control of bacterial infections.

- At spawning, eggs are water-hardened in iodophor for disinfection.

- Juvenile fish are administered antibiotics orally as needed for the control of bacterial infections.

- Formalin is dispensed into water for control of parasites and fungus on eggs, juveniles and adult steelhead and brood cutthroat trout. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as "low regulatory priority" are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor. Currently no eggs are brought to this facility.

- All equipment (e.g., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.

- Different lots of fish and eggs are physically segregated from each other by separate ponds, incubator units and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODF'W facilities 'to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

- *Total* Suspended *Solids (TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable Solids (SS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *pH*—measured quarterly when settleable solids are measured.

- Water *Temperatures* -daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- *Dissolved* Oxygen (DO&measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

Objective 6: Communicate effectively with other fish producers, managers and the public.

Coordination/Communication within ODFW

Annual Fish Production Meetings: ODFW conducts meetings throughout the state to set annual fish production goals for all public hatcheries in Oregon. These meetings involve the participation of ODFW research, management and fish culture staff as well as representatives from applicable federal agencies and tribes.

Record Keeping: The following records are kept at all ODFW hatcheries:

- Egg and *Fry* Report-records all egg and fry movements, treatments, etc.

- *Anadromous Adult Transaction Report*-details the collection and disposition of all adult fish.

- *Monthly Ponded Report*-updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).

- *Mark Recovery Report*-details sex, fish length and tag information from all marked adult fish that are captured.

- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish Loss and Treatment Report*-records disease problems and daily mortality.

- *Fish Liberation Reports*-details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap and Barrier* Log-records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly Progress* Report-document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

Hatcherv Management Information Svstem (HMIS): Computerized system to collect, report, summarize and analyze hatchery production data. This system is a tool to be used in production control at all hatchery management levels.

Coordinated Information Svstem (CIS): Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Interagency Coordination/Communication

Production Advisorv Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisorv Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatcherv Operations Team (MOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

ODFW staff meets frequently with Eugene Water and Electric to discuss hatchery operations.

Communication with the General Public

Leaburg Hatchery receives approximately 50,000 visitors each year.

PERFORMANCE STANDARDS-LEABURG HATCHERY

Objective 1

Measures	Species	Hatchery Goal[1]	5-Year Average	Range	Constraints
Adult Capture	S. Steelhead	200	213	58-421	3,4
Adult Prespawning Survival	S. Steelhead	95%	83%	69.1-96.0%	3,4
Egg-take	S. Steelhead	385,000	563,000	210K-1,245K	4
Green Egg-to-Fry Survival	S. Steelhead	95%	70.5%	58.4-86.0%	4,6
Fry-to-Smolt Survival	S. Steelhead	95%	76%	51-88%	6
Fish Releases	S. Steelhead	108,000	110,090	106K-117K	
Egg Transfers	S. Steelhead	0	--2	--2	6
Fish Transfers	S. Steelhead	118,000	--2	--2	6
Adul is Passed Upstream	S. Stcclhead	NA	NA	NA	
Percent Survival	S. Steelhead	NA	Unknown	Unknown	4,5,6

NA=Not applicable.
[1] Based on 1992 fish production goals.
[2]Not estimated for this report.

Objective 2

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	S. Steelhead	4.53	4.7	4.5-5.1	
Acclimation	S. Steelhead	Yes	Yes	--	

Objective 3

Measures	Species	Hatcher-v Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	S. Steelhead	No	No	--	3,4
Spawning Pop. >500	S. Steelhead	Yes	No	--	
Spawning Ratio Male:Female	S. Steelhead	1:1	No	--	

Objective 4

Measures	Species	Hatcherv Goal	5-Year Averaee	Ranee	Constraints
Adhere to Disease Policy	S. Steelhead	Yes	Yes	--	

[3] Goal changed from 5.0 to 4.5 fish/pound in 1992.

Objective 5

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes	--	
TSS Max Effluent	All	cl5 mg/l	Yes	--	
SS Effluent	All	co.1 ml/l	*Yes*	--	
SS Max Effluent	All	<0.2 ml/l	Yes	--	
Downstream Temp	All	Varies	Yes	--	
PH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	*Yes*	--	

Objective 6

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constraints/Comments—Leaburg Hatchery

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. Need self-cleaning screens of appropriate size to meet statewide standards at the hatchery water intake.

2. Design of the effluent abatement system is inadequate to achieve maximum cleaning potential.

3. An adult holding pond for summer steelhead is needed.

4. Hatchery has no good adult collection facility; it must rely on McKenzie Hatchery to obtain most of the adults needed for spawning.

5. Potential fish losses caused by fish entering an unscreened water canal used for hydropower generation (Walterville Canal).

6. No assured clean water source for egg incubation and early rearing.

Lookingglass Hatchery and Satellite
(Imnaha)

INTRODUCTION

Lookingglass Hatchery is located along Lookingglass Creek, a Grande Ronde River tributary located approximately 2 miles from Palmer Junction in northeast Oregon. The hatchery began production in 1982. Currently the rearing units are in excellent condition and include 18 raceways, 2 adult holding ponds and 32 Canadian-style starting troughs. The facility is staffed with 5.8 FTE's.

Water rights for the hatchery total 38,782 gpm from Lookingglass Creek and wells. Water rights for Lookingglass Creek include 22,442 gpm for fish propagation and an additional 13,462 gpm for operation of a fishway constructed prior to the hatchery. Water flows equal to the water rights are available year round but are not needed at all times. Freezing of the intake and water supply is a problem during the winter. Well water is used to temper creek water and prevent raceways and intake from filling with slush ice.

The Imnaha Acclimation Pond is operated as a satellite of Lookingglass Hatchery. It is located along the middle section of the Imnaha River at an elevation of 3,760 feet above sea level. The facility, which was built in 1988, consists of a single acclimation/holding pond of approximately 12,655 cubic feet. It is staffed with 0.5 FTE's.

PURPOSE

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.

Lookingglass Hatchery serves as an adult collection, egg incubation, rearing and release site for the spring chinook destined for the Grande Ronde River system. The Imnaha Acclimation Pond is used for the collection of spring chinook adults returning to the Imnaha River. Adults captured at the Imnaha facility are held and spawned on-site. Eggs are incubated and juveniles reared at Lookingglass Hatchery. Fish are then transferred back to the Imnaha facility for acclimation and release.

GOALS

Grande Ronde River Svstem: Produce up to 5,820 spring chinook adults for in-place, in-kind mitigation.

Imnaha River Svstem: Produce up to 3,210 spring chinook adults for in-place, in-kind mitigation.

OBJECTIVES

Objective 1: Hatchery Production

Produce up to 900,000 spring chinook smolts (48,335 pounds) for on-station release.

Produce up to 490,000 spring chinook smolts (19,470 pounds) for release from the Imnaha Acclimation Pond.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices used at this facility. Because ODFW hatcheries are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

Rapid River Stock Spring Chinook: Rapid River broodstock was recently approved as the broodstock for spring chinook releases in the Grande Ronde River system. Entry of spring chinook adults into the Grande Ronde occurs from mid-May through July. Peak spawning occurs from mid-May to mid-September. Adults are captured and spawned at Lookingglass Hatchery. In years of inadequate hatchery returns, adults are also collected at Idaho's Rapid River Hatchery and Hells Canyon Dam. The adults collected at Hells Canyon Dam are transferred to Rapid River Hatchery for spawning. Adults captured at Rapid River Hatchery are spawned at that facility and eggs are transferred to Lookingglass.

Imnaha Stock Spring Chinook: Entry of adults into the Imnaha River occurs from mid-May through July. Peak spawning occurs from mid-August to mid-September. Adults are collected at the Imnaha Acclimation Pond and held there until maturation. Adults are held and spawned at the Imnaha facility and eggs to transferred to Lookingglass Hatchery.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which is intended to reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to induce homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Rapid River Stock Spring Chinook: Rear 900,000 fish to a size of 20 fish/pound, acclimate to parent river water and release at the hatchery in April. All fish are marked prior to release.

Imnaha Stock Spring Chinook: Rear 490,000 fish at Lookingglass Hatchery and transfer to the Imnaha Acclimation Pond in March. Make a direct stream release of 100,000 fish and acclimate the remaining 390,000 fish for a minimum of four weeks and release into the Imnaha River in April at a size of 15-25 fish/pound. All fish are marked prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the following interim practices are currently being used at Lookingglass Hatchery:

Rapid River Stock Spring Chinook: The interim practice is to collect adults throughout the entire run. Due to low numbers of returning adults, all adults are collected for hatchery purposes. The major component of the run is comprised of hatchery fish. Adults are spawned at a 1:1 male to female ratio.

Imnaha Stock Spring Chinook: The interim practice is to collect wild and hatchery adults throughout the entire run. No more than 33 percent of the wild run is captured for hatchery use; the remaining 67 percent is allowed to pass above the collection facility. No more than 60 percent of the hatchery adults are collected and 40 percent are passed upstream. Adults are spawned at a 1:1 ratio.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.

- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.

- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

- Conduct applied research on new and existing techniques to control disease epizootics .

Disease Prevention (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.

- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Lookingglass Hatchery and Satellite

Health Monitoring

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each spring chinook lot. The sample includes a minimum of 10 moribund/dead fish (if available) and 4-6 live fish per lot. Results are reported on the ODFW Fish Examination form and the Lower Snake Compensation Plan monthly report.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each salmon lot. Necropsies on all prespawning mortality (up to 20 fish) are conducted for bacteria, parasites and other causes of death. Additional examinations are conducted if mortality exceeds normal levels.

- Prior to transfer or release, fish are given a health exam. This exam includes aspects of the preceding monthly monitoring exam. Results are reported on ODFW Fish Examination forms and in the Lower Snake River Compensation Plan monthly report.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- Adult spring chinook are injected with antibiotics for the control of bacterial diseases.

- Eggs are spawned into colanders to remove ovarian fluid, fertilized, and then water-hardened in iodophor for disinfection.

- Juvenile fish are administered antibiotics orally, as needed, for the control of bacterial infections.

- Formalin is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and exposure time varies with species, life-stage and disease being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as “low regulatory priority” are used for treatments.

Sanitation

- All freshly fertilized eggs taken from the Imnaha satellite facility to Lookingglass Hatchery are water-hardened in iodophor and transported in iodophor-disinfected buckets. Eggs are fertilized, rinsed, water-hardened and transported in well water. Transport occurs within three hours of egg disinfection.

- Different lots of fish and eggs are physically segregated from each other by separate ponds, incubator units and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities-to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

- Total *Suspended Solids (TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable Solids (SS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *pH*—measured quarterly when settleable solids are measured.

- *Water Temperatures*—daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- *Dissolved* Oxygen (DO&measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

Objective 6: Communicate effectively with other fish producers, managers and the public.

Coordination/Communication within ODFW

Annual Fish Production Meetings: ODFW conducts meetings throughout the state to set annual fish production goals for all public hatcheries in Oregon. These meetings involve the participation of ODFW research, management and fish culture staff as well as representatives from applicable federal agencies and tribes.

Record Keening: The following records are kept at all ODFW hatcheries:

- *Egg and Fry* Report-records all egg and fry movements, treatments, etc.

- *Anadromous Adult Transaction Report*-details the collection and disposition of all adult fish.

- *Monthly Ponded Report*-updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).

- *Mark* Recovery Report-details sex, fish length and tag information from all marked adult fish that are captured.

- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish Loss and Treatment Report*-records disease problems and daily mortality.

- *Fish Liberation Reports*—details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap and Barrier* Log-records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly Progress* Report-document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

Hatcherv Management Information System (HMIS): Computerized system to collect, report, summarize and analyze hatchery production data. This system is a tool to be used in production control at all hatchery management levels.

Coordinated Information Svstem (CIS): Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Interagency Coordination/Communication

Production Advisorv Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisorv Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

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Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Other: Periodic meetings are held with the U.S. Fish and Wildlife Service and appropriate Indian tribes to discuss hatchery operations.

Communication with the General Public

Lookingglass Hatchery receives approximately ***2,900*** visitors per year.

PERFORMANCE STANDARDS-LOOKINGGLASS HATCHERY AND SATELLITE

Objective 1

Measures	Species	Hatchery Goal[1]	5-Year Average	Range	Constraints
Adult Capture	Rapid R. CHS	592	299	28-523[2]	6,9
	Imnaha CHS	264	396	187-502	9,13,14,15
Adult Prespawning Survival	Rapid R. CHS	95%	96.3%	95.5-96.7%[3]	7
	Imnaha CHS	95%	95.8%	93.0-98.6%	16
Egg-take	Rapid R. CHS	1,125,000	571,000	334K-864K[3]	9
	Imnaha CHS	560,000	328,000	187K-223K	
Green Egg-to-Fry Survival	Rapid R. CHS	95%	88.6%	82.4-96.6%	7,5
	Imnaha CHS	95%	83.3%	75.3-95.8%	7,5
Fry-to-Smolt Survival	Rapid R. CHS	95%	96.4%	89-99.8%	7,5
	Imnaha CHS	95%	85.2%	57.2-99.8%	
Fish Releases	Rapid R. CHS	900,000	734,596	417K-918K	1-12
	Imnaha CHS	490,000	221,936	123K-444K	
Egg Transfers	Rapid R. CHS	0	--[4]	--[4]	
	Imnaha CHS	0	--[4]	--[4]	
Fish Transfers	Rapid R. CHS	0	--[4]	--[4]	
	lmnaha CHS	0	--[4]	--[4]	
Adults Passed Upstream	Rapid R. Sp Ch	NA	NA	NA	
	Imnaha CHS	66% Wild 40% Hatchery	146	70-234	
Percent Survival	Rapid R. CHS	0.65%	0.07%[5]	0.04-0.10%	3,5-10
	lmnaha CHS	0.65%	0.13%	0.03-0.23%	3,5-10,16

NA=Not applicable.
[1] Based on 1992 fish production goals.
[2] Four years of data.
[3] Three years of data.
[4] Not estimated for this report.
[5] Two years of data.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Rapid R. CHS	12-20	15.9	12.9-18.4	3,4,5,7
	Imnaha CHS	15-25	15.4	8.2-18.8	1,2
Acclimation	Rapid R. CHS	Yes	Yes	--	
	Imnaha CHS	Yes	Yes	--	Imnaha 2,16

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Rapid R. CHS	Yes	Yes	--	6
	Imnaha CHS	Yes	Yes	--	
Spawning Pop. >500	Rapid R. CHS	Yes	No	--	9
	Imnaha CHS	Yes	No	--	
Spawning Ratio Male:Female	Rapid R. CHS	1:1	Yes	--	
	Imnaha CHS	1:1	Yes	--	

Objective 4

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	Rapid R. CHS	Yes	Yes	--	7
	Imnaha CHS	Yes	Yes	--	

Ob'ective 5

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes	--	
TSS Max Effluent	All	<15 mg/l	Yes	--	
SS Effluent	All	<0.1 ml/l	Yes	--	
SS Max Effluent	All	CO.2 ml/l	Yes	--	
Downstream Temp	All	Varies	Yes	--	
pH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	Yes	--	

Objective 6

Measures	Species	Hatcherv Goal	5-Year Averaee	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constraints/Comments-Lookingglass Hatchery and Satellite

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. Ice at Lookingglass Creek intake threatens the water supply during cold periods in the winter.

2. Cold water temperatures limit fish growth in winter and early spring.

3. There are not enough Canadian-style troughs to accommodate the entire production. Approximately 13 more troughs are needed.

4. Raceway walls are not high enough to allow loading of designed rearing densities. Fish are able to jump over the raceway walls.

5. Lack of chilled well water for early rearing.

6. If drought conditions continue, there could be possible lack of river water.

7. Passage of adults above the intake could result in a disease outbreak in juveniles and adults.

8. Lack of time and expertise to meet the increasing demands of maintenance and repairs to heavy equipment, such as well motors, diesel generators, and chillers. A new Trades Maintenance position may be needed in the near future to meet these demands.

9. Operating under the constraints of the wild fish policy and Endangered Species Act.

10. Design of intake system does not allow the ability to dewater the intake for maintenance or repairs without shutting off the water to the facility.

11. Need on-station housing for one permanent position.

12. During emergency situations, the juvenile fish could get mixed via access through the main pipeline.

13. Extreme erosion on the North Fork of the Imnaha River is causing heavy flows of silt after rain storms. When the river has higher silt levels, the spring chinook adults at the Imnaha facility cannot be treated with formalin. This results in higher-than-normal mortality.

14. Telephone system at the Imnaha facility is very unreliable.

15. The Imnaha facility would operate more effectively if it were connected to commercial power, rather than an on-site propane generator.

16. Ice at the Imnaha facility threatens the water supply.

Marion Forks Hatchery and Satellite
(Minto Pond)

INTRODUCTION

Marion Forks Hatchery is located along Marion and Horn creeks (Santiam River tributaries in the Willamette Basin) about 17 miles east of Detroit, Oregon. Site elevation is 2,580 feet above sea level. The facility is staffed with 4.8 FTE's.

Rearing facilities are in good condition and include 8 raceways, 48 circular ponds and 12 Canadian-style starting troughs. There are two water rights: 15,257 gpm from Marion Creek and 14,368 gpm from Horn Creek. Water is supplied from Marion Creek from April through September, and from Horn Creek from October through March. All rearing units use single-pass water.

