This report was funded by the Bonneville Power Administration (BPA), U.S. Department of Energy, as part of BPA's program to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities on the Columbia River and its tributaries. The views in this report are the author's and do not necessarily represent the views of BPA.

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P.O. **Box 3621**
Portland, OR 97208

Please include title, author, and DOE/BP number from the back cover in the request

Contents

Codes, Acronyms, and Abbreviations Used in This Report

Species Codes

CHF	Fall Chinook
CHS	Spring Chinook
CHR	Summer Chinook
COH	Coho
CT	Cutthroat Trout (Resident)
RB	Rainbow Trout
SCT	Sea-run Cutthroat Trout
SOC	Sockeye
STS	Summer Steelhead
STU	Sturgeon
STW	Winter Steelhead
Type-N	Late-run Coho
Type-S	Early-run Coho
URB	Upriver Bright Fall Chinook

Disease/Pathogen Codes

BGD	Bacterial Gill Disease
BKD	Bacterial Kidney Disease
C. shasta	*Ceraomyxa shasta*
CAD	Coho Anemia Disease
Colum.	Columnaris (*Flexibactor columnaris*)
CWD	Cold Water Disease
EIBS	Erthrocytic Inclusion Body Syndrome
ERM	Enteric Red Mouth
Furunc.	Furunculosis
Ich	*Ichthyophthirius multifilis*
IHN	infectious Hematopoietic Necrosis
IPN	infectious Pancreatic Necrosis
MAS	Motile Aeromonas Septicemia
M. cere.	*Myxosoma cerebra/is*
VHS	Viral Hemorrhagic Septicemia