Minto Pond, located 33 miles downstream of the hatchery, is operated as a satellite facility. There is one water right for 26,940 gpm from the North Santiam River to operate this facility.

PURPOSE

Marion Forks Hatchery began operation in 1951. The U.S. Army Corps of Engineers (COE) funds the majority of operational costs as mitigation for the development of Detroit and Big Cliff dams. The hatchery is used for egg incubation and rearing of spring chinook and winter steelhead (adult collection and spawning occurs at Minto Pond). The hatchery is also used as a rearing facility for cutthroat trout.

GOALS

The COE mitigation agreement requires the annual production of no more than 84,000 pounds of juvenile chinook and steelhead to mitigate for hydroelectric development in the North Santiam River. The Santiam Basin plan harvest objective for the mainstem and North Fork Santiam River is to provide a catch of 330 hatchery adult winter steelhead.

OBJECTIVES

Objective 1: Hatchery Production

Spring Chinook
Produce 50,000 fry (250 pounds) for release into Detroit Reservoir.

Produce 500,000 smolts (55,560 pounds) for release into the North Santiam River.

Transfer 325,000 fry to McKenzie Hatchery.

Rear 640,000 fingerlings for transfer to South Santiam Hatchery.

Rear 305,000 smolts (15,250 pounds) for transfer to Clackamas Hatchery.

Winter Steelhead
Produce 100,000 smolts (20,000 pounds) for release into the North Santiam River.

Provide 55,000 eggs to Oregon's Salmon and Trout Enhancement Program.

Cutthroat Trout
Rear 18,000 fingerlings (120 pounds) for transfer to Fall River Hatchery.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices associated with anadromous fish production at this facility. Because ODFW hatcheries-are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

Spring Chinook: Adults begin arriving in the Santiam River in mid-May. Adults are collected and held for spawning at the Minto Pond trap beginning in late August. Peak spawning occurs from mid to late September.

Winter Steelhead: Adults are collected and held for spawning at the Minto Pond trap beginning in early April. Peak spawning occurs from late April through early May.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Spring Chinook: Rear 500,000 fish to a size of 9 fish / pound. Transfer 250,000 to Minto Pond for acclimation and release into the North Santiam River in March. Truck the remaining 250,000 fish for an off-station release into the North Santiam River in March. Portions of both groups are marked to compare acclimated vs. nonacclimated release strategies. Some fish are also coded-wire tagged as part of a bacterial kidney disease (BKD) study being conducted in cooperation with Oregon State University.

The spring chinook program at Marion Forks Hatchery also includes rearing 50,000 fish to a size of 200 fish / pound and releasing them into Detroit Reservoir (North Santiam River System) in early June.

Winter Steelhead: Rear 100,000 fish to a size of 5 fish / pound. Transfer 50,000 to Minto Pond, acclimate for one month and release into North Santiam River in early April. Truck the remaining 50,000 fish for an off-station release into the North Santiam River in early April. All steelhead are marked prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the following interim practices are currently being used at Marion Forks Hatchery:

Spring Chinook: The Minto Pond trap is opened in August and adults are collected throughout the run until early October. The adults collected include both wild and hatchery fish (the largest portion is probably hatchery fish). Adults are spawned at a 1:1 male to female ratio. Only North Santiam spring chinook are used for broodstock.

Winter Steelhead: The Minto Pond trap is opened in mid-April and adults are collected through mid-May. Both wild and hatchery fish are collected. Approximately 30 percent of the fish used for spawning are wild fish. Spawning is conducted using a 4X4 matrix process which involves 16 family groups. Only North Santiam winter steelhead are used for broodstock.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.

- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.

- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.

- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Marion Forks Hatchery and Satellite

Health Monitoring

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each fish lot at the hatchery. The sample includes a minimum of 10 dead fish (if available) and 4-6 live fish per lot.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each salmon and steelhead lot. If prespawning is above normal, necropsies are conducted to identify bacteria, parasites and other causes of death.

- Fish are given health exam prior to transfer or release. This exam may be in conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- A small percentage of adult spring chinook is injected with antibiotics for the control of bacterial diseases. Adult winter steelhead are not injected.

- At spawning, eggs are water-hardened in iodophor for disinfection and then transported to Marion Forks Hatchery.

- Juvenile fish are administered antibiotics orally as needed for the control of bacterial infections.

- Formalin is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as "low regulatory priority" are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor.

- All equipment (e.g., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.

- Different lots of fish and eggs are physically segregated from each other by separate ponds, incubator units and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities-to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

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- *Settleable* Solids *(SS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *pH*—measured quarterly when settleable solids are measured.

- *Water Temperatures*-daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- Dissolved Oxygen (DO)-measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

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- *Mark Recovery Report*-details sex, fish length and tag information from all marked adult fish that are captured.

- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish Loss and Treatment* Report-records disease problems and daily mortality.

- *Fish Liberation Reports*—details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap and Barrier* Log-records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

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In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Communication with the General Public

Marion Forks Hatchery receives approximately 6,000 visitors per year. Hatchery personnel also assist with school tours, classroom fish-rearing projects and a mentorship program.

PERFORMANCE STANDARDS-MARION FORKS HATCHERY AND SATELLITE

Objective I

Measures	Species	Hatchery Goal[1]	5-Year Average	Range	Constraints
Adult Capture	Spr. Chinook	476	1,286	900-2,152	8
	W. Steelhead	355	373	166-802	8
Adult Prespawning Survival	Spr. Chinook	95%	76.0%	64.6-90.1%	12
	W. Steelhead	95%	90.7%	72.0-100%	
Egg-take	Spr. Chinook	850,000	1,248,000	835K-2,159K	3
	W. Steelhead	325,000	610,000	315K-1,125K	
Green Egg-to-Fry Survival	Spr. Chinook	95%	66.1%	54.2-82.0%	
	W. Steelhead	95%	46.4%	33.2-87.1%	
Fry-to-Smolt Survival	Spr. Chinook	95%	92.3%	85.8-97.4%	13
	W. Steelhead	95%	72.2%	61.0-91.9%	13
Fish Releases	Spr. Chinook	550,000	508,330	451K-558K	1,2,9
	W. Steelhead	100,000	100,880	86K-117K	1,2
Egg Transfers	Spr. Chinook	0	--[2]	--[2]	
	W. Steelhead	55,000	--[2]	--[2]	
Fish Transfers	Spr. Chinook	630,000	--[2]	--[2]	
	W. Steelhead	0	--[2]	--[2]	
Adults Passed Upstream	Spr. Chinook	NA	389	O-678	14
	W. Steelhead	NA	212	71-525	
Percent Survival	Spr. Chinook	NA	0.90%[3]	0.15-1.53%	
	W. Steelhead	NA	Unknown	unknown	

NA=Not applicable.
[1] Based on 1991 fish production goals.
[2] Not estimated for this report.
[3] Based on four years of data.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Spr. Chinook	9.0	10.1	9.0-l 1.9	4
	W. Steelhead	5.0	5.3	4.9-5.8	4
Acclimation	Spr. Chinook	Partial	Partial	--	11
	W. Steelhead	Partial	Partial	--	

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Spr. Chinook	Yes	Yes	--	8
	W. Steelhead	Yes	Yes	--	8
Spawning Pop. >500	Spr. Chinook	Yes	Yes	--	
	W. Steelhead	Yes	No	--	
Spawning Ratio Male:Female	Spr. Chinook	1:1		--	
	W. Steelhead	Matrix	No	--	

Objective 4

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	Spr. Chinook	Yes	Yes	--	
	W. Steelhead	Yes	Yes	--	

Objective 5

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes	--	
TSS Max Effluent	All	cl5 mg/l	Yes	--	
SS Effluent	All	<0.1 ml/l	Yes	--	
SS Max Effluent	All	CO.2 ml/l	Yes	--	
Downstream Temp	All	Varies	Yes	--	
PH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	Yes	--	

Ob;ective 6

Measures	Species	Hatcherv Goal	5-Year Averaee	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constraints/Commen ts-Marion Forks Hatchery and Satellite

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. Marion Creek often freezes in the winter and is not suitable for fish rearing. During very cold spells, the water flow from Horn Creek is reduced to 5,800 gpm.
2. Yearling and fingerling fish compete for pond space during the spring when maximum poundage is on-station.
3. Egg incubation is limited by the number of incubators. The water must be heated to accelerate the development of eggs and fry to meet desired release size.
4. Cold water limits growth potential during much of the year.
5. Logging in the watershed is a potential threat to water quality.
6. Need for pathogen-free water supply, especially for egg development and early rearing.
7. Heated water is needed to improve egg incubation or early rearing conditions.
8. Fish attraction at the collection site is poor; therefore, not all fish swim into the trap area.
9. Replacement of 24 circular ponds with large rearing ponds could increase hatchery efficiency and productivity.
10. Very limited fish growth in the winter months because of cold water temperatures.
11. Pond size at Minto limits number of fish that can be acclimated.
12. Poor adult survival occurs at Minto holding ponds, especially when fish are held for long periods.
13. Hatchery has limited predator control.
14. Minto trap is not operated year round.

McKenzie River Hatchery

INTRODUCTION

McKenzie River Hatchery is located along the McKenzie River approximately 22 miles east of Springfield, Oregon. Site elevation is 700 feet above sea level. The facility is staffed with 5.6 FTE's.

Rearing facilities are in good condition and consist of 30 raceways, 2 adult holding ponds and 8 Canadian-style starting troughs. Water rights total 31,500 gpm from two sources: the McKenzie River and Cogswell Creek. All raceways are supplied with single-pass water. Adult holding ponds are supplied with reuse water from the raceways, or can be supplied with fresh single-pass water.

PURPOSE

McKenzie River Hatchery was totally reconstructed in 1975. It is jointly funded by the U.S. Army Corps of Engineers (COE) and the Oregon Department of Fish and Wildlife as mitigation for the development of Blue River and Cougar reservoirs on the upper McKenzie River. The hatchery is used for adult collection, egg incubation and rearing of spring chinook. It is also a rearing station for summer steelhead and coho.

GOALS

Spring Chinook: The COE mitigation agreement requires a maximum of 80,800 pounds of hatchery production to achieve a return of 4,060 adults to the McKenzie River. The management goal for the state-funded production is to return 18,000 adults (wild and hatchery) to the McKenzie River. An additional hatchery goal is to help achieve the management goal of returning 750 adult fish to the Molalla River.

Summer Steelhead: Help achieve the ODFW management goals for the McKenzie River and Molalla River. The McKenzie River goal is to provide an annual sport catch of 1,200 adults. The Molalla River goals are to provide an annual return of 4,900 adults and an annual sport catch of 2,450 adults.

OBJECTIVES

Objective 1: Hatchery Production

Spring; Chinook
Produce 983,350 smolts (105,950 pounds) for release into the McKenzie River (McKenzie stock).

Produce 1 million fingerlings (5,000 pounds) for release into the Middle Fork Willamette River (Willamette stock).

Produce 200,000 fingerlings (2,000 pounds) for release into Blue River Reservoir (McKenzie stock).

Transfer 350,500 eggs to Marion Forks Hatchery, Oregon's Salmon and Trout Enhancement Program and Oregon State University (McKenzie stock) .

Produce 100,000 smolts (12,500 pounds) for release into the Molalla River (South Santiam stock).

Summer Steelhead
Produce 36,000 smolts (8,000 pounds) for release into the North Santiam River (South Santiam stock).

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices associated with anadromous fish production at this facility. Because ODFW hatcheries-are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

McKenzie Stock Spring Chinook: Adults return to the hatchery from May to September. Peak spawning occurs from mid to late September.

South Santiam Stock Spring Chinook: No adults are collected at this hatchery. Eggs are transferred from South Santiam Hatchery.

McKenzie Stock Summer Steelhead: Adults are collected as a backup to the Leaburg Hatchery steelhead program; however, no fish are spawned at McKenzie Hatchery. Fingerlings are transferred from Leaburg Hatchery.

South Santiam Stock Summer Steelhead: No adults are collect at McKenzie Hatchery; fingerlings are transferred from Oak Springs Hatchery.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

McKenzie Stock Spring Chinook: Several different release strategies are being evaluated as part of a study to compare spring vs. fall releases, and compare releases of large-graded smolts, small-graded smolts and ungraded smolts. Approximately 983,350 fish are released as part of this study. The release size ranges from 8-12 fish / pound and all fish are released on-station. Portions of these releases are coded-wire tagged.

Other McKenzie stock spring chinook programs involve rearing 200,000 fish to a size of 200 fish / pound and releasing them into the Blue River Reservoir in mid-May, and rearing 1 million fingerlings to a size of 200 fish / pound and releasing them into the Middle Fork Willamette River.

South Santiam Stock Spring Chinook: Rear 33,000 fish to size of 8 fish / pound and release into the Molalla River in November. Fish releases are part of an otolith fish-marking study. Rear 67,000 fish to a size of 9 fish / pound and release into the Molalla River in March.

South Santiam Stock Summer Steelhead: Rear 36,000 fish to a size of 4.5 fish / pound and release into the N. Santiam River in April. All fish are marked (fin clipped) prior to release.

Willamette Stock Spring. Chinook: Rear 1.0 million fish to a size of 200 fish / pound and release into the Middle Fork Willamette River.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock *Selection and Spawning*

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the following interim practices arc currently being used at McKenzie Hatchery:

McKenzie Stock Spring Chinook: Adults returning to the hatchery are collected throughout the entire run. Substantial numbers of wild and hatchery fish pass to the upper river system. Adults are spawned at a 1:1 spawning ratio. Currently, only spring chinook returning to McKenzie Hatchery are used for broodstock. This current broodstock is a mixture of McKenzie and Willamette stocks from past spawnings.

South Santiam Stock Spring Chinook: No spawning is conducted at this facility (see South Santiam Hatchery Plan for additional information).

McKenzie Stock Summer Steelhead: No spawning is conducted at this facility (see Leaburg Hatchery Plan for additional information).

South Santiam Stock Summer Steelhead: No spawning is conducted at this facility (see South Santiam Hatchery Plan for additional information).

Willamette Stock Spring Chinook: No spawning is conducted at this facility (see Willamette/Dexter Hatchery Plan for additional information).

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to-achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.
- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.
- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at McKenzie Hatchery

Health Monitoring

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each fish lot at the hatchery. The sample includes a minimum of 10 dead fish (if available) and 4-6 live fish per lot.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each salmon lot. If the prespawning mortality level is high, necropsies are conducted on dead adult fish for bacteria, parasites and other causes of death.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- Adult spring chinook are injected with antibiotics for the control of bacterial diseases. Adult summer steelhead are collected and transported to Leaburg Hatchery.

- At spawning, eggs are water-hardened in iodophor for disinfection.

- Juvenile fish are administered antibiotics orally as needed for the control of bacterial infections.

- Formalin is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as “low regulatory priority” are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor.

- All equipment (e.g., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.

- Different lots of fish and eggs are physically segregated from each other by separate ponds, incubator units and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities-to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

- *Total Suspended Solids (TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable Solids* (W-measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *pH*—measured quarterly when settleable solids are measured.

- *Water Temperatures*-daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- *Dissolved* Oxygen (DO&measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

Objective 6: Communicate effectively with other fish producers, managers and the public.

Coordination/Communication within ODFW

Annual Fish Production Meetings: ODFW conducts meetings throughout the state to set annual fish production goals for all public hatcheries in Oregon. These meetings involve the participation of ODFW research, management and fish culture staff as well as representatives from applicable federal agencies and tribes.

Record Keeping:: The following records are kept at all ODFW hatcheries:

- *Egg and Fry Report*-records all egg and fry movements, treatments, etc.

- *Anadromous Adult Transaction Report*-details the collection and disposition of all adult fish.

- *Monthly Ponded Report*-updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).

- *Mark Recovery* Report-details sex, fish length and tag information from all marked adult fish that are captured.

- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish Loss and Treatment Report*-records disease problems and daily mortality.

- *Fish Liberation Reports*—details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap and* Barrier Log-records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly* Progress Report-document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

Hatcherv Management Information Svstem (HMIS): Computerized system to collect, report, summarize and analyze hatchery production data. This system is a tool to be used in production control at all hatchery management levels.

Coordinated Information Svstem (CIS): Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Interagency Coordination/Communication

Production Advisorv Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisorv Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatcherv Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. MOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the U.S. *v. Oregon Agreement.* Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Other: ODFW staff meets frequently with Eugene Water and Electric to discuss hatchery operations.

Communication with the General Public

McKenzie Hatchery receives approximately 1,000 visitors per year.

PERFORMANCE STANDARDS-MCKENZIE RIVER HATCHERY

Objective 1

Measures	Species	Hatchery Goal[1]	5-Year Average	Range	Constraints
Adult Capture	Spr. Chinook	1,300	3,063	1,668-4,497	
	S. Steelhead[2]	NA	NA	NA	
Adult Prespawning Survival	Spr. Chinook	95%	89.7%	84.0-96.0%	
	S. Steelhead	95%	99.7%	99.6-100%	
Egg-take	Spr. Chinook	2300,000	1,800,000	1.3-2.3 million	
	S. Steelhead	NA	NA	NA	
Green Egg-to-Fry Survival	Spr. Chinook	95%	81%	59-91%	
	S. Steelhead	NA	NA	NA	
Fry-to-Smolt Survival	Spr. Chinook	95%	94.1%	92.0-99.7%	1
	S. Steelhead	95%	92.0%	88.0-97.0%	1
Fish Releases	Spr. Chinook[3]	1,021,350	919,910	802K-1,126K	2,3
	Spr. Chinook[4]	1350,000	771277	347K-1,213K	2,3
	S. Steelhead	120,000	115,560	101K-124K	2,3
Egg Transfers	Spr. Chinook	0	--[5]	--[5]	
	S. Steelhead	0	--[5]	--[5]	
Fish Transfers	Spr. Chinook	0	_[5]	--[5]	
	S. Steelhead	0	--[5]	--[5]	
Adults Passed Upstream	Spr. Chinook	NA	NA	NA	
	S. Steelhead	NA	NA	NA	
Percent Survival	Spr. Chinook	NA	1.02%[6]	0.97-1.09%	
	S. Steelhead	NA	Unknown	Unknown	

NA=Not applicable.
[1] Based on 1992 fish production goals.
[2] Adults transferred to Leaburg Hatchery.
[3] Smolt releases.
[4] Fingerling releases.
[5] Not estimated for this report.
[6] Three years of data.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Spr. Chinook[7]	8-10	8.8	8.2-9.5	
	Spr. Chinook[8]	200	210.0	143.0-296.7	
	S. Steelhead	4.5	5.0	4.5-5.5	
Acclimation	Spr. Chinook	Yes	Yes	--	
	S. Steelhead	Partial	Partial	--	

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Spr. Chinook	Yes	Yes	--	
	S. Steelhead	No	No	--	
Spawning Pop. >500	Spr. Chinook	Yes	Yes	--	
	S. Steelhead	No	No	--	
Spawning Ratio Male:Female	Spr. Chinook	1:1	Yes	--	
	S. Steelhead	NA	NA	NA	

Objective 4

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	Spr. Chinook	Yes	Yes	--	
	S. Steelhead				

[7] Smolt releases.
[8] Fingerling releases.

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes		
TSS Max Effluent	All	<15 mg/l	Yes		
SS Effluent	All	co.1 ml/l	Yes		
SS Max Effluent	All	CO.2 ml/l	Yes		
Downstream Temp	All	Varies	Yes		
PH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	Yes	--	

Objective 6

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constraints/Comments-McKenzie River Hatchery

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. Unscheduled work on Leaburg Canal can interrupt water supply. Logging in Cogswell Creek watershed may reduce water quality.

2. Need the ability to mass mark the hatchery fish production.

3. Potential fish losses associated with fish entering an unscreened water canal (Watterville Canal) used for hydropower generation on the McKenzie River.

Oak Springs Hatchery

INTRODUCTION

Oak Springs Hatchery is located on the Deschutes River about 9 miles from Maupin, Oregon. Site elevation is 850 feet above sea level. The hatchery is staffed with 6.5 FTE's.

The hatchery has 39 rearing units ranging from circular tanks to 40' x 50' concrete ponds. Water is supplied by gravity flow from several springs. The present water delivery system can deliver approximately 11,670 gpm to the hatchery. Some mixing with re-use water occurs from one pond series to another.

PURPOSE

Oak Springs Hatchery was constructed in several phases beginning in 1922 with the last major construction 1969. The hatchery is presently undergoing new pond construction. The facility, which is operated with state funds, produces steelhead and resident trout. It is currently used for egg incubation and rearing of summer steelhead, rearing of winter steelhead, and maintenance of two resident rainbow trout broodstocks.

GOALS

<u>Summer Steelhead</u>: Help meet the Santiam River Subbasin Management Plan objectives of increasing the annual sport catch to 700 fish in the main stem Santiam and 5,600 in the South Santiam.

<u>Winter Steelhead</u>: The current fishery management goal is to provide a minimum annual run of 3,800 adult hatchery fish to the Hood River Subbasin. (A draft of the Hood River Subbasin Plan is being reviewed, but has not been adopted.)

<u>Rainbow Trout</u>: The current fishery management strategy is to not release hatchery rainbow into the Deschutes River mainstem. There are several tributaries, reservoirs, and standing water bodies in the lower Deschutes River, however, which are stocked. The goals of fish stocking programs in the Warm Springs River and White River drainages are to provide recreational fishing opportunities and consumptive fisheries in small streams that may not be sustained by natural production alone. (A draft of the Lower Deschutes River Subbasin Plan is currently being reviewed, but has not been adopted.)

OBJECTIVES

Objective 1: Hatchery Production

Summer Steelhead

Produce 235,000 fingerlings (2,350 pounds) for transfer to South Santiam Hatchery.

Produce 250,000 fingerlings (1,250 pounds) for transfer to Gnat Creek Hatchery.

Produce 200,000 fingerlings (1,000 pounds) for transfer to Roaring River Hatchery.

Produce 44,000 smolts (4,400 pounds) for transfer to McKenzie Hatchery.

Produce 42,000 smolts (3,500 pounds) for transfer to N. Fork Clackamas Reservoir net pens.

Produce 35,000 smolts (7,000 pounds) for release into the Salmon/Zigzag River System.

Produce 80,000 smolts (16,000 pounds) for release into Hood River.

Winter Steelhead

Produce 40,000 fingerlings (8,000 pounds) for release into the Clackamas River.

Produce 30,000 smolts (6,000 pounds) for release into the Hood River.

Rainbow Trout

Produce 65,000 fingerlings (875 pounds) and 42,100 yearlings (14,230 pounds) for release into standing water bodies in four ODFW Fishery Districts (Deschutes stock, C. *shasta* resistant).

Provide 3,820,000 eggs to ODFW hatcheries and Oregon's Salmon and Trout Enhancement Program (Oak Springs and Deschutes stock).

Produce 625,000 fingerlings (300 pounds) for transfer to Cole Rivers Hatchery (Oak Springs stock).

Produce 1,381,000 fingerlings and yearlings (67,800 pounds) for release into lakes, streams and reservoirs in seven ODFW Fishery Districts (Oak Springs stock).

Produce 160,800 yearlings (53,600 pounds) for release into lakes, streams and reservoirs for two ODFW Fishery Districts (Cape Cod stock).

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices associated with anadromous fish production at this facility. Because ODFW hatcheries-are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

No anadromous fish adults are collected at this hatchery. Summer steelhead eggs are normally shipped in from South Santiam Hatchery. Adults for the Hood River winter steelhead program are captured at the Parkdale Diversion Dam and held for spawning. Adults for the Clackamas program are captured at River Mill Dam.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Summer Steelhead

- Rear 42,000 fish to a size of 12 fish/pound; transfer to the N. Fork Clackamas Reservoir net pens for final rearing, acclimation and release into the reservoir (see Clackamas Hatchery Plan). All fish are marked prior to release.

- Rear 35,000 fish to a size of 5 fish/pound and release into the Salmon River (Sandy River System) in late April or early May. All fish are marked prior to release.

- Rear 80,000 fish to a size of 5 fish/pound and release into the Hood River (nonacclimated) in April. All fish are marked prior to release.

Winter Steelhead

- Rear 40,000 fish (wild Clackamas stock) to a size of 5 fish/pound and release directly into the Clackamas River. All fish are marked prior to release.

- Rear 30,000 fish to a size of 5 fish/pound and release into the Hood River (nonacclimated) in mid-April. All fish are marked prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broods tock Selection and Spawning

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the following interim practices are currently being used at Oak Springs Hatchery:

Summer Steelhead: No summer steelhead are spawned at this hatchery (see the South Santiam Hatchery Plan for spawning protocols). The Skamania stock is acceptable for broodstock use at this facility as this was the original parent stock for these programs.

Winter Steelhead: No winter steelhead are spawned at this hatchery (see the Clackamas Hatchery Plan for spawning protocols). The intent is to use only Hood River and Clackamas stocks for each of the respective winter steelhead programs.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

<u>Disease Control</u> (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.

- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.

- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

- Conduct applied research on new and existing techniques to control disease epizootics.

<u>Disease Prevention</u> (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.

- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Oak Springs Hatchery

Health Monitoring

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each fish lot at the hatchery. The sample includes a minimum of 10 moribund/dead fish (if available) and 4-6 live fish per lot.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each rainbow trout lot.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- Eggs are spawned into colanders to remove ovarian fluid, fertilized and then water-hardened in iodophor for disinfection.

- Juvenile fish are administered antibiotics orally as needed for the control of bacterial infections.

- Formalin is dispensed into water for control of parasites and fungus on eggs, juveniles and adult fish. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as "low regulatory priority" are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor.

- All equipment (e.g., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.

- Different lots of fish/eggs are physically segregated from each other by separate ponds, incubator units and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

- *Total Suspended Solids (TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable Solids* (W-measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *pH*—measured quarterly when settleable solids are measured.

- *Water Temperatures*-daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- *Dissolved* Oxygen (DO)-measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Now* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

Objective 6: Communicate effectively with other fish producers, managers and the public.

Coordination/Communication within ODFW

Annual Fish Production Meetings: ODFW conducts meetings throughout the state to set annual fish production goals for all public hatcheries in Oregon. These meetings involve the participation of ODFW research, management and fish culture staff as well as representatives from applicable federal agencies and tribes.

Record Keening: The following records are kept at all ODFW hatcheries:

- Egg *and Fry Report*—records all egg and fry movements, treatments, etc.

- *Anadromous Adult Transaction Report*-details the collection and disposition of all adult fish.

- *Monthly Ponded Report*-updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).

- *Mark Recovery Report*-details sex, fish length and tag information from all marked adult fish that are captured.

- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- Fish Loss *and Treatment Report*-records disease problems and daily mortality.

- *Fish Liberation Reports*—details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap* and *Barrier* Log-records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly Progress Report*-document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

Hatcherv Management Information System (HMIS): Computerized system to collect, report, summarize and analyze hatchery production data. This system is a tool to be used in production control at all hatchery management levels.

Coordinated Information Svstem (CIS): -Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Interagency Coordination/Communication

Production Advisorv Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisorv Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatcherv Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Communication with the General Public

Oak Springs Hatchery receives approximately 750 visitors per year.

PERFORMANCE STANDARDS-OAK SPRINGS HATCHERY

Objective I

Measures	Species	Hatchery Goal[1]	5-Year Average	Range	Constraints
Adult Capture	S. Steelhead	NA	NA	NA	
	W. Steelhead	NA	NA	NA	
Adult Prespawning Survival	S. Steelhead	NA	NA	NA	
	W. Steelhead	NA	NA	NA	
Egg-take	S. Steelhead	NA	NA	NA	
	W. Steelhead	NA	NA	NA	
Green Egg-to-Fry Survival	S. Steelhead	95%	98%	97-98%	1,2,3,4,5,7
	W. Steelhead	95%	NA	NA	1,2,3,4,5,7
Fry-to-Smolt Survival	S. Steelhead	95%	80%	56-98%	1,2,3,4,5,6,7
	W. Steelhead	95%	NA	NA	1,2,3,4,5,6,7
Fish Releases	S. Steelhead	115,000	206,300	171,850-253,000	3
	W. Steelhead	70,000	NA	NA	3
Egg Transfers	S. Steelhead	0	--[2]	--[2]	
	W. Steelhead	0	--[2]	--[2]	
Fish Transfers	S. Steelhead	771,000	--[2]	--[2]	7,8
	W. Steelhead	40,000	--[2]	--[2]	7,8
Adults Passed Upstream	S. Steelhead	NA	NA	NA	
	W. Steelhead	NA	NA	NA	
Percent Survival	S. Steelhead	NA	Unknown	Unknown	
	W. Steelhead	NA	Unknown	Unknown	

NA=Not applicable.
[1]Based on 1991 fish production goals.
[2]Not estimated for this report.

Obiecfive 2

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	S. Steelhead	5.0	4.5	4.2-5.7	1,2,3,4,5,6,7
	W. Steelhead	5.0	NA	NA	1,2,3,4,5,6,7
Acclimation	S. Steelhead	No	No	--	
	W. Steelhead	No	No	--	

Ob;ecfive 3

Measures	Species	Hatcherv Goal	5-Year Average	Ranee	Constraints
Collect Adults Throughout Run	S. Steelhead	NA	NA	NA	
	W. Steelhead	NA	NA	NA	
Spawning Pop. >500	S. Steelhead	NA	NA	NA	
	W. Steelhead	NA	NA	NA	
Spawning Ratio Male:Female	S. Steelhead	NA	NA	NA	
	W. Steelhead	NA	NA	NA	

Ob;ecfive 4

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	S. Steclhead	Yes	Yes	--	
	W. Steelhead	Yes	Yes	--	

Objective 5

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes	--	
TSS Max Effluent	All	cl5 mg/l	Yes	--	
SS Effluent	All	<0.1 ml/l	Yes	--	
SS Max Effluent	All	co.2 ml/l	Yes	--	
Downstream Temp	All	Varies	Yes	--	
PH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	Yes	--	

Objective 6

Measures	Species	Hatcherv Goal	5-Year Average	Ranne	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constraints/Comments-Oak Springs Hatchery

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. Water delivery system to rearing ponds is limiting fish production potential.
2. Agricultural runoff is contaminating the Oak Springs, which often leads to fish disease problems.
3. There are inadequate numbers of rearing containers to rear small groups of fish.
4. Lack adequate isolation egg incubation and early rearing facilities to meet fish production goals.
5. There are currently no chilling capabilities for incubation.
6. Need predator control measures to control avian predation.
7. Lack of funding over the past decade has created a deferred maintenance and equipment backlog.
8. The hatchery access road needs improvement so that fish transfers will not be hindered during the winter months.

Oxbow Hatchery and Satellites
(Wahkeena and Herman Creek Ponds)

INTRODUCTION

Oxbow Hatchery is located approximately 2 miles east of Cascade Locks, Oregon. Site elevation is 100 feet above sea level.

Rearing facilities are in fair to good condition and consist of 12 concrete raceways, 32 deep troughs and 32 shallow troughs. The hatchery obtains its water supply from Oxbow Springs through gravity flow. The Oxbow Springs flow dwindles to about 300 gpm in the summer and fall and is not used for rearing fish during that period.

Herman Creek Ponds (upper and lower) and Wahkeena Pond are operated as a satellite facilities. The Herman Creek facility is located about 1/2 mile east of the hatchery. Rearing facilities are in fair to good condition and consist of two asphalt rearing ponds and two concrete raceways. Wahkeena Pond is located along the Columbia River approximately 11 miles west of Bonneville Dam. The pond covers approximately 18 acres and has an estimated volume of 180 acre-feet. A total of 5.0 FTE's is used to operate Oxbow Hatchery and the satellite facilities.

PURPOSE

Oxbow Hatchery was originally constructed in 1913 to provide additional rearing facilities for Bonneville Hatchery. It was relocated to its present site in 1937 following the construction of Bonneville Dam. Oxbow operated as a state-funded hatchery until 1952 when it was remodeled and expanded as part of the Columbia River Fisheries Development Program (Mitchell Act)-a program to enhance declining fish runs in the Columbia River Basin.

The hatchery is presently used for interim egg incubation and early rearing of spring chinook, fall chinook and coho. No adult fish are collected or spawned at Oxbow and there are no fish released at this facility. Herman Creek Ponds is used as an interim rearing site for coho transferred in from other facilities. Fish are eventually transferred to Bonneville Hatchery for acclimation and release. Wahkeena Pond serves as a rearing and release site for coho transferred from Oxbow Hatchery.

GOALS

Produce fall chinook, spring chinook and coho that will contribute to NE Pacific and Columbia River Basin commercial and sport fisheries.

OBJECTIVES

Objective 1: Hatchery Production

Coho

Produce 1.5 million smolts (100,000 pounds) for release into the Columbia River from Wahkeena Pond.

Produce 2 million fingerlings (83,850 pounds) at Upper Herman Creek Pond for transfer to Bonneville Hatchery.

Spring Chinook

Produce 150,000 fingerlings for transfer to Bonneville Hatchery (Deschutes stock).

Produce 390,000 fingerlings (1,950 pounds) for transfer to Bonneville Hatchery (Carson stock).

Produce 642,000 fingerlings (5,135 pounds) for transfer to Clackamas Hatchery (Clackamas stock).

Fall Chinook

Produce 3.2 million fry (3,200 pounds) for transfer to Bonneville Hatchery.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices associated with anadromous fish production at this facility. Because ODFW hatcheries-are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

There are no adult fish collected at this facility. Eggs or fry are received from a number of other hatcheries.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Fall Chinook: Transfer eggs from Big Creek Hatchery for incubation; transfer 3.2 million fry to Bonneville Hatchery for rearing and release.

Spring Chinook

- Transfer eggs (Deschutes stock) from Bonneville Hatchery; rear 150,000 fish to a size of 200 fish/pound; transfer back to Bonneville Hatchery for -final rearing and release.

- Transfer eggs (Carson stock) from Carson National Fish Hatchery; rear 390,000 fish to a size of 200 fish/pound; transfer to Bonneville Hatchery for final rearing and release.

- Transfer eggs from Clackamas Hatchery; rear 642,000 fish to a size of 125 fish/pound; transfer back to Clackamas for final rearing and release.

Coho

- Transfer eggs from Cascade and Sandy hatcheries; rear 2 million fish to a size of 150 fish/pound; transfer to Wahkeena Pond and rear to a size of 15 fish/pound; release into the Columbia River in mid-May. A component of the release is coded-wire tagged.