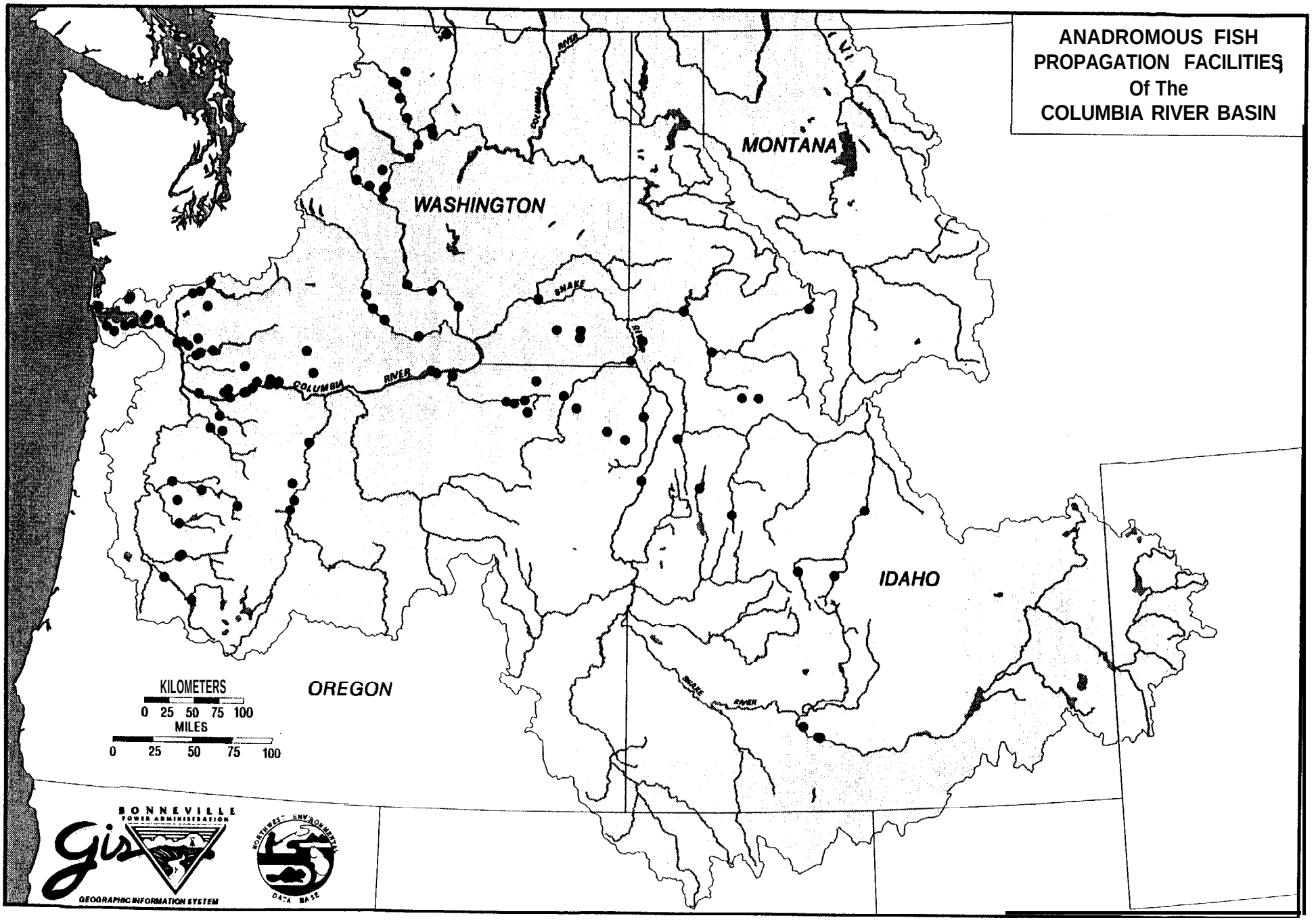
Water Supply Codes

cs	Surface water with no fish present
G	Ground water
S	Surface water
SA	Surface water containing anadromous fish
SR	Surface water with only resident fish
ST	Treated surface water, depurated
SW	Salt water

Acronyms and Abbreviations

BPA	Bonneville Power Administration
CIS	Coordinated Information System
COE	Corps of Engineers
CRITFC	Columbia River Inter-Tribal Fish Commission
CTWSRO	Confederated Tribes of the Warm Springs Reservation of Oregon
CWT	Coded-Wire Tag
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FTE	Full Time Equivalent
IDFG	Idaho Department of Fish and Game
IHOT	Integrated Hatchery Operations Team
LSRCP	Lower Snake River Compensation Plan
NFH	National Fish Hatchery
NMFS	National Marine Fisheries Service
NPPC	Northwest Power Planning Council
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
TAC	Technical Advisory Committee
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife (formerly Washington Department of Fisheries and Washington Department of Wildlife)
YIN	Yakama Indian Nation