- Transfer fingerlings (150 fish/pound) from Cascade Hatchery; rear 2 million fish to a size of 16-30 fish/pound; transfer to Bonneville Hatchery for final rearing and release. A component of the 2 million fish is coded-wire tagged prior to transfer to Bonneville Hatchery.

Objective 3: Maintain stock integrity and genetic diversity.

Broodsfock Selection and Spawning

There are no adult fish collected or spawned at Oxbow Hatchery or the satellite facilities.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.
- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.
- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density-Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Oxbow Hatchery and Satellites

Health Monitoring

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each fish lot at the hatchery. The sample includes a minimum of 10 moribund/dead fish (if available) and 4-6 live fish per lot.

- At spawning, if adults are held in lower Herman Creek ponds, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each salmon lot. If prespawning mortality level is high, necropsies are conducted on dead adult fish for bacteria, parasites and other causes of death.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor for disinfection.
- Juvenile fish are administered antibiotics orally as needed for the control of bacterial infections.
- Formalin is dispensed into water for control of parasites and fungus on eggs, juveniles and adults. Treatment dosage and exposure time varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as "low regulatory priority" are used for treatments.
- Each year, after fish are released, Wahkeena Pond is drained and treated with copper sulfate to prevent eye fluke infections.

Sanitation

- All eggs brought to Oxbow Hatchery are surface-disinfected with iodophor.
- All equipment (e.g., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.
- Different lots of fish/eggs at Oxbow Hatchery are physically segregated from each other by separate ponds, incubator units and water supplies. At Herman Creek Ponds, fish are segregated by separate ponds at the upper site, but water from the upper ponds is the influent for the lower ponds.
- Fish transport trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

- Total Suspended *Solids (TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable Solids (SS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *pH*—measured quarterly when settleable solids are measured.

- *Wafer Temperatures*-daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- *Dissolved Oxygen (DO)*—measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

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- *Monthly Ponded Report*-updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).

- *Mark Recovery Report*-details sex, fish length and tag information from all marked adult fish that are captured.

- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish Loss and Treatment* Report-records disease problems and daily mortality.

- *Fish Liberation Reports*—details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap and Barrier Log*—records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

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Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Communication with the General Public

Oxbow Hatchery receives approximately 750 visitors per year.

PERFORMANCE STANDARDS-OXBOW HATCHERY AND SATELLITES

Objective 1

Measures	Species	Hatchery Goal[1]	5-Year Average	Range	Constraints
Adult Capture	Fall Chinook	NA	NA	NA	
	Spr. Chinook	NA	NA	NA	
	Coho	NA	NA	NA	
Adult Prespawning Survival	Fall Chinook	NA	NA	NA	
	Spr. Chinook	NA	NA	NA	
	Coho	NA	NA	NA	
Egg-take	Fall Chinook	NA	NA	NA	
	Spr. Chinook	NA	NA	NA	
	Coho	NA	NA	NA	
Green Egg-to-Fry Survival	Fall Chinook	95%	NA	NA	
	Spr. Chinook	95%	NA	NA	
	Coho	95%	NA	NA	
Fry-to-Smolt Survival	Fall Chinook	95%	NA	NA	
	Spr. Chinook	95%	NA	NA	
	Coho	95%	20.7%	11.5-42.0%	
Fish Releases	Fall Chinook	0	0	0	
	Spr. Chinook	0	0	0	
	Coho	1,500,000	578,200	39K-1,900K	1
Egg Transfers	Fall Chinook	0	--[2]	--[2]	
	Spr. Chinook	0	--[2]	--[2]	
	Coho	0	--[2]	--[2]	
Fish Transfers	Fall Chinook	3,200,000	--[2]	--[2]	
	Spr. Chinook	1,182,000	--[2]	--[2]	
	Coho	2,000,000	--[2]	--[2]	
Adults Passed Upstream	Fall Chinook	NA	NA	NA	
	Spr. Chinook	NA	NA	NA	
	Coho	NA	NA	NA	
Percent Survival	Fall Chinook	NA	NA	NA	
	Spr. Chinook	NA	NA	NA	
	Coho	NA	1.14%	O-5.19%	

NA=Not applicable.
[1] Based on 1992 fish production goals.
[2]Not estimated for this report.

Ob'ecfive 2

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Fall Chinook	NA	NA	NA	
	Spr. Chinook	NA	NA	NA	
	Coho	15	16.8	14.7-34.0	
Acclima tion	Fall Chinook	NA	NA	NA	
	Spr. Chinook	NA	NA	NA	
	Coho	Yes	Yes	--	

Objective 3

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Fall Chinook	NA	NA	NA	
	Spr. Chinook	NA	NA	NA	
	Coho	NA	NA	NA	
Spawning Pop. >500	Fall Chinook	NA	NA	NA	
	Spr. Chinook	NA	NA	NA	
	Coho	NA	NA	NA	
Spawning Ratio Male:Female	Fall Chinook	NA	NA	NA	
	Spr. Chinook	NA	NA	NA	
	Coho	NA	NA	NA	

Objective 4

Measures	Species	Hatcherv Goal	5-Year Averaee	Range	Constraints
Adhere to Disease Policy	Fall Chinook	Yes	Yes	--	
	Spr. Chinook	Yes	Yes	--	
	Coho	Yes	Yes	--	

Ob:ecfive 5

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes	--	
TSS Max Effluent	All	<15 mg/l	Yes	--	
SS Effluent	All	co.1 ml/l	Yes	--	
SS Max Effluent	All	co.2 ml/l	Yes	--	
Downstream Temp	All	Varies	Yes	--	
PH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	Yes	--	

Obiecfive 6

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constraints/Comments-Oxbow Hatchery and Satellites

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. Production is constrained by the available water supply.
2. A pollution abatement pond is needed for two Herman Creek ponds.
3. Water intake modifications are needed at lower Herman Creek to make year-round rearing feasible.
4. Need Canadian-style troughs and water heating capabilities to bring small lots of fish together for ponding.
5. Lack of funding over the past decade has created a serious deferred maintenance and equipment backlog.
6. Need capabilities to enumerate smolt production when released at Wahkeena Pond.
7. Inadequate office area to serve personnel.

Roaring River Hatchery

INTRODUCTION

Roaring River Hatchery is located along Roaring River (tributary to Crabtree Creek of the South Santiam River in the Willamette Basin) about 18 miles northeast of Albany, Oregon. Facility elevation is 570 feet above sea level. The hatchery is staffed with 4.8 FTE's.

Six rearing ponds were rebuilt in 1987 and are in good condition; 12 rearing ponds remain in poor condition. Water rights total 11,225 gpm from Roaring River. Water is delivered by gravity flow. Some water is pumped through a filter system to insure a clean supply for egg incubation and starter tanks. Low flow available to the hatchery is 3,366 gpm in October and the high flow is about 15,000 gpm during the winter/spring. Water is reused from the upper to lower ponds.

PURPOSE

Roaring River Hatchery was constructed in 1924 and is operated with state funds. Many improvements have been made to the hatchery since original construction. In 1987, six new rearing ponds were constructed to replace the original ponds.

The hatchery is mixed-stock facility producing both anadromous fish and resident trout. The hatchery is used for rearing summer steelhead and for egg incubation and rearing of winter steelhead. The rainbow trout program involves broodstock maintenance, spawning, egg incubation and rearing.

GOALS

Summer Steelhead: Increase the annual sport catch to 2,450 fish in the Molalla River, 700 in the Santiam River mainstem, and 4,500 in the North Santiam River.

Winter Steelhead: Maintain an average annual sport catch of approximately 600 late-run fish from the Molalla subbasin and 500 early-run fish from the Molalla River. Meet subbasin fishery management objectives for the Molalla River and North Santiam River systems.

Rainbow Trout: Meet subbasin fishery management objectives for six ODFW Fishery Districts.

OBJECTIVES

Objective 1: Hatchery Production

Summer Steelhead
Produce 30,000 smolts (6,670 pounds) for release into the Molalla River.

Produce 105,000 smolts (23,335 pounds) for release into the North Santiam River System.

Winter Steelhead
Produce 62,500 smolts (12,500 pounds) for release into the Molalla River.

Rainbow Trout
Provide 2,089,000 eggs to ODFW hatcheries.

Produce 6,000 fingerlings (30 pounds) for release into Crabtree Lakes.

Produce 241,500 legal-sized trout (80,333 pounds) for release into streams and standing water bodies in six ODFW Fishery Districts.

Provide 800,000 fingerlings (2,476 pounds) for ODFW hatcheries.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices associated with anadromous fish production at this facility. Because ODFW hatcheries -are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

No adults are collected at this hatchery. Summer steelhead fingerlings are shipped in from Oak Springs Hatchery. Winter steelhead eggs are shipped in from Big Creek Hatchery.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Steelhead are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. All steelhead are released off-station. The specific rearing and release strategies used at this hatchery are outlined below.

Summer Steelhead: Rear 135,000 fish to a size of 4.5 fish/pound and release off-station (nonacclimated) into the Molalla (30,000), Little North Fork Santiam (20,000), and North Santiam (85,000) rivers in April. All fish are marked (fin clipped) prior to release.

Winter Steelhead: Rear 62,500 fish to size of 5 fish/pound and release off-station (nonacclimated) into the Molalla River in April. All fish are marked prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

No anadromous fish spawning is conducted at this hatchery. See the Big Creek Hatchery Plan for winter steelhead spawning protocols and the South Santiam Hatchery Plan for summer steelhead spawning protocols.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-AU Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.

- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.

- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks,

- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.

- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Roaring River Hatchery

Health Monitoring

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each fish lot at the hatchery. The sample includes a minimum of 10 dead fish (if available) and 4-6 live fish per lot.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each lot of rainbow trout. Feeding fry (60 fish) are subsequently sampled for IPN virus because the brood fish are not killed at spawning. If prespawning mortality level is above normal, necropsies are conducted on dead adult fish for bacteria, parasites and other causes of death.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor for disinfection.

- Juvenile fish are administered antibiotics orally, as needed, for the control of bacterial infections.

- Formalin is dispensed into water for control of parasites and fungus on eggs, juveniles and adult trout. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as "low regulatory priority" are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor.

- All equipment (e.g., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.

- Different lots of fish and eggs are physically segregated from each other by separate ponds, incubator units and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

- *Total* Suspended *Solids (TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable Solids* (W-measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *pH*—measured quarterly when settleable solids are measured.

- *Water Temperatures*-daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- *Dissolved* Oxygen *(DO)*—measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

Objective 6: Communicate effectively with other fish producers, managers and the public.

Coordination/Communication within ODFW

Annual Fish Production Meetings: ODFW conducts meetings throughout the state to set annual fish production goals for all public hatcheries in Oregon. These meetings involve the participation of ODFW research, management and fish culture staff as well as representatives from applicable federal agencies and tribes.

Record Keeping: The following records are kept at all ODFW hatcheries:

- *Egg and Fry Report*-records all egg and fry movements, treatments, etc.

- *Anadromous Adult Transaction Report*-details the collection and disposition of all adult fish.

- *Monthly Ponded Report*-updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).

- *Mark Recovery Report*-details sex, fish length and tag information from all marked adult fish that are captured.

- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish Loss and Treatment Report*-records disease problems and daily mortality.

- *Fish Liberation Reports*—details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap and Barrier* Log-records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly Progress Report*-document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

Hatcherv Management Information Svstem (HMIS): Computerized system to collect, report, summarize and analyze hatchery production data. This system is a tool to be used in production control at all hatchery management levels.

Coordinated Information Svstem (CIS): Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Interagency Coordination/Communication

Production Advisorv Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisorv Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatcherv Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Communication with the General Public

Roaring River Hatchery receives approximately 15,000 visitors per year.

PERFORMANCE STANDARDS-ROARING RIVER HATCHERY

Objective 1

Measures	Species	Hatchery Goal[1]	5-Year Average	Range	Constraints
Adult Capture	S. Steelhead	NA	NA	NA	
	W. Steelhead	NA	NA	NA	
Adult Prespawning Survival	S. Steelhead	NA	NA	NA	
	W. Steelhead	NA	NA	NA	
Egg-take	S. Steelhead	NA	NA	NA	
	W. Steelhead	NA	NA	NA	
Green Egg-to-Fry Survival	S. Steelhead	NA	NA	NA	
	W. Steelhead	NA	NA	NA	
Fry-to-Smolt Survival	S. Steelhead	95%	84.9%	54-98%	
	W. Steelhead	95%	73.0%	59-79%	
Fish Releases	S. Steelhead	135,000	151,635	138K-164K	
	W. Steelhead	62,500	73,700[2]	66K-77K	
Egg Transfers	S. Steelhead	0	--[3]	--[3]	
	W. Steelhead	0	_[3]	--[3]	
Fish Transfers	S. Steelhead	0	--[3]	--[3]	
	W. Steelhead	0	_[3]	--[3]	
Adults Passed Upstream	S. Steelhead	NA	NA	NA	
	W. Steelhead	NA	NA	NA	
Percent Survival	S. Steelhead	NA	unknown	Unknown	
	W. Steelhead	NA	unknown	Unknown	

NA=Not applicable.
‘Based on 1991 fish production goals.
*Four year average.
[3]Not estimated for this report.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	S. Steelhead	4.54	6.2	5.0-7.5	
	W. Steelhead	5.05	5.9	5.6-6.2	1,2
Acclimation	S. Steelhead	No	No	--	
	W. Steelhead	No	No	--	

Obiecfive 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	S. Steelhead	NA	NA	NA	
	W. Steelhead	NA	NA	NA	
Spawning Pop. >500	S. Steelhead	NA	NA	NA	
	W. Steelhead	NA	NA	NA	
Spawning Ratio Male:Female	S. Steelhead	NA	NA	NA	
	W. Steelhead	NA	NA	NA	

Objective 4

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	S. Steclhead	Yes	Yes	--	
	W. Steelhead	Yes	Yes	--	

[4] Hatchery goal revised from 5.0 to 4.5 fish/pound in 1992.
[5] Hatchery goal revised from 6.0 to 5 0 fish/pound in 1992.

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes	--	
TSS Max Effluent	All	<15 mg/l	Yes	--	3
SS Effluent	All	<0.1 ml/l	Yes	--	
SS Max Effluent	All	<0.2 ml/l	Yes	--	
Downstream Temp	All	Varies	Yes	--	
PH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	Yes	--	

Obiecfive 6

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constraints/Comments-Roaring River Hatchery

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. Pathogen-free water supply is needed, especially for egg development and early rearing.

2. Rearing pond modifications or development are needed to meet fish management needs.

3. Modification to six rearing ponds is needed to meet state water quality standards.

4. Numbers and size of juveniles received from Oak Springs Hatchery must be at target size to make release size.

Round Butte Hatchery and Satellite
(Pelton Ladder)

INTRODUCTION

Round Butte Hatchery is located on the Deschutes River at the base of Round Butte Dam, 10 miles west of Madras, Oregon. Hatchery elevation is 1,745 feet above sea level. The facility is funded by Portland General Electric (PGE).

Rearing facilities include 10 Burrows ponds, 1 oval pond, 2 adult holding ponds and 28 starter tanks. These facilities are in good condition. Water is supplied to the hatchery from tunnels in the canyon wall that collect seepage from the upstream reservoir (Lake Billy Chinook). Water is not reused in any of the rearing units.

Pelton Ladder is operated as a satellite rearing facility. The facility is a former fish passage ladder which has had some sections converted for rearing fish. It is located at the base of Pelton Reservoir (Lake Simtustus), an impoundment on the Deschutes River. There are no water rights held for Pelton Ladder. A constant water flow of 3,591 gpm is provided from Lake Simtustus.

Round Butte Hatchery is staffed with 4.7 FTE's. This includes the personnel required to operate the Pelton Ladder facility.

PURPOSE

Round Butte Hatchery was constructed in 1972 to mitigate for the fishery losses caused by Pelton/Round Butte Hydroelectric Complex. Round Butte and its satellite (Pelton Ladder) are used for adult collection, egg incubation and rearing of spring chinook, summer steelhead and brown trout.

GOALS

The mitigation agreement requires PGE to return an average annual run of 1,800 summer steelhead adults and 1,200 spring chinook adults to the project area (i.e., Pelton trap). At least 600 of the returning spring chinook adults must be mature females.

OBJECTIVES

Objective 1: Hatchery Production

Summer Steelhead
Produce 162,000 smolts (40,500 pounds) for release into the Deschutes River.

Spring Chinook
Produce 270,000 smolts (33,335 pounds) for release into the Deschutes River.

Brown Trout
Produce 20,050 legal-sized fish (10,025 pounds) for release into Lake Simtustus.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices associated with anadromous fish production at this facility. Because ODFW hatcheries-are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

Summer Steelhead: Adults arrive in the Deschutes River from August through April. Peak spawning occurs in February. Adults are collected at a trap below Pelton Ladder and at a trap at Sherars Falls. Fish are then transported to Round Butte Hatchery for holding and spawning.

Spring Chinook: Entry of adults into the subbasin occurs between May and August. Spawning occurs in late August. Fish are collected at the Pelton Ladder trap and transported to Round Butte Hatchery for spawning.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Summer Steelhead: Rear 162,000 smolts to a size of 4 fish/pound and release directly into the Deschutes River near Pelton Ladder in April.