Anadromous Fish Production Facilities in the Columbia River Basin


ANADROMOUS FISH
PROPAGATION FACILITIES
Of The
COLUMBIA RIVER BASIN
WASHINGTON
MONTANA
IDAHO
OREGON
COLUMBIA RIVER
SNAKE RIVER
KILOMETERS
0 25 50 75 100
MILES
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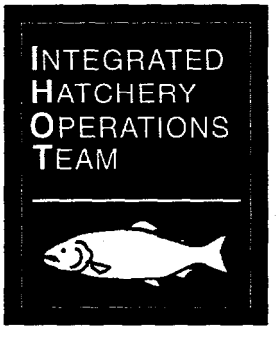
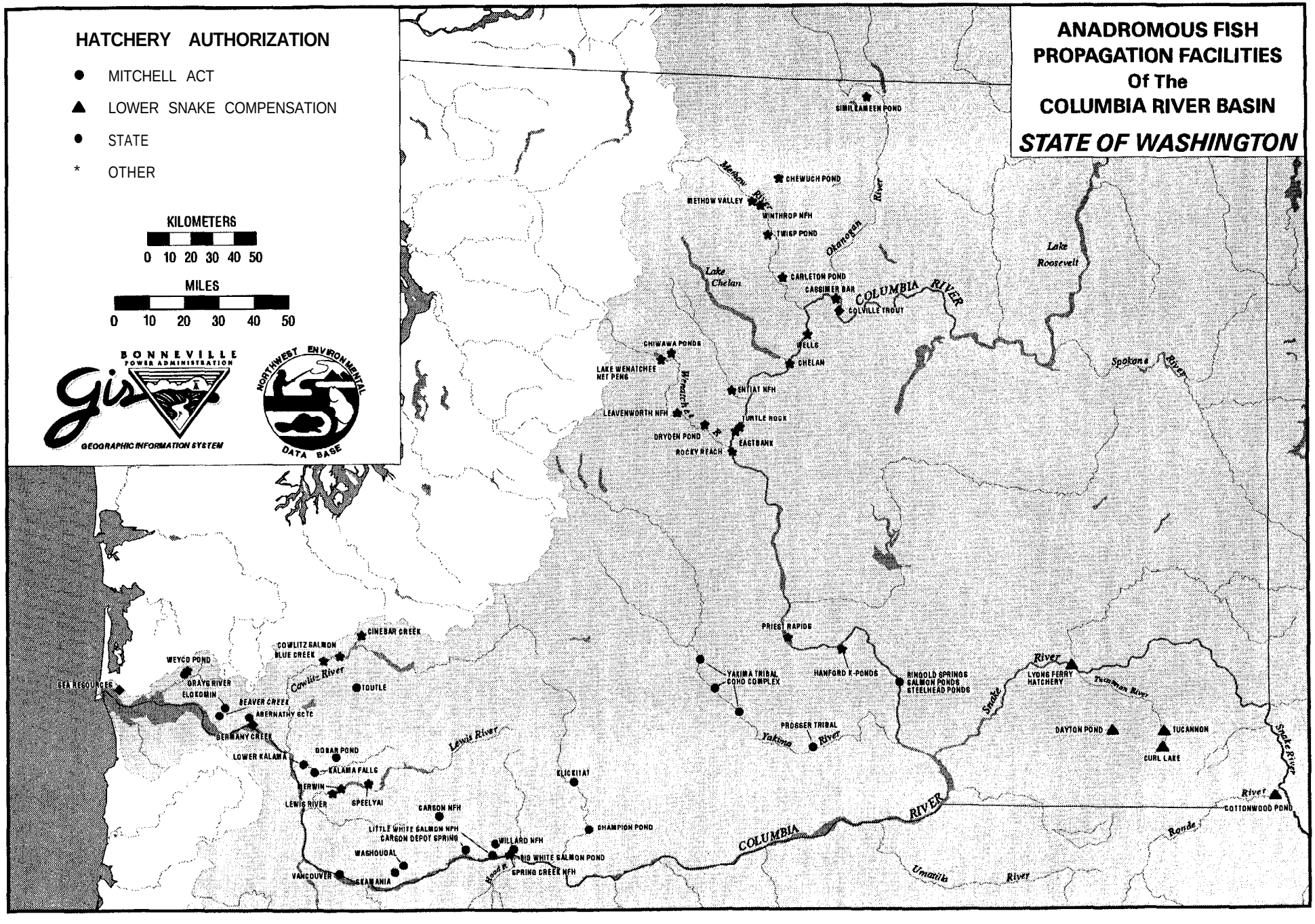
BONNEVILLE
POWER ADMINISTRATION
GIS
GEOGRAPHIC INFORMATION SYSTEM
NORTHWEST ENVIRONMENTAL
DATA BASE



Washington Department of Fish and Wildlife Hatchery Operation Plans


HATCHERY AUTHORIZATION
MITCHELL ACT
LOWER SNAKE COMPENSATION
STATE
OTHER
KILOMETERS
0 10 20 30 40 50
MILES
0 10 20 30 40 50
BONNEVILLE POWER ADMINISTRATION
GIS
GEOGRAPHIC INFORMATION SYSTEM
NORTHWEST ENVIRONMENTAL DATA BASE
ANADROMOUS FISH PROPAGATION FACILITIES Of The COLUMBIA RIVER BASIN
STATE OF WASHINGTON
SIMILKAMEEN POND
CHEWUCH POND
METHOW VALLEY
WINTHROP NFH
TWISP POND
Methow River
Okanogan River
Lake Chelan
CARLETON POND
CASSIMER BAR
COLVILLE TROUT
COLUMBIA RIVER
Lake Roosevelt
CHIWAWA PONDS
WELLS
CHELAN
LAKE WENATCHEE NET PENS
ENTIAT NFH
Wenatchee R.
LEAVENWORTH NFH
TURTLE ROCK
DRYDEN POND
EAGLE BANK
ROCKY REACH
Spokane River
PRIEST RAPIDS
HANFORD K-PONDS
YAKIMA TRIBAL COHO COMPLEX
RINGOLD SPRINGS SALMON PONDS STEELHEAD PONDS
LYONS FERRY HATCHERY
Tucannon River
Snake River
DAYTON POND
TUCANNON
CURL LAKE
PROSSER TRIBAL
Yakima River
CINEBAR CREEK
COWLITZ SALMON
BLUE CREEK
Cowlitz River
WEYCO POND
GRAYS RIVER
ELOKOMIN
SEA RESOURCES
TOUTLE
BEAVER CREEK
ABERNATHY SCTC
GERMANY CREEK
LOWER KALAMA
BOBAR POND
KALAMA FALLS
MERWIN
LEWIS RIVER
SPEELYAI
Lewis River
KLICKITAT
CARSON NFH
LITTLE WHITE SALMON NFH
CARSON DEPOT SPRING
WILLARD NFH
BIG WHITE SALMON POND
SPRING CREEK NFH
CHAMPION POND
WASHOUGAL
VANCOUVER
SKAMANIA
Wind R.
COLUMBIA RIVER
Grande Ronde River
Umatilla River
COTTONWOOD POND
Snake River