Spring Chinook: Rear 270,000 fish at Round Butte Hatchery. Transfer 210,000 to Pelton Ladder for acclimation and final rearing; volitionally release in April at a size of 9 fish/pound. Rear the remaining 60,000 fish at Round Butte Hatchery to a size of 6 fish/pound; release directly into the Deschutes River near the Pelton Ladder in April. An evaluation of ladder-reared fish vs. hatchery-reared fish is being conducted. The 120,000 fish involved in this evaluation are coded-wire tagged. All remaining smolts not involved in this evaluation are fin-clipped prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the following interim practices are currently being used at Round Butte Hatchery:

Summer Steelhead: The interim practice is to collect adults throughout most of the run and incorporate wild fish into the Deschutes summer steelhead broodstock. Spawnings of wild fish and hatchery fish are presently conducted separately (i.e., only wild/wild matings and hatchery/hatchery matings are conducted). Of the current hatchery releases, 54,000 fish are the result of wild/wild crosses and 108,000 are hatchery/hatchery crosses. Only Deschutes stock summer steelhead is used for broodstock. Future programs involving mating wild and hatchery fish are being developed to help improve the current broodstock. Collection of wild fish for this program would occur at Sherars Falls and Pelton trap.

Spring Chinook: Adults are collected throughout the entire run and spawned at a 1:1 male to female spawning ratio. Wild fish (approximately 5 percent) are incorporated into the hatchery population each year. Only Deschutes stock spring chinook is used for broodstock.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

<u>Disease Control</u> (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.
- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

<u>Disease Prevention</u> (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.
- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Round Butte Hatchery and Satellite

Health Monitoring

- Monthly health monitoring examinations of clinically diseased fish are conducted on each fish lot at the hatchery. The sample includes a minimum of 10 dead fish (if available) per lot. Live "healthy" fish are not usually examined because parasites have not been found in the juveniles reared in hatchery spring water.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each lot of adult salmon and steelhead. If prespawning mortality level is above normal, necropsies are conducted on dead adult fish for bacteria, parasites and other causes of death.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial cr preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- Adult spring chinook are injected with antibiotics for the control of bacterial diseases. Adult steelhead are not injected with antibiotics.

- At spawning, eggs are water-hardened in iodophor for disinfection.

- Juvenile fish are administered antibiotics orally as needed for the control of bacterial infections.

- Formalin is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon and steelhead. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as “low regulatory priority” are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor.

- All equipment (e.g., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.

- Different lots of fish and eggs are physically segregated from each other by separate ponds, incubator units and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

- *Total* Suspended *Solids (TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable* Solids *(SS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *pH*—measured quarterly when settleable solids are measured.

- *Water Temperatures*-daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- *Dissolved* Oxygen (DO)--measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

Objective 6: Communicate effectively with other fish producers, managers and the public.

Coordination/Communication within ODFW

Annual Fish Production Meetings: ODFW conducts meetings throughout the state to set annual fish production goals for all public hatcheries in Oregon. These meetings involve the participation of ODFW research, management and fish culture staff as well as representatives from applicable federal agencies and tribes.

Record Keeping: The following records are kept at all ODFW hatcheries:

- *Egg and Fry Report*-records all egg and fry movements, treatments, etc.
- *Anadromous Adult Transaction Report*-details the collection and disposition of all adult fish.
- *Monthly Ponded Report*-updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).
- *Mark Recovery Report*-details sex, fish length and tag information from all marked adult fish that are captured.
- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).
- *Fish Loss and Treatment Report*-records disease problems and daily mortality.
- *Fish Liberation Reports*—details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).
- *Trap and Barrier* Log-records whenever any fish trap or barrier is activated or closed.
- *Visifor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly Progress Report*-document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

Hatchery Management Information System (HMIS): Computerized system to collect, report, summarize and analyze hatchery production data. This system is a tool to be used in production control at all hatchery management levels.

Coordinated Information System (CIS): Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Interagency Coordination/Communication

Production Advisory Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatchery Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Other: Meetings between ODFW, Warm Springs Tribe, PGE, private land owners, Oregon State Police, Bureau of Land Management, and special interest groups are periodically held to discuss Deschutes River management issues.

PERFORMANCE STANDARDS—ROUND BUTTE HATCHERY AND SATELLITE

Objective 1

Measures	Species	Hatchery Goal[1]	5-Year Average	Range	Constraints
Adult Capture	S. Steelhead	380	2,525	1,116-5,589	4
	Spr. Chinook	500	2,039	1,798-2,306	
Adult Prespawning Survival	S. Steelhead	95%	89%	80.1-93.2%	
	Spr. Chinook	95%	47.3%	50-80%	5
Egg-take	S. Steelhead	700,000	879,000	730K-1,042K	
	Spr. Chinook	575,000	477,000	321K-642K	
Green Egg-to-Fry Survival	S. Steelhead	95%	62.6%	48-77%	
	Spr. Chinook	95%	71.1%	54.9-80.2%	
Fry-to-Smolt Survival	S. Steelhead	95%	81%	62-99%	2
	Spr. Chinook	95%	92.5%	90.6-97.6%	
Fish Releases	S. Steelhead	162,000	160,570	157K-163K	1,2,3
	Spr. Chinook	270,000	216,758	259K-273K	1,3,5
Egg Transfers	S. Steelhead	0	--[2]	--[2]	
	Spr. Chinook	0	--[2]	--[2]	
Fish Transfers	S. Steelhead	0	--[2]	--[2]	
	Spr. Chinook	0	--[2]	--[2]	
Adults Passed Upstream	S. Steelhead	NA	--[2]	--[2]	
	Spr. Chinook	NA	--[2]	--[2]	
Percent Survival	S. Steelhead[3]	NA	4.8%	2.3-8.5%	
	Spr. Chinook	NA	1.14%	0.75-2.06%	

NA=Not applicable.
[1] Based on 1991 fish production goals.
[2] Not estimated for this report.
[3] Recent survival is return to Deschutes River; estimate based on in-river fish populations.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	S. Steelhead	4.0	4.4	4.2-4.7	
	Spr. Chinook	6.0-9.0	8.0	7.0-9.0	
Acclimation	S. Steelhead	No	No	--	
	Spr. Chinook	Partial	Partial	--	

Ob'ective 3

Measures	Species	Hatcher-v Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	S. Steelhead	Yes	Yes	--	
	Spr. Chinook	Yes	Yes	--	
Spawning Pop. >500	S. Steelhead	Yes	Yes	--	
	Spr. Chinook	Yes	Yes	--	
Spawning Ratio Male:Female	S. Steelhead	1:1	Yes	--	
	Spr. Chinook	1:1	Yes	--	6

Ob;ective 4

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	S. Steelhcad	Yes	Yes	--	
	Spr. Chinook	Yes	Yes	--	

Ob'ective 5

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes	--	
TSS Max Effluent	All	<15 mg/l	Yes	--	
SS Effluent	All	co.1 ml/l	Yes		
SS Max Effluent	All	co.2 ml/l	Yes		
Downstream Temp	All	Varies	Yes	--	
pH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	Yes		

Objective 6

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constraints/Comments-Round Butte Hatchery and Satellite

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. The size of the water delivery pipe limits water flows that can be delivered to the hatchery.

2. Adult summer steelhead diagnosed with IHN has led to the destruction of large numbers of fry and fingerlings in the past.

3. Number of rearing ponds limits flexibility in late summer. There is insufficient space available for additional gravity-fed ponds.

4. Presently, capture of wild summer steelhead adults occurs too late to fully accomplish the spawning goals (i.e., wild x hatchery matings).

5. Water chilling capacity is inadequate to provide water to enough incubator stacks. The egg-take ends up in two 25-tray incubator stacks which poses some risk for disaster (although it has never happened).

6. Sex ratio of returning spring chinook adults sometimes hampers spawning ratio goals.

Sandy Hatchery

INTRODUCTION

Sandy Hatchery is located along Cedar Creek (a Sandy River tributary) near the town of Sandy, Oregon. Hatchery elevation is 500 feet above sea level. The facility is staffed with 4.5 FTE's.

Rearing units are in fair to good condition and consist of 20 raceways, 24 incubation troughs and I adult holding pond. Water rights total 12,577 gpm from a spring and Cedar Creek. Water is supplied to the hatchery by gravity flow from Cedar Creek with a high flow of 8,000 gpm in March and a low flow of 1,800 gpm in July/August. A small amount of spring water is also used. Water is recirculated in the rearing ponds during the summer months. Adult holding ponds are supplied with water from the rearing ponds.

PURPOSE

Sandy Hatchery began operation in 1951 as a state-funded facility. In 1959, the hatchery became part of the Columbia River Fisheries Development Program (Mitchell Act)—a program to enhance declining fish runs in the Columbia River Basin. The facility is currently used for adult collection, egg incubation and rearing of coho. It also supplies coho eggs to a variety of other facilities and programs.

GOALS

Produce coho that will contribute to NE Pacific and Columbia River Basin commercial and sport fisheries while providing adequate escapement for hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Produce 1,000,000 coho smolts (66,670 pounds) for on-station release.

Provide 2,000,000 green coho eggs to the Eagle Creek National Fish Hatchery as a backup to its program.

Provide a total of 2,445,450 eyed coho eggs to McKenzie, Oxbow and Klamath hatcheries, Oregon's Salmon and Trout Enhancement Program and Oregon State University.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices associated with anadromous fish production at this facility. Because ODFW hatcheries are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

Adult coho return to the Sandy River between October and mid-December. Peak spawning occurs during the first three weeks of November. Fish are collected at the hatchery. There is some adult escapement above the hatchery during high water flows.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations. The specific rearing and release strategies used at this hatcherv are outlined below.

Coho: Rear 1,000,000 fish to a size of 15 fish / pound and release on-station during May and June. A component of the release is coded-wire tagged.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the following interim practices are used at Sandy Hatchery:

Coho: Collect adult coho throughout the run and maintain a 1:3 male to female spawning ratio. The major portion of the run is comprised of hatchery fish. Only Sandy River coho is used for broodstock.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-Ail Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.
- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are-submitted to Fish Pathology from each hatchery.

- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events, It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Sandy Hatchery

Health Monitoring

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each fish lot. The sample includes a minimum of 10 moribund/dead fish (if available) and 4-6 live fish per lot.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each salmon lot. If the prespawning mortality level is above normal, necropsies are conducted to identify bacteria, parasites and other causes of death.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor for disinfection.

- Juvenile fish are administered antibiotics orally, as needed, for the control of bacterial infections.

- Formalin is dispensed into water for control of parasites and fungus on eggs and juveniles. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as “low regulatory priority” are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor.

- All equipment (e.g., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.

- Different lots of fish/eggs are physically segregated from each other by separate ponds, incubator units and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

- A barrier prevents adult salmon or steelhead from entering Cedar Creek above the hatchery intake.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

- Total Suspended *Solids (TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable Solids* (W-measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *pH*—measured quarterly when settleable solids are measured.

- *Wafer Temperatures*—daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- *Dissolved* Oxygen (DO&measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

Objective 6: Communicate effectively with other fish producers, managers and the public.

Coordination/Communication within ODFW

Annual Fish Production Meetings: ODFW conducts meetings throughout the state to set annual fish production goals for all public hatcheries in Oregon. These meetings involve the participation of ODFW research, management and fish culture staff as well as representatives from applicable federal agencies and tribes.

Record Keeping: The following records are kept at all ODFW hatcheries:

- *Egg and Fry Report*-records all egg and fry movements, treatments, etc.

- *Anadromous Adult Transaction Report*-details the collection and disposition of all adult fish.

- *Monfhly Ponded Report*—updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).

- *Mark Recovery Report*-details sex, fish length and tag information from all marked adult fish that are captured.

- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish Loss and Treatment Report*-records disease problems and daily mortality.

- *Fish Liberation Reports*—details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap and Barrier* Log-records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly* Progress Report-document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

Hatcherv Management Information Svstem (HMIS): Computerized system to collect, report, summarize and analyze hatchery production data. This system is a tool to be used in production control at all hatchery management levels.

Coordinated Information Svstem (CIS): Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

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In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the U.S. v. Oregon *Agreement.* Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Communication with the General Public

Sandy Hatchery receives approximately 10,000 visitors per year.

PERFORMANCE STANDARDS-SANDY HATCHERY

Objective 1

Measures	Species	Hatchery Goal[1]	5-Year Average	Range	Constraints
Adult Capture	Coho	4,950	12,588	6,591-22,542	2,3
Adult Prespawning Survival	Coho	95%	96.0%	91.4-98.6%	2
Egg-take	Coho	6,000,000	6,219,000	4,847K-8,035K	3
Green Egg-to-Fry Survival	Coho	95%	88.7%	81.8-94.8%	4,5
Fry-to-Smolt Survival	Coho	95%	89.3%	81.6-96.9%	5,6,10
Fish Releases	Coho	1,000,000	992,965	890K-1,062K	1,6,10,11
Egg Transfers	Coho	4,443,450	--[2]	--[2]	
Fish Transfers	Coho	0	--[2]	--[2]	
Adults Passed Upstream	Coho	NA	2903	NA	
Percent Survival	Coho	NA	4.97%	2.36-8.81%	

NA=Not applicable.
[1]Based on 1991 fish production goals.
[2]Not estimated for this report.
[3]One year only.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Coho	15.0	14.5	13.1-15.0	
Acclimation	Coho	Yes	Yes	--	

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Coho	Yes	Yes	Yes	
Spawning Pop. >500	Coho	Yes	Yes	Yes	
Spawning Ratio Male:Female	Coho	1:3	Yes	Yes	

Objective 4

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	Coho	Yes	Yes	--	

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes	--	
TSS Max Effluent	All	<15 mg/l	Yes	--	
SS Effluent	All	<0.1 ml/l	Yes	--	
SS Max Effluent	All	<0.2 ml/l	Yes	--	
Downstream Temp	All	Varies	Yes	--	
PH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	Yes	--	

Objective 6

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constraints/Comments-Sandy Hatchery

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. Low water flows and high temperatures in the summer limit on-station production.
2. Property owners remove water from Cedar Creek during low flow periods which reduces water flows for hatchery use.
3. The adult holding pond is too small for the large number of fish handled at this facility.
4. Low water flows in Cedar Creek limit the timing of returning adults.
5. Pathogen-free water is needed, especially for egg development and rearing.
6. Heated or chilled water is needed to enhance egg incubation and early rearing.
7. Oxygen supplementation is needed to significantly increased fish production, especially during low flow periods.
8. Lack of funding over the past decade has created a serious deferred maintenance and equipment backlog.
9. A standby diesel generator is needed to supplement power during electrical outages.
10. Need to refurbish the rearing ponds.
11. Avian/furbearer predator control measures are needed at the hatchery.
12. Need larger outlet valves and discharge pipes.

South Santiam Hatchery and Satellite
(Stayton Ponds)

INTRODUCTION

South Santiam Hatchery is located on the South Santiam River just downstream from Foster Dam. Elevation of the facility is 500 feet above sea level. It is staffed with 4.2 FTE's.

Rearing facilities are in good condition and include an adult holding pond, 10 Burrows ponds (4,147 cubic feet each) and 4 Burrows ponds (5,022 cubic feet each). The adult holding pond is not used for rearing.

The hatchery currently receives water from Foster Reservoir. A total of 8,400 gpm is available for the rearing units. An additional 5,500 gpm is used in the adult holding pond. All rearing ponds receive single-pass water.

South Santiam Hatchery has one satellite facility, Stayton Ponds. The facility is located on the N. Fork Santiam River near the town of Stayton. The rearing facilities consist of old gravel pits of varying depths and shapes. There are two ponds located at this site. Stayton Ponds is staffed with 1.7 FTE's.

PURPOSE

South Santiam Hatchery began operation at its present location in 1968. It is funded by both the state of Oregon and the U.S. Army Corps of Engineers (COE). The COE's obligation is to mitigate for fishery losses caused by development of Foster and Green Peter dams. The hatchery is used as for adult collection, egg incubation and rearing of spring chinook and summer steelhead.

Stayton Ponds is operated as part of the Columbia River Fisheries Development Program (Mitchell Act)-a program to enhance declining fish runs in the Columbia River Basin. Bonneville Hatchery is used to start fall chinook for Stayton Ponds. Fish reared at Stayton Ponds are eventually released into Willamette River tributaries and at Bonneville Hatchery.

GOALS

<u>Spring Chinook and Steelhead</u>: The COE mitigation agreement requires the annual production of no more than 71,000 pounds of juvenile spring chinook and steelhead. This production level is designed to compensate for loss of 1,400 wild spring chinook spawners and 700 wild steelhead spawners above Foster Dam.

Fall Chinook: Produce lower river fall chinook that will contribute to NE Pacific and Columbia River Basin commercial and sport fisheries.

OBJECTIVES

Objective 1: Hatchery Production

Spring Chinook
Produce 300,000 smolts (33,340 pounds) for release into the South Santiam River.

Provide a total of 3,257,200 eggs to Willamette Hatchery, McKenzie Hatchery and Oregon's Salmon and Trout Enhancement Program.

Rear 605,000 smolts (40,350 pounds) for transfer to Clackamas Hatchery (Clackamas stock).

Fall Chinook
Rear 8,160,000 smolts (148,400 pounds) for release into Mill Creek, Molalla River, North Santiam River and the Columbia River.

Summer Steelhead
Produce 144,000 smolts (32,000 pounds) for release into the South Santiam River.

Produce 40,500 smolts (9,000 pounds) for release into the North Santiam River.

Provide 1,425,000 eggs to Bonneville and Oak Springs hatcheries.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices associated with anadromous fish production at this facility. Because ODFW hatcheries are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

Spring Chinook: Adult spring chinook return to the South Santiam River from May to September. Adults are collected at the Foster Dam fish collection facility located across the river from the hatchery. Fish are transported to the hatchery holding ponds until spawning in September.

Fall Chinook: No adult fall chinook are presently collected at this hatchery or its satellite facilities. The fall chinook reared at Stayton Ponds originate from fingerlings received from Bonneville Hatchery.

Summer Steelhead: Adults return to the South Santiam River from April to November. Adults are collected at the Foster Dam fish collection facility and transported to the hatchery. Fish are held in a fishway until spawning from December through February.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Spring Chinook: Transfer 310,000 smolts from Willamette Hatchery in October; rear at South Santiam Hatchery to a size of 9 fish/pound and release on-station in early March. All fish are marked (otolith) and a portion is also coded-wire tagged.

Fall Chinook: Rear 9,160,000 fish at Stayton Pond to a size of 55 fish/pound. Directly release all fish in May as follows:

- 300,000 into the Molalla River
- 2,000,000 into Mill Creek
- 4,860,000 into the N. Santiam River
- 2,000,000 into the Columbia River. These fish are acclimated at Bonneville Hatchery for two weeks before release. A portion of this release is coded-wire tagged.

Summer Steelhead: Rear 184,000 fish to a size of 4.5 fish/pound; truck and release 144,400 fish into the South Santiam River and 40,500 fish into the North Santiam River in April. The North Santiam releases are not acclimated. All steelhead are marked prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the following interim practices are currently being used at South Santiam Hatchery:

Spring Chinook: Broodstock is all hatchery fish that originated from the Willamette stock. Adults are spawned at a 1:1 or 1:2 male to female ratio depending upon the run size. The South Santiam stock is the preferred broodstock; however, Willamette stock is also acceptable.

Fall Chinook: No spawning occurs at Stayton Ponds.

Summer Steelhead: Broodstock is comprised of hatchery fish that originated from Skamania stock. More adults return to the trapping facility than are needed for hatchery production. None are passed above Foster Dam. Adults are spawned at a 1:1 male to female ratio. Any Skamania stock is acceptable for broodstock use, but Santiam stock is preferred.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.

- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.

- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.

- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at South Santiam Hatchery and Satellite

Health Monitoring

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each fish lot. The sample includes a minimum of 10 dead fish (if available) and 4-6 live fish per lot.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each salmon and steelhead lot. If the prespawning mortality level is above normal, necropsies are conducted to identify bacteria, parasites and other causes of death.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- Adult fall chinook, spring chinook and summer steelhead are injected with antibiotics for the control of bacterial diseases.

- At spawning, eggs are water-hardened in iodophor for disinfection.

- Juvenile fish are administered antibiotics orally, as needed, for the control of bacterial infections.

- Formalin is dispensed into water for control of parasites and fungus on eggs, juveniles, and adult salmon and steelhead. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as “low regulatory priority” are used for treatments.

Sanitation

- All equipment (i.e., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.

- Different lots of fish and eggs are physically segregated from each other by separate ponds, incubator units and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

- *Total* Suspended Solids *(TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable Solids* (W-measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- @-measured quarterly when settleable solids are measured.

- Water Temperatures-daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- *Dissolved* Oxygen *(DO)*—measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

Objective 6: Communicate effectively with other fish producers, managers and the public.

Coordination/Communication within ODFW

Annual Fish Production Meetings: ODFW conducts meetings throughout the state to set annual fish production goals for all public hatcheries in Oregon. These meetings involve the participation of ODFW research, management and fish culture staff as well as representatives from applicable federal agencies and tribes.

Record Keening: The following records are kept at all ODFW hatcheries:

- *Egg* and *Fry* Report-records all egg and fry movements, treatments, etc.

- *Anadromous Adult Transaction Report*-details the collection and disposition of all adult fish.

- *Monthly Ponded Report*-updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).

- *Mark Recovery* Reporf-details sex, fish length and tag information from all marked adult fish that are captured.

- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish* Loss *and Treatment* Report-records disease problems and daily mortality.

- *Fish Liberation* Reports-details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap and Barrier* Log-records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly* Progress Report-document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

Hatcherv Management Information Svstem (HMIS): Computerized system to collect, report, summarize and analyze hatchery production data. This system is a tool to be used in production control at all hatchery management levels.

Coordinated Information Svstem (CIS): Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Interagency Coordination/Communication

Production Advisorv Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisory Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatcherv Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement*. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at ali facilities, where applicable.

Communication with the General Public

South Santiam Hatchery receives approximately 8,000 visitors per year.

PERFORMANCE STANDARDS-SOUTH SANTIAM HATCHERY AND SATELLITE

Objective 1

Measures	Species	Hatchery Goal[1]	5-Year Average	Ranee	Constraints
Adult Capture	Spr. Chinook	714	5,806	4,107-7,464	5,9
	S. Steelhead	1,536	6,055	1,316-8,990	5,9
	Fall Chinook	NA	NA	NA	
Adult Prespawning Survival	Spr. Chinook	95%	83.3%	79.7-85.5%	1,4,5
	S. Steelhead	95%	58%	47-74%	1,4,5
	Fall Chinook	NA	NA	NA	
Egg-take	Spr. Chinook	3,800,000	2,846,000	1,363K-3,953K	1,3,4,5,9
	S. Steelhead	1,700,000	1,351,000	1,044K-1,736K	1,3,4,5,9
	Fall Chinook	NA	NA	NA	
Green Egg-to-Fry Survival	Spr. Chinook	95%			3,14
	S. Steelhead	95%	68.8%	19.7-89.5%	3,14
	Fall Chinook	NA	NA	NA	
Fry-to-Smolt Survival	Spr. Chinook	95%	98.4%	96-99%	3,6-10,12,13,16
	S. Steelhead	95%	87.0%	75-96%	3,6-10,12,13,15
	Fall Chinook	95%	74.2%	70-88%	
Fish Releases	Spr. Chinook	300,000	259,126	205K-308K	7,9,10,13,15
	S. Steelhead	184,500	197,061	177K-207K	8,9,10,13,15
	Fall Chinook[2]	9,160,000	5,755,060	4,598K-7,480K	6,15
Egg Transfers	Spr. Chinook	3,257,200	--[3]	--[3]	
	S. Steclhcad	1,425,000	--[3]	--[3]	
	Fall Chinook	0	--[3]	--[3]	
Fish Transfers	Spr. Chinook	605,000	--[3]	--[3]	
	S. Steelhead	0	--[3]	--[3]	
	Fall Chinook	0	--[3]	--[3]	
Adults Passed Upstream	Spr. Chinook	NA	NA	NA	
	S. Steelhead	NA	NA	NA	
	Fall Chinook	NA	NA	NA	

NA=Not applicable.
[1]Based on 1991 fish production goals.
[2]Stayton Ponds.
[3]Not estimated for this report.

Ob'ective 1 (continued)

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Percent Survival	Spr. Chinook	NA	1.03%[4]	0.79-1.34%	2,6,7,9
	S. Steelhead[5]	NA	--[3]	--[3]	
	Fall Chinook[2]	NA	0.88%	0.11-3.39%	6

Objective 2

Measures	Species	Hatcher-v Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Spr. Chinook	9.0	9.4	8.2-10.4	6,7,12,13,15,16
	S. Steelhead	4.56	5.2	5.0-5.5	6,7,8,12-l 7
	Fall Chinook	55.0	54.5	43.8-63.0	
Acclimation	Spr. Chinook	Yes	Yes	--	2,9
	S. Steelhead	Partial	Partial	--	2,9
	Fall Chinook	Partial	Partial	--	

Objective 3

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Spr. Chinook	Yes	Yes	--	4,5
	S. Steelhead	Yes	Yes	--	4,5
	Fall Chinook	NA	NA	NA	
Spawning Pop. >500	Spr. Chinook	Yes	Yes	--	4,5
	S. Steelhead	Yes	Yes	--	4,5
	Fall Chinook	NA	NA	NA	
Spawning Ratio Male:Female	Spr. Chinook	1:1 (or 1:2)	Yes	--	
	S. Steelhead	1:1	Yes	--	
	Fall Chinook	NA	NA	NA	

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[4] Based on three years of data.
[5] Over the past five years, an average of 5,556 adults were recycled through the fishery by releasing fish in the South Santiam River below the hatchery.
[6] Goal increased to 4.5 fish/pound in 1992.

Objective 4

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	Spr. Chinook	Yes	Yes	--	
	S. Steelhead	Yes	Yes	--	
	Fall Chinook	Yes	Yes	--	

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes	--	
TSS Max Effluent	All	<15 mg/l	Yes	--	
SS Effluent	All	<0.1 ml/l	Yes	--	
SS Max Effluent	All	<0.2 ml/l	Yes	--	
Downstream Temp	All	Varies	Yes	--	
PH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	Yes	--	

Objective 6

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constraints/Comments-South Santiam Hatchery and Satellite

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. The adult holding pond is too small to meet existing program needs. A water quality concern exists as the water supply from the deep reservoir intake is low in dissolved oxygen.

2. There is no way to directly release fish from the rearing ponds into the river. Fish must be loaded into liberation trucks for release.

3. The release of MN-positive winter steelhead adults above the hatchery, and the potential of spring chinook being released in the near future has created a need for pathogen-free water for incubation and early rearing.

4. Separate adult holding ponds for summer steelhead and spring chinook are needed. Steelhead are currently held in the ladder below the spring chinook, thus causing high steelhead mortalities. The existing spawning room and adult handling area are inadequate.

5. The adult trapping facility needs improving to increase ease of trapping returning adults, especially spring chinook.

6. Water (pipeline) delivery system limits fish production capability.

7. Poor rearing pond design (Burrows) limits fish rearing potential.

8. Need Canadian-style rearing troughs for early rearing of summer steelhead. This will permit encompassing all portions of the run needed for maintaining genetic integrity.

9. A smolt release tube is needed for on-station releases.

10. There is no pollution abatement facility.

11. Insufficient office space.

12. Need to add one additional permanent position for adequate staffing.

13. The ability to control fish growth would be greatly enhanced by providing a way to control water temperatures in the individual rearing ponds.

14. Greater ability to heat/chill incubation water would help control egg development.

15. Need measures to control avian/furbearer predation.

16. Pond space is limited for the production required at this facility.

Umatilla Hatchery and Satellites
(Bonifer and Minthorn Ponds)

INTRODUCTION

Umatilla Hatchery is located adjacent to the Columbia River, 3.5 miles west of Irrigon, Oregon. Facility rearing units include 34 raceways and 8 troughs. Water is supplied to the hatchery from four remote wells capable of pumping 5,100 gpm and one well station capable of pumping 10,000 gpm. The facility is staffed with seven permanent employees and one seasonal employee.

The two satellite facilities (Bonifer Ponds and Minthorn Ponds) located in the subbasin are operated by staff from the Confederated Tribes of the Umatilla Indian Reservation.

PURPOSE

The Umatilla Hatchery was authorized under the Northwest Power Planning Council's (NPPC) Fish and Wildlife Program and began operation in 1991. Hatchery funding is provided by Bonneville Power Administration. The hatchery is used for egg incubation and rearing of spring chinook, fall chinook and summer steelhead.

Two satellite facilities (Bonifer Ponds and Minthorn Pond) are used for adult trapping/holding/spawning and juvenile fish acclimation.

GOALS

The NPPC authorized the hatchery construction to produce up to 290,000 pounds of salmon and steelhead for release into the Umatilla River. This production is designed to:

1. Partially mitigate for fish losses caused by hydroelectric dams on the Columbia River.

2. Use artificial propagation as a component of the Umatilla fisheries restoration program to achieve natural and hatchery adult return goals as described in the Umatilla Hatchery Master Plan (1989).

3. Test Michigan- versus Oregon-type rearing strategies (oxygen supplementation) and other experimental and supplemental rearing strategies.

OBJECTIVES

Objective 1: Hatchery Production

URB Fall Chinook
Produce 5,940,000 smolts (99,000 pounds) for release into the Umatilla River.

Spring Chinook
Produce 1,290,000 smolts (114,000 pounds) for release into the Umatilla River.

Summer Steelhead
Produce 210,000 smolts (42,000 pounds) for release into the Umatilla River.

Provide 1,800 eggs to Oregon's Salmon and Trout Enhancement Program.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct enviror.mental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices associated with anadromous fish production at this facility. Because ODFW hatcheries are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

Adults for the fall chinook program are collected at Bonneville Hatchery (see Bonneville Hatchery Plan) and from the Umatilla River. Adults for the spring chinook program are collected at Carson National Fish Hatchery (see Carson National Fish Hatchery Plan). Adults for the summer steelhead program are collected from the Umatilla River (Three Mile Dam) and transferred to Minthorn Pond for holding and spawning. In the past, eggs from the adults captured at Three Mile Dam were incubated at Irrigon and transferred to Oak Springs Hatchery for rearing to smolt size.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size so that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Various release strategies are used to ensure that fish migrate from the Umatilla River system with least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

URB Fall Chinook: Rear 2,682,000 fish to a size of 60 fish / pound and release into the Umatilla River (nonacclimated) in mid-May. All fish are marked prior to release.

Spring Chinook

- Rear 720,000 fish to a size of 20 fish/pound and release into the Umatilla River (nonacclimated) in mid-May.
- Rear 492,000 fish to a size of 12 fish/pound and release into the Umatilla River (nonacclimated) in mid-November.
- Rear 210,000 fish to a size of 5 fish/pound and release into the Umatilla River (nonacclimated) in late March.

An evaluation of size-at-release and time-of-release is currently underway. All spring chinook are marked prior to release.

Summer Steelhead

- Rear 50,000 smolts and transfer to Bonifer Ponds for a 3-4 week acclimation period; release into the Umatilla River in mid-April at a size of 5 fish/pound.
- Rear 50,000 smolts and transfer to Bonifer Ponds for a 3-4 week acclimation period; release into the Umatilla River in early May at a size of 5 fish/pound.
- Rear 50,000 smolts and transfer to Minthorn pond for a 3-4 week acclimation period; release into the Umatilla River in mid-April at a size of 5 fish/pound.

An evaluation of acclimation versus direct stream release is currently underway. All summer steelhead are marked (fin clipped) prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the following interim practices are currently being used at Umatilla Hatchery:

URB Fall Chinook: No adults are collected at the hatchery, but are collected at Three Mile Dam (Umatilla River) and at Bonneville Hatchery (see Bonneville Hatchery Plan). The hatchery goal is to spawn fish from throughout the run using a 2:3 male to female ratio if the population is over 250 fish.

Spring Chinook: No adults are spawned at this hatchery (see Carson National Fish Hatchery Plan).

Summer Steelhead: Adults captured at Three Mile Dam and held at Minthorn Pond for spawning are mostly wild fish. The interim practice is to use wild fish for broodstock. Capture of wild fish for hatchery broodstock cannot exceed 10 percent of the run. Only when the 10 percent is exceeded can hatchery fish be incorporated into the spawning regime. Adults are collected throughout the entire run and spawned using a 1:1 male to female ratio or matrix spawning ratio depending on run size. Only Umatilla River summer steelhead are used for broodstock.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults. to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.
- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.
- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index-is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Umatilla Hatchery and Satellites

<u>Health Monitoring</u>

- Monthly health monitoring examinations are conducted on five live fish per lower Oregon and Michigan index series of raceways, and five moribund/dead fish from each Oregon and Michigan index raceway. Results are reported on the ODFW Fish Examination form and Umatilla Hatchery annual progress report.

- When Umatilla summer steelhead are spawned, all adults are examined for viral pathogens using samples of ovarian fluid, milt and kidney/spleen/pyloric caeca. Necropsies on all mortality up to 20 fish are conducted for bacteria, parasites and other causes of death. Additional examinations are conducted if mortality exceeds normal levels. Results are reported on ODFW Viral Examination or Fish Examination forms and in the Umatilla Hatchery fish health monitoring annual report.

- Prior to transfer or release, fish are given a health exam. This is a special examination that includes aspects of the monthly monitoring exam.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- Juvenile fish are administered antibiotics orally, as needed, for the control of bacterial infections.

- Formalin is dispensed into water for control of parasites and fungus on eggs, juveniles and adults. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as "low regulatory priority" are used for treatments.

Sanitation

- All eggs brought to the Umatilla Hatchery are surface-disinfected with iodophor.

- All equipment (i.e., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.

- Different lots of fish/eggs are physically segregated from each other by separate incubator units and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed. The following environmental parameters are currently monitored at all ODFW hatcheries:

- Total Suspended *Solids (TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable* Solids *(SS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *pH*—measured quarterly when settleable solids are measured.

- *Water Temperatures*-daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- Dissolved Oxygen *(DO)*—measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

Objective 6: Communicate effectively with other fish producers, managers and the public.