Beaver Creek Hatchery/Gobar Pond

INTRODUCTION

Beaver Creek Hatchery is located on the Elochoman River about 10 miles upstream from the river mouth. The Elochoman River is a north bank tributary of the lower Columbia River, just downstream of Cathlamet, Washington.

The facility consists of 10 intermediate raceways, 20 raceways, 1 earthen rearing pond, 2 adult holding ponds, and a hatchery building with 60 troughs. It is staffed with 4 FTE's.

Water rights total 16,013 gpm from three sources: Elochoman River, Beaver Creek and a well. Beaver Creek water is gravity flow while the other two sources are pumped. The Elochoman River is used in summer and fall while Beaver Creek water is used from mid-November through mid-May. Filtered well water (1 cfs) is used to incubate eggs and for early rearing of fry. Water use in summer is about 5,800 gpm. Gobar Pond, a 0.93-acre earthen rearing pond located on Gobar Creek (Kalama River tributary), is operated as a satellite facility.

Rearing Facilities at Beaver Creek Hatchery/Gobar Pond

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Buckets					320		Plastic	14	Fair	Used in troughs
Circular Tanks	16		5	1,000	2	2.000	Fiberglass	7	Good	Not setup
Earthen Rearing Pond				217,800	1	217,800	Earth	16	Good	One surface only
Heath-type Incubators					4		Fiberglass	30	Fair	Add-on system
Holding Raceways	96.5	11.8	3.7	4,327	2	8,654	Concrete	38	Fair	Holding and rearing
Intermediate Rwys	27.5	3.8	2	209	10	2,090	Concrete	38	Fair	
Lower Adult Trap				126	1	126	Conc/Wood	38	Fair	Adult Trap Only
Production Rwys	79.5	9.8	2.2	1,636	20	32,720	Concrete	38	Fair	
Smolt Trap	43.8	4.58	2.7	532	2	1,064	Concrete	16	Good	
Troughs	16.4	1	.5	8	40	8	Concrete	38	Fair	6 baskets&rough
Troughs	4.5	1.2	1	5	20	104	Fiberglass	26	Fair	
Upper Adult Trap				138	1	138	Conc/Wood	38	Fair	
Rearing Pond	450	90	6	243,000	1	243,000	Earth		Fair	
Smdt Trap	40	9	3	1,080	1	1,080	Concrete	21	Fair	

PURPOSE

Beaver Creek Hatchery was authorized under the Mitchell Act and began operating in 1957 as part of the Columbia River Fisheries Development Program-a program to mitigate for fishery losses caused by hydroelectric system development in the Columbia River Basin. The facility is currently used for adult collection, egg incubation and rearing of winter steelhead and sea-run cutthroat trout. It is also used for egg incubation and rearing of summer steelhead (adult collection and spawning occurs at Skamania Hatchery). The National Marine Fisheries Service funds the hatchery operation and maintenance.

Gobar Pond was constructed by Weyerhaeuser Corporation and began operation in 1975. The pond is used to rear and acclimate summer and winter steelhead pre-smolts prior to smolt release.

GOALS

Produce adult winter steelhead, summer steelhead and sea-run cutthroat for harvest by sport anglers while providing adequate escapement for hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Winter Steelhead
Produce *260,000* smolts for on-station and off-station release.

Summer Steelhead
Produce 230,000 smolts for on-station and off-station release.

Sea-run Cutthroat
Produce 50,000 smolts for on-station and off-station release.

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

Objective 3 Maintain stock integrity and differential spawning time from wild fish (winter steelhead).

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 steelhead producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Beaver Creek Hatchery is to collect enough adults to maintain the hatchery production program.

Winter Steelhead: Entry of adult hatchery fish into the subbasin occurs from mid-November through February, with a peak in December. Adults are captured and spawned at the hatchery.

Summer Steelhead: Summer steelhead are not indigenous to the Elochoman River but were first planted in 1982. Hatchery summer steelhead enter the subbasin from May through August. Broodstock are not captured on the Elochoman; eggs are obtained from Skamania Hatchery on the Washougal River.

Sea-run Cutthroat: Adults enter the subbasin from July through October and are captured at the hatchery from October through January.

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

Rearing and Release Strategies-Overview

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions.

Size at Release: One important strategy for minimizing interactions is to ensure that all fish are released so they will promptly migrate from the subbasin. To accomplish this, fish should be released at a size and condition factor to indicate a smolt condition. For steelhead, a release size of 4.0-8.0 fish per pound with a condition factor of less than 1.0 is considered appropriate. For cutthroat, the release size should be between 3.5 and 5 fish/pound with a condition factor of less than 1.0.

Time of Release: Smolts should be released between April 15 and May 15, the time period that research has indicated that optimum returns be expected.

Acclimation: Acclimating smolts to the parent stream water prior to their release can help reduce straying when they return as adults as well as increase survival to adulthood. Acclimation periods from 4 to 6 weeks are required to get maximum benefits from this technique. Current investigations are underway to more closely define these requirements.

Volitional Release: The use of volitional release ensures that only actively migrating fish are released from the hatchery pond. The removal of the migrating fish also benefits the remaining population by allowing them more time to feed, reducing the stress on the remaining population by reducing loadings, and may decrease the likelihood of disease occurrence during final rearing.

Marking Programs: All hatchery smolts stocked in systems where they will co-mingle as adults with an under-escaped wild run are marked with an adipose clip to allow for selective fishery regulations.

Rearing and Release Strategies--Beaver Creek Hatchery/Gobar Pond

The specific fish rearing and release strategies currently used at this hatchery are detailed below.

Winter Steelhead: Rear 260,000 fish to a size of 48 fish/pound and volitionally release approximately 30 percent on-station between April 15 and May 15. The remaining smolts are released off-station at the following sites:

Kalama River	25,000
Grays River	15,000
Abernathy Creek	15,000
German Creek	15,000
Coweeman Creek	15,000
Skamokawa Creek	15,000

In addition, 60,000 pre-smolts are transported to Gobar Pond in February for volitional release between April 15 and May 15. All winter steelhead are marked prior to release.

Summer Steelhead: Rear 230,000 fish to a size of 48 fish / pound and release approximately 10 percent on-station between April 15 and May 15. Remaining smolts are released off-station at the following sites.

East Fork Lewis River	20,000
Kalama River	35,000
North Fork Toutle River	35,000
South Fork Toutle River	35,000
Green River	15,000

Approximately 60,000 pre-smolts are transported to Gobar Pond in February and volitionally released between April 15 and May 15. All summer steelhead are marked prior to release.

Sea-run Cutthroat: Rear 50,000 smolts to a size of 3-5 fish / pound and release 60 percent on-station between April 15 and May 15. The remaining smolts are released off-station at the following sites:

Mill Creek	5,000
Abernathy Creek	5,000
German Creek	5,000
Coweeman Creek	5,000

All fish are marked prior to release.

Objective 3: Maintain stock integrity and genetic diversity

Broodstock Selection

Adult hatchery winter steelhead fish are collected and spawned from December through February. Early spawning fish have historically been selected for hatchery broodstock so that spawning time of returning hatchery fish precedes wild fish. All hatchery spawning is completed by February 1, while most wild fish spawn in April and May.

Sea-run cutthroat broodstock have also been selected for early spawning fish, which inhibits returning hatchery fish from crossbreeding with wild fish. However, in years of low returns, nearly all fish are spawned.

No summer steelhead adults are collected on the Elochoman.