Coordination/Communication within ODFW

Annual Fish Production Meetings: ODFW conducts meetings throughout the state to set annual fish production goals for all public hatcheries in Oregon. These meetings involve the participation of ODFW research, management and fish culture staff as well as representatives from applicable federal agencies and tribes.

Record Keeping: The following records are kept at all ODFW hatcheries:

- *Egg and Fry Report*-records all egg and fry movements, treatments, etc.

- *Anadromous Adult Transaction Report*—details the collection and disposition of all adult fish.

- *Monthly Ponded Report*-updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).

- *Mark Recovery Report*-details sex, fish length and tag information from all marked adult fish that are captured.

- Length *Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish Loss and Treatment Report*-records disease problems and daily mortality.

- *Fish Liberation Reports*—details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap and Barrier Log*-records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly Progress Report*-document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

Hatcherv Management Information Svstem (HMIS): Computerized system to collect, report, summarize and analyze hatchery production data. This system is a tool to be used in production control at all hatchery management levels.

Coordinated Information Svstem (CIS): Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Interagency Coordination/Communication

Production Advisorv Committee. (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisorv Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatcherv Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the *U.S. v. Oregon Agreement.* Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Other: Periodic meetings involving staff from the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and ODFW are held to discuss the operation and management of the hatchery and satellite facilities. Two important documents co-authored by the CTUIR and ODFW are the Umatilla Hatchery Annual Operation Plan and the Umatilla Basin Fish Production Plan.

PERFORMANCE STANDARDS-UMATILLA HATCHERY AND SATELLITES

Objective f

Measures	Species	Hatchery Goal[1]	5-Year Average	Range	Constraints
Adult Capture	Fall Chinook	5,542	NA	NA	1,4
	Spr. Chinook	2,200	NA	NA	1,4
	S. Steelhead	212	NA	NA	1
Adult Prespawning Survival	Fall Chinook.	80%	NA	NA	1,4
	Spr. Chinook	80%	NA	NA	1,4
	S. Steelhead	75%	NA	NA	1
Egg-take	Fall Chinook	9,281,000	NA	NA	2
	Spr. Chinook	2,303,571	NA	NA	2
	S. Steelhead	396,000	NA	NA	
Green Egg-to-Fry Survival	Fall Chinook	71%	NA	NA	
	Spr. Chinook	62%	NA	NA	
	S. Steelhead	59%	NA	NA	
Fry-to-Smolt Survival	Fall Chinook	90%	NA	NA	
	Spr. Chinook	90%	NA	NA	
	S. Steelhead	90%	NA	NA	
Fish Releases	Fall Chinook	5,940,000	NA	NA	1,3
	Spr. Chinook	1,290,000	NA	NA	1,3
	S. Steelhead	210,000	NA	NA	1,2,3
Egg Transfers	Fall Chinook	0	NA	NA	
	Spr. Chinook	0	NA	NA	
	S. Steelhead	1,800	NA	NA	
Fish Transfers	Fall Chinook	0	NA	NA	
	Spr. Chinook	0	NA	NA	
	S. Steelhead	0	NA	NA	
Adults Passed Upstream	Fall Chinook	NA	NA	NA	
	Spr. Chinook	NA	NA	NA	
	S. Steelhead	NA	NA	NA	
Percent Survival[2]	Fall Chinook	0.003%	--[3]	--[3]	
	Spr. Chinook	0.002-0.75%	--[3]	--[3]	
	S. Steelhead	0.027%	--[3]	--[3]	

NA=Not applicable.
[1] Based on Umatilla Hatchery Master Plan.
[2] Smolt-to-adult survival.
[3] Not estimated for this report.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Fall Chinook	60.0	NA	NA	
	Spr. Chinook	5.0-20.0	NA	NA	
	S. Steelhead	5.0	NA	NA	
Acclimation	Fall Chinook	Partial	NA	NA	
	Spr. Chinook	Partial	NA	NA	
	S. Steelhead	Yes	NA	NA	

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Fall Chinook	Yes	NA	NA	4
	Spr. Chinook	Yes	NA	NA	1,4
	S. Steelhead	Yes	NA	NA	
Spawning Pop. >500	Fall Chinook	Yes	NA	NA	
	Spr. Chinook	Yes	NA	NA	
	S. Steelhead	No	NA	NA	
Spawning Ratio Male:Female	Fall Chinook	2:3	NA	NA	
	Spr. Chinook	2:3	NA	NA	
	S. Steelhead	1:1	NA	NA	

Objective 4

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	Fall Chinook	Yes	NA	NA	
	Spr. Chinook	Yes	NA	NA	
	S. Steelhead	Yes	NA	NA	

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	NA	NA	
TSS Max Effluent	All	<15 mg/l	NA	NA	
SS Effluent	All	co.1 ml/l	NA	NA	
SS Max Effluent	All	<0.2 ml/l	NA	NA	
Downstream Temp	All	Varies	NA	NA	
PH	All	6.0-9.0	NA	NA	
Continuous Monitoring of Other Parameters	All	Yes	NA	NA	

Objective 6

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	NA	--	

Constraints/Comments—Umatilla Hatchery and Satellites

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. There is insufficient water available at Umatilla Hatchery to accomplish the designed hatchery program. As a result, fish production has been cut drastically to reflect the existing water supply.

2. The full rearing potential is not being realized for all species due to the study design (replication) parameters of the oxygen supplementation evaluation.

3. Additional acclimation release sites need to be developed.

4. Additional brood holding and spawning facilities need to be developed.

Wallowa Hatchery and Satellites
(Big Canyon and Little Sheep Ponds)

INTRODUCTION

Wallowa Hatchery is located along Spring Creek, a tributary of the Wallowa River (Grande Ronde River Subbasin), 1 mile east of Enterprise, Oregon. Site elevation is 3,700 feet above sea level. Big Canyon and Little Sheep acclimation facilities are operated as satellites.

There are many types of rearing units at Wallowa Hatchery, including two acclimation ponds and an adult holding pond. The majority of fish production at this facility consists of resident fish. The hatchery is staffed with 3 FTE's.

Water rights for the entire hatchery total 23,813 gpm from several sources. The acclimation ponds receive water from Spring Creek.

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. Water rights total 5,835 gpm from Deer Creek. The facility is staffed by Wallowa Hatchery personnel from March through May.

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. Water rights total 8,797 gpm from Little Sheep Creek. The facility is staffed by Wallowa Hatchery personnel from March through May.

PURPOSE

Wallowa began operation in 1920 as a resident trout hatchery. In 1985, the hatchery was renovated 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.

Wallowa Hatchery is one of six fish production facilities under the LSRCP. It is used for adult collection, spawning, acclimation and release of summer steelhead. (Egg incubation and rearing occurs at Irrigon Hatchery.) The two satellite facilities (Big Canyon and Little Sheep Creek) are used to trap adult summer steelhead and acclimate smolts prior to release.

In addition to the LSRCP hatchery programs, Wallowa continues to serve as rearing facility for rainbow trout.

GOALS

Summer Steelhead: Help meet the LSRCP mitigation goals of producing 2,000 adults for in-place, in-kind mitigation in the Imnaha River System and 9,184 adults for in-place, in-kind mitigation in the Grande Ronde River System.

Rainbow Trout: Provide a resident trout fishery as outlined in the draft Grande Ronde Subbasin Fish Management Plan.

OBJECTIVES

Objective 1: Hatchery Production

Summer Steelhead
Collect 2.33 million eggs for transfer to Irrigon Hatchery.

Collect 425,000 eggs for transfer to Lyon's Ferry Hatchery.

Acclimate 612,500 smolts (122,500 pounds) from Irrigon Hatchery for on-station release.

Acclimate 375,000 smolts (75,000 pounds) from Irrigon Hatchery for release into Deer Creek (Big Canyon facility).

Acclimate 200,000 smolts (40,000 pounds) from Irrigon Hatchery for release into Little Sheep Creek (Little Sheep Creek facility).

Rainbow Trout
Produce 118,000 legal-sized fish for release into the Grande Ronde System and 5,000 fingerlings for release into lakes (see Irrigon Hatchery Plan).

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices associated with anadromous fish production at this facility. Because ODFW hatcheries are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

Wallow Stock Summer Steelhead: Wallowa stock is used as the broodstock for hatchery releases into the Grande Ronde River System. Entry of adults into the subbasin occurs between early March and late May. Peak spawning occurs in April. Fish are collected and spawned at both the Wallowa Hatchery and the Big Canyon Acclimation Pond. Eggs are transferred to Wallowa Hatchery for eye-up and then transferred to Irrigon Hatchery for incubation and rearing.

Imnaha Stock Summer Steelhead: Entry of adults into the Imnaha River Subbasin occurs between early March and late May. Adults are collected and spawned at Little Sheep acclimation facility. Eggs are transferred to Wallowa Hatchery for eye-up and then transferred to Irrigon Hatchery for incubation and rearing.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Wallow Stock Summer Steelhead: Rear 1,350,000 fish to size of 5 fish / pound at Irrigon Hatchery. Transfer 612,500 smolts to the Wallowa Hatchery acclimation ponds and 375,000 smolts to the Big Canyon acclimation facility. Acclimate smolts at these facilities for approximately four weeks and release during April and May. Directly release all remaining smolts in April as follows:

- 50,000 smolts into Deer Creek
- 262,000 smolts into the Upper Grande Ronde River
- 62,500 smolts into Catherine Creek

All fish are marked prior to release. A portion of the releases is also coded-wire tagged. Irrigon Hatchery receives credit for these smolt releases.

Imnaha Stock Summer Steelhead: Rear 330,000 fish to size of 5 fish / pound at Irrigon Hatchery. Transfer 200,000 to the Little Sheep Creek acclimation facility; acclimate for a minimum of three weeks; release in April and May. Directly release the remaining smolts into the Imnaha River (80,000 smolts in April) and Little Sheep Creek (50,000 smolts in May). All fish are marked prior to release. A portion of the releases is also coded-wire tagged. Irrigon Hatchery receives credit for these smolt releases.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the following interim practices are currently being used at Wallowa Hatchery:

Wallowa Stock Summer Steelhead: Adults are collected at Wallowa Hatchery throughout the run during March and April. Most adults collected at this facility are hatchery fish. When adult returns to Wallowa hatchery are low, fish are also spawned at the Big Canyon facility. Here the trap is opened (when needed) in early March and closed in late May. Both wild and hatchery fish are used for spawning and all fish are spawned at a 2:3 male to female ratio. Any Snake River stock is acceptable for release into the Grande Ronde River System.

Imnaha Stock Summer Steelhead: The trap at the Little Sheep Creek facility is opened from early March to mid-May. Fish are spawned at a 1:1 male to female ratio using both wild and hatchery fish. Imnaha stock summer steelhead is the only acceptable stock for release into the Imnaha River System.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.

- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.

- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.

- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Wallowa Hatchery and Satellites

Health Monitoring

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each lot of steelhead. The sample includes a minimum of 10 moribund/dead fish (if available) and 4-6 live fish per lot. Results are reported on the ODFW Fish Examination form and the Lower Snake Compensation Plan monthly report.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each salmon lot. Necropsies on all prespawning mortality (up to 20 fish) are conducted for bacteria, parasites and other causes of death. Additional examinations are conducted if mortality exceeds normal levels. Results are reported on ODFW Viral Examination forms and in the Lower Snake River Compensation Plan monthly report.

- Prior to liberation from acclimation ponds, summer steelhead and spring chinook smolts are given a health exam. This is a special exam that includes aspects of the monthly monitoring exam. Results are reported on ODFW Fish Examination forms and in the Lower Snake River Compensation Plan monthly report.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- If adult spring chinook are held for spawning, they are injected with antibiotics for the control of bacterial diseases.

- Eggs are spawned into colanders to remove ovarian fluid, fertilized, and then water-hardened in iodophor for disinfection.

- Juvenile rainbow trout are administered antibiotics orally, as needed, for the control of bacterial infections.

- Formalin is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as “low regulatory priority” are used for treatments.

Sanitation

- All freshly fertilized eggs are water-hardened in iodophor and transported in iodophor-disinfected buckets. Eggs are fertilized, rinsed, water-hardened and transported in well water. Transport is within three hours of egg disinfection.

- All equipment (e.g., nets, tanks, rain gear, boots) is disinfected with iodophor between different fish/egg lots and whenever the equipment is transported to and from the satellite facilities.

- Different egg stocks at Wallowa Hatchery are physically isolated from each other by separate incubator rooms and water supplies. Different fish lots are segregated by separate ponds and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

- *Total* Suspended Solids *(TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable* Solids (W-measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *pH*—measured quarterly when settleable solids are measured.

- *Water Temperatures*-daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- Dissolved Oxygen *(DO)*—measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

Objective 6: Communicate effectively with other fish producers, managers and the public.

Coordination/Communication within ODFW

Annual Fish Production Meetings: ODFW conducts meetings throughout the state to set annual fish production goals for all public hatcheries in Oregon. These meetings involve the participation of ODFW research, management and fish culture staff as well as representatives from applicable federal agencies and tribes.

Record Keeping: The following records are kept at all ODFW hatcheries:

- *Egg and Fry Report*—records all egg and fry movements, treatments, etc.
- *Anadromous Adult Transaction Report*-details the collection and disposition of all adult fish.
- *Monthly Ponded Report*-updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).
- *Mark Recovery Report*-details sex, fish length and tag information from all marked adult fish that are captured.
- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).
- *Fish Loss and Treatment Report*-records disease problems and daily mortality.
- *Fish Liberation Reports*—details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).
- *Trap and Barrier* Log-records whenever any fish trap or barrier is activated or closed.
- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly Progress Report*-document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

Hatcherv Management Information System (HMIS): Computerized system to collect, report, summarize and analyze hatchery production data. This system is a tool to be used in production control at all hatchery management levels.

Coordinated Information Svstem (CIS): Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

Interagency Coordination/Communication

Production Advisorv Committee (PAC): The Columbia River PAC is comprised of representatives from the regulatory management agencies and tribes. This group meets monthly to discuss anadromous fish production issues and to provide an opportunity for communication among the anadromous fish hatchery managers.

Technical Advisorv Committee (TAC): The Columbia River TAC is comprised of regulatory fish harvest technicians. This group provides management direction used in establishing hatchery fish production goals. TAC meets monthly.

Integrated Hatcherv Operations Team (IHOT): This group is comprised of representatives from fish management agencies and tribes. IHOT meets monthly and is currently developing a series of regional hatchery policies.

Pacific Northwest Fish Health Protection Committee (PNFHPC): This group is comprised of representatives from U.S. and Canadian fish management agencies, tribes, universities, and private fish operations. The groups meets twice a year to monitor regional fish health policies and to discuss current fish health issues in the Pacific Northwest.

In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the U.S. v. *Oregon Agreement.* Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Other: Periodic meetings are held with staff from the U.S. Fish and Wildlife Service and appropriate Indian tribes to discuss hatchery operations.

Communication with the General Public

Wallowa Hatchery and the satellite facilities receive approximately 6,000 visitors each year.

PERFORMANCE STANDARDS-WALLOWA HATCHERY AND SATELLITES

Objective 1

Measures	Species	Hatchery Goal[1]	5-Year Average	Range	Constraints
Adult Capture	Wallowa StS	949	1,989	906-4,022	1,2,3,4,5
	Imnaha StS	407	665	362-981	
Adult Prespawning Survival	Wallowa StS	95%	80.7%	64.5-96.9%	1
	Imnaha StS	95%	93.0%	88.0-96.8%	
Egg-take	Wallowa StS	3,250,000	3,226,000	2,225K-4,824K	4,5,6
	Imnaha StS	670,000	717,000	455K-849K	
Green Egg-to-Fry Survival	Wallowa StS	95%	69.5%	69.7-76.0%	5
	Imnaha StS	95%	60.1%	50.0-71.5%	
Fry-to-Smolt Survival	Wallowa StS	95%	NA	NA	
	Imnaha StS	95%	NA	NA	1,2
Fish Releases[2]	Wallow StS	NA	NA	NA	
	Imnaha StS	NA	NA	NA	
Egg Transfers	Wallowa StS	2,755,000	—[3]	- -[3]	
	Imnaha StS	NA	- -[3]	- -[3]	
Fish Transfers	Wallow StS	NA	—[3]	- -[3]	
	Imnaha StS	NA	—[3]	- -[3]	
Adults Passed Upstream	Wallowa StS[4]	NA	659	21-2,311	
	Imnaha StS[5]	NA	341	55-618[6]	
Percent Survival	Wallowa StS	0.68%	0.79%[7]	0.59-1.97%	
	Imnaha StS	0.61%	0.49%[6]	0.12-0.88%	

NA=Not applicable.
[1]Based on 1991 fish production goals.
[2]Fish releases are credited to Inigon Hatchery (see Irrigon Hatchery Plan).
[3]Not estimated for this report.
[4]Big Canyon-pass all wild and equal number of hatchery fish.
[5]Little Sheep-pass 50 percent of wild run and pass three hatchery fish for every two wild fish passed.
[6]Released above Little Sheep Creek trap.
[7]Only two year average.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	S. Steelhead	5.0	4.6	4.3-4.8	1
Acclimation	S. Steelhead	Yes	Yes	--	1,2,4,5

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Wallow StS	Yes	Yes	--	3,4,6
	Imnaha StS	Yes	Yes	--	
Spawning Pop. >500	Wallowa StS	Yes	Partial	--	
	Imnaha StS	Yes	Partial	--	
Spawning Ratio Male:Female	Wallowa StS	2:3	Yes	--	
	Imnaha StS	1:1	Yes	--	

Objective 4

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	Wallowa StS	Yes	Yes	--	
	Imnaha StS	Yes	Yes	--	

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes	--	1
TSS Max Effluent	All	<15 mg/l	Yes	--	1
SS Effluent	All	<0.1 ml/l	Yes	--	
SS Max Effluent	All	<0.2 ml/l	Yes	--	
Downstream Temp	All	Varies	Yes	--	
PH	All	6.0-9.0	Yes	--	
Continuous Monitoring of Other Parameters	All	Yes	Yes	--	

Obiecfive 6

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constraints/Comments—Wallowa Hatchery and Satellites

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. Water flows and water quality are limiting production. Spring Creek is contaminated from agricultural runoff. High turbidity and low dissolved oxygen are also problems. Low flows and high water temperatures in the summer are obstacles to year-round rearing. Ponds often freeze during the winter.

2. Need additional staff housing.

3. Need two position numbers for the seasonal tech 2's that are hired to operate Big Canyon and Little Sheep. When these positions are filled, it is difficult to find tech 2 numbers that are not being used.

4. The hatchery could be operated more efficiently with another permanent staff position (Tech 1).

5. Bringing egg groups together more than 8 weeks apart cannot be accomplished with the current systems.

6. Need better alternatives for adult disposition.

Willamette Hatchery and Satellite
(Dexter Ponds)

INTRODUCTION

Willamette Hatchery is located along Salmon Creek, approximately 3 miles upstream from its confluence with the Middle Fork of the Willamette River. Site elevation is 1,217 feet above sea level. The hatchery is staffed with 9.7 FTE's.

The facility rearing units are in fair to good condition and consist of 10 raceways, 40 modified Burrows ponds, 4 circular ponds, 2 adult trout brood ponds, and 1 adult salmon holding pond. The hatchery is basically split into two separate salmon and trout rearing sections. Dexter Holding Ponds, located immediately below Dexter Dam, is operated as a satellite facility.

Water flow available to the hatchery, based on the current water delivery system, ranges from a low of 29,623 gpm to a high 37,028 gpm. Most rearing units receive single-pass water.

PURPOSE

Willamette Trout Hatchery and the adjacent Oakridge Salmon Hatchery were combined in 1983 and operate today as Willamette Hatchery. The trout hatchery was constructed in 1922 and the salmon hatchery in 1911. The U.S. Army Corps of Engineers (COE) rebuilt the salmon hatchery in 1952 to mitigate for fishery losses caused by Hills Creek, Lookout Point and the Dexter hydroelectric/flood control projects.

Today, Willamette Hatchery is used for adult holding/spawning, egg incubation and rearing of spring chinook and rainbow trout. In addition, both summer and winter steelhead are reared at this facility for a short period of time. The Dexter satellite facility serves as an adult collection, rearing and acclimation release site for spring chinook and summer steelhead. In addition, BPA is funding an oxygen supplementation research project. All facilities are funded with state and federal revenues.

GOALS

<u>Spring Chinook and Summer Steelhead</u>: The COE mitigation agreement requires an annual production of no more than 235,000 pounds of juvenile chinook salmon and steelhead. The hatchery production contributes to three spring chinook programs. The goals of these programs are to:

- Return an annual average run of 11,250 spring chinook to the Middle Fork Willamette River Subbasin.

- Provide a potential harvest of 200 spring chinook adults in the Santiam River mainstem and 1,300 adults in the South Santiam River.

- Reestablish a run of 750 naturally produced spring chinook adults in the Molalla River System.

- Goal for the Middle Fork Willamette River is to provide a diversity of angling opportunities with an annual sport catch of 2,250 adult summer steelhead.

Rainbow Trout: Meet subbasin management objectives for three ODFW fishery districts.

OBJECTIVES

Objective 1: Hatchery Production

Spring Chinook
Provide 431,800 eggs to CEDC, Oregon's Salmon and Trout Enhancement Program and research.

Produce 310,000 smolts (25,840 pounds) for transfer to South Santiam Hatchery.

Produce 858,000 fingerlings (8,520 pounds) and 556,000 smolts (47,085 pounds) for transfer to Dexter Ponds.

Release 958,000 smolts (113,000 pounds) from Dexter Ponds into the South Santiam River.

Provide 10,000 smolts (1,000 pounds) for ODFW research.

Produce 10,000 smolts (670 pounds) for transfer to the National Marine Fisheries Service research in Newport, Oregon.

Produce 1,300,000 fingerlings (13,000 pounds) for release into Fall Creek, Hills Creek and Lookout Point reservoirs.

Produce 1,369,000 smolts (153,945 pounds) for release into the Middle Fork Willamette River.

Winter Steelhead
Produce 340,000 pre-smolts (22,670 pounds) for transfer to Alsea Hatchery.

Summer Steelhead
Produce 118,000 smolts (26,222 pounds) for release into the Middle Fork Willamette River.

Rainbow Trout
Produce 208,000 legal-sized fish (69,400 pounds) for release into lakes, streams and reservoirs (Cape Cod stock).

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Objective 3: Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Objective 5: Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Objective 6: Communicate effectively with other fish producers, managers and the public.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices associated with anadromous fish production at this facility. Because ODFW hatcheries-are managed to maximize use of the hatchery rearing space, hatchery operations are dynamic and subject to annual change depending upon statewide program needs.

It is also important to note that the Oregon Fish and Wildlife Commission recently adopted a Wild Fish Management Policy, a Natural Production Policy, and a Hatchery Fish Gene Resource Management Policy to help guide the management of wild and hatchery fish in Oregon. These policies are currently being implemented and will likely change future brood collection, and rearing and release strategies for some fish stocks. Therefore, until these policies are fully implemented, the hatchery operations outlined in this report represent the interim practices currently used at this facility.

Objective 1: Hatchery Production

Adult Collection

Spring Chinook: Adults arrive from May to October. Peak spawning occurs during late September. Adults are collected at Dexter Rearing Pond and trucked to Willamette Hatchery for holding and spawning.

Summer Steelhead: No adult collection occurs at this hatchery. Fish are normally received as fingerlings from Leaburg Hatchery.

Objective 2: Minimize interactions with other fish populations through proper rearing and release strategies.

Rearing and Release Strategies

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size that smoltification occurs within nearly the entire population, which will reduce the retention time in downstream migration. Rearing on parent river water, or acclimation to parent river water for several weeks is used to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations. Various release strategies are used to ensure that fish migrate from the hatchery with least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Spring Chinook

- Rear 775,000 fish to a size of 9 fish/pound and release off-station (nonacclimated) into the Middle Fork Willamette River (near Dexter Ponds) in mid-March.

Approximately 456,000 fish are coded-wire tagged as part of a liquid oxygen study funded by Bonneville Power Administration.

- Rear 1,300,000 fish to a size of 100 fish/pound and release off-station (nonacclimated) into Fall Creek Reservoir (1,000,000), Lookout Point Reservoir (250,000) and Hills Creek Reservoir (50,000) in mid-May.

- Rear 269,000 fish to a size of 8 fish/pound at Dexter Ponds; release on-station into the Middle Fork Willamette River in November. A portion of this release is coded-wire tagged.

- Rear 380,000 fish to a size of 9 fish/pound at Dexter Ponds; release on-station into the Middle Fork Willamette River in mid-March. A portion of this release is coded-wire tagged.

- Rear 474,000 fish to a size of 8 fish/pound at Dexter Ponds; release off-station (nonacclimated) into the South Santiam River in November. All fish are marked (otolith) and a portion of this release is also coded-wire tagged.

- Rear 484,000 fish to a size of 9 fish/pound at Dexter Ponds; release off-station (nonacclimated) into the South Santiam River in March. All fish are marked (otolith) and a portion of this release is also coded-wire tagged.

Summer Steelhead: Transfer fish from Leaburg Hatchery to Dexter Ponds; rear 118,000 fish to a size of 4.5 fish/pound and release on-station (acclimated) into the Middle Fork Willamette River in mid-March. All fish are marked (fin clipped) prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

Oregon's recently adopted Wild Fish Management Policy and Hatchery Fish Gene Resource Management Policy will likely change future broodstock selection and spawning protocols for some fish stocks. Until these policies are fully implemented, the following interim practices are currently being used at Willamette Hatchery:

Spring Chinook: Adults are collected throughout the run. Most adults are collected during the middle of the run with smaller numbers collected at the early and late portions of the run. The annual spawning population is large enough to maintain a 1:3 male to female spawning ratio. The majority of the run is comprised of hatchery fish. Willamette, McKenzie and South Santiam spring chinook stocks are all acceptable stocks for use at Willamette Hatchery.

Summer Steelhead: No spawning occurs at this facility (see Leaburg Hatchery Plan). The Skamania summer steelhead stock is acceptable for use at Willamette Hatchery.

Objective 4: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at ODFW hatcheries is to produce healthy smolts that will contribute to the fishery and return sufficient numbers of adults to continue propagation of the stocks and provide supplementation if desired. Equally important is to prevent the introduction, amplification or spread of fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)

- Perform necropsies of diseased and dead fish to diagnose the cause of loss.

- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.

- Apply a disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)

- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses are increasing. Monthly mortality records are submitted to Fish Pathology from each hatchery.

- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.

- Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs (conducted by the ODFW Nutrition Section) and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the use of vaccines or antibiotics in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility. This will help avoid new disease problems and fish pathogens not previously found at the site.

- Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.

- Conduct applied research on new and existing disease prevention techniques.

- Utilize pond management strategies (e.g., Density Index and Flow Index guidelines) to help optimize the quality of the aquatic environment and minimize fish stress which can be conducive to infectious and noninfectious diseases. For example, a Density Index is used to estimate the maximum number of fish that can occupy a rearing unit based on the rearing unit's size. A Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Willamette Hatchery/Dexter Ponds

Health Monitoring

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each fish lot at the hatchery. The sample includes a minimum of 10 dead fish (if available) and 4-6 live fish per lot.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca (based on a minimum sampling at the 5% incidence level) are examined for viral pathogens from each salmon lot. Necropsies are conducted on dead adult fish for bacteria, parasites and other causes of death.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit.

- Whenever abnormal behavior or mortality is reported or observed, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of specific fish pathogens are conducted in accordance with the Oregon Administrative Rules fish disease control policy. Results from each examination mentioned above are reported on the ODFW Fish Health or Virus Examination forms.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Oregon Administrative Rules fish disease control policy.

Therapeutic and Prophylactic Treatments

- Adult spring chinook are injected with antibiotics for the control of bacterial diseases.

- At spawning, eggs are water-hardened in iodophor for disinfection.

- Juvenile fish are administered antibiotics orally as needed for the control of bacterial infections.

- Formalin is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and exposure time varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration (FDA) or those classified by FDA as "low regulatory priority" are used for treatments.

Sanitation

- All eggs brought to Willamette Hatchery are surface-disinfected with iodophor.

- All equipment (i.e., nets, tanks, rain gear, boots) is disinfected with iodophor between uses with different fish/egg lots.

- Different lots of fish and eggs are physically segregated from each other by separate ponds, incubator units and water supplies.

- Fish transport trucks are disinfected between the hauling of different fish lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at ODFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit administered by the Oregon Department of Environmental Quality. It is also used in managing fish health. On a short-term basis, monitoring helps identify when changes to hatchery practices are required. Long-term monitoring provides the ability to quantify water quality impacts resulting from changes in the watershed (e.g., logging, road building and urbanization). The following environmental parameters are currently monitored at all ODFW hatcheries:

- *Total Suspended Solids (TSS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *Settleable Solids (SS)*—measured quarterly. Two composite samples are collected, one during normal operations and one during cleaning. Some facilities may take more samples because of multiple outfalls.

- *pH*—measured quarterly when settleable solids are measured.

- *Water Temperatures*—daily maximum and minimum water temperatures are measured within the hatchery. Temperature units are recorded for egg development in some hatcheries.

- *Dissolved Oxygen (DO)*—measured only when conditions warrant (e.g., periods of low flows and high temperatures).

- *Air Temperatures*-maximum and minimum temperatures are recorded daily at some stations, but there are no special monitoring requirements.

- *Flow* Logs-changes in water flows through the hatchery ponds are recorded whenever flows are altered for hatchery management activities (i.e., ponding of fish, splitting of fish lots, fish releases, etc.).

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- *Monthly Ponded Report*-updates hatchery operations from the previous month (i.e., current number of fish, size, transfers or releases, feed conversion, mortality, medication, etc.).

- *Mark Recovery Report*-details sex, fish length and tag information from all marked adult fish that are captured.

- *Length Frequency* Record-details fish lengths of all anadromous fish released (based on a sample of the releases).

- *Fish Loss and Treatment* Report-records disease problems and daily mortality.

- *Fish Liberation Reports*-details information regarding all fish releases (e.g., fish numbers, size, location, method of release, marks, etc.).

- *Trap and Barrier* Log-records whenever any fish trap or barrier is activated or closed.

- *Visitor* Log-some facilities record the daily visitor use of the facility; however, this is not a requirement.

- *Monthly Progress* Report-document summarizing operational activities for the hatchery and all satellite facilities (e.g., fish culture, fish health, fish distribution, maintenance and safety).

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In-River Agreements: State and tribal representatives meet annually to set Columbia River harvests as part of the U.S. v. *Oregon* Agreement. Periodic meetings are also held throughout the year to assess if targets are being met.

In-Season Communications: Communication with PAC, the Columbia River Inter-Tribal Fish Commission, Washington Department of Wildlife, Washington Department of Fisheries, U.S.' Fish and Wildlife Service and Idaho Department of Fish and Game takes place each year to coordinate proper fish and egg transfers in an effort to meet basin-wide goals at all facilities, where applicable.

Communication with the General Public

Willamette/Dexter facilities receive approximately 20,000 visitors each year.

PERFORMANCE STANDARDS-WILLAMETTE HATCHERY AND SATELLITE

Objective 1

Measures	Species	Hatchery Goal[1]	5-Year Average	Range	Constraints
Adult Capture	Spr. Chinook	2,145	13,164	6,923-17,928	1,4
	S. Steelhead	NA	NA	NA	
Adult Prespawning Survival	Spr. Chinook	95%	66.5%	53.5-76.3%	1,4
	S. Steelhead	NA	NA	NA	
Egg-take	Spr. Chinook	4,300,000	4,811,000	3,592K-6,650K	4
	S. Steelhead	NA	NA	NA	
Green Egg-to-Fry Survival	Spr. Chinook	95%	77.1%	57.9-83.9%	2
	S. Steelhead	NA	NA	NA	
Fry-to-Smolt Survival	Spr. Chinook	95%	85.7%	79.4-94.9%	2
	S. Steelhead	NA	NA	NA	
Fish Releases	Spr. Chinook	3,694,000	2,102,309	1,934K-2,268K	
	S. Steelhead	118,000	NA	NA	3
Egg Transfers	Spr. Chinook	431,000	--[2]	--[2]	
	S. Steelhead	0	--[2]	--[2]	
Fish Transfers	Spr. Chinook	1,744,000	--[2]	--[2]	
	S. Steelhead	0	--[2]	--[2]	
	W. Steelhead	340,000	--[2]	--[2]	
Adults Passed Upstream	Spr. Chinook	NA	NA	NA	
	S. Steelhead	NA	NA	NA	
Percent Survival	Spr. Chinook	NA	1.36%	0.98-2.08%	
	S. Steelhead	NA	Unknown	Unknown	

NA-Not applicable.
[1]Based on 1992 fish production goals.
[2]Not estimated for this report.

Ob'ective 2

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Spr. Chinook S. Steelhead	8.0-9.0 4.5	8.8 NA	7.6-10.0 NA	2
Acclimation	Spr. Chinook S. Steelhead	Partial Yes	Partial Partial	-- --	

Objective 3

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Spr. Chinook S. Steelhead	Yes NA	Yes NA	-- NA	1,4
Spawning Pop. >500	Spr. Chinook S. Steelhead	Yes NA	Yes NA	-- NA	4
Spawning Ratio Male:Female	Spr. Chinook S. Steelhead	1:3 NA	Yes NA	-- NA	4

Ob'ective 4

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	Spr. Chinook S. Steelhead	Yes Yes	Yes Yes	-- --	

Objective 5

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
TSS Effluent	All	<5 mg/l	Yes		
TSS Max Effluent	All	<15 mg/l	Yes	--	
SS Effluent	All	co.1 ml/l	Yes		
SS Max Effluent	All	co.2 ml/l	Yes	--	
Downstream Temp	All	Varies	Yes		
PH	All	6.0-9.0	Yes		
Continuous Monitoring of Other Parameters	All	Yes	Yes		

Objective 6

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	

Constraints/Comments-Willamette Hatchery and Satellite

Correcting the following constraints will enable the hatchery staff to better implement ODFW policies:

1. There are possible flow restrictions in September/October.

2. Mud and silt load in the water supply can be severe. Debris on the intake screens in the fall and early winter can restrict flow to the rearing ponds.

3. There is no capability for on-site releases.

4. Need sorting pens in the adult holding pond and a larger sorting/spawning area at the hatchery.

5. Diversion dam integrity threatens water supply.

6. Stability of bank protection project threatens portion of hatchery facility.