Spawning Protocol

The intent is to utilize a spawning population of at least 200 adults. Fish are usually spawned at a 2:1 male-to-female ratio. Most egg-takes are used in hatchery production.

Acceptable Stocks

Importing eggs from other facilities with acceptable stocks is occasionally done when insufficient number of eggs are available at Beaver Creek Hatchery. Eggs from adults returning to the hatchery are always given priority for on-station use. However, if inadequate numbers are available, other lower Columbia River hatchery stocks such as the Cowlitz and Kalama have been used.

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 WDFW hatcheries is to produce healthy smolts that will survive well and contribute to the sport fishery. The fish health programs also seek to prevent the introduction, amplification or spread of certain fish pathogens detrimental to hatchery or wild fish.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. The standard elements of these programs are outlined below.

Disease Control

- Necropsies of diseased and dead fish are conducted to diagnose the cause of loss.
- Appropriate treatments are prescribed.
- A disease control policy is used to determine how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention

- Disease preventative strategies have been implemented, including the use of quality feeds and rearing fish in environmental conditions appropriate to

avoid disease events. In addition, pathologist approved treatments may be used prophylactically to avoid disease problems.

- A disease prevention policy has been implemented which restricts the introduction of stocks into a facility which may result in the introduction of a new pathogen.

- Sanitation procedures are used which prevent introduction of pathogens into or within a facility.

- Applied research is conducted on new and existing disease prevention techniques.

Fish Health Activities at *Beaver Creek Hatchery*

Health Monitoring

- At spawning, a minimum of 60 ovarian fluids, 60 milts and 60 kidney / spleens are examined for viral pathogens from each fish lot.

- Prior to transfer or release, fish are given a health exam.

- Whenever abnormal behavior or mortality is observed, the fish health specialist examines the affected fish, makes a diagnosis and recommends the appropriate treatment.

- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy

Fish and Egg Movements

- Fish and eggs are moved in accordance with the Co-Managers Fish Disease Control Policy

Therapeutic and Pronhylactic Treatments

- At spawning, eggs are water-hardened in iodophor (100 ppm for 60 minutes) as a bacterial and viral disinfectant.

- Juvenile fish are administered antibiotics orally when needed to control bacterial infections.

- Formalin (37% formaldehyde) is dispensed into water for control of ecto-parasites on juvenile fish and for fungus control on eggs.

- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

- All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish / egg lots.

- Different fish / egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.

- Tank trucks are disinfected between the hauling of adult and juvenile fish.

- Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring

Environmental Monitoring

Environmental monitoring is conducted at WDFW facilities to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids (TSS)*—1 time per quarter on composite effluent and influent samples.

- *Settleable Solids (SS)*—1 time per week on effluent and influent samples.

- *In-hatchery* Water Temperatures-daily maximum and minimum readings.

Objective 6 Communicate effectively with other steelhead producers and managers

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, federal 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Eauilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS-BEAVER CREEK HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	STW	1,200	854	414-l ,234	1
	STS	N/A	N/A	N/A	
	SCT	450	681	493-929	
Adult Prespawning Survival	STW	95%	97.7%	97.5-97.9%	
	STS	N/A	N/A	N/A	
	SCT	95%	98.0%	97.5-98.9%	
Egg-take	STW	1 ,OOo,ooo	753,839	342K-1,341K	1
	STS	N/A	N/A	N/A	
	SCT	200,000	163,106	95K-204K	
Green Egg-to-Fry Survival	STW	72%	85.9%	73.1-94.8%	
	STS	72%	92.2%	72.8-99.9%	
	SCT	72%	70.9%	50.2-87.1%	2
Fry-to-Smolt Survival	STW	83%	81.1%	47.7-99.8%	2
	STS	83%	89.5%	81.1-93.1%	
	SCT	83%	73.4%	0-95.1%	2
Fish Releases	STW	280,000	310,529	137K-398K	2
	STS	230,000	252,181	203K-312K	
	SCT	50,000	78,665	55K-104K	2
Egg Transfers	STW	0	--[1]	_[1]	
	STS	0	--[1]	--[1]	
	SCT	0	--[1]	--[1]	
Fish Transfers	STW	0	--[1]	--[1]	
	STS	0	--[1]	--[1]	
	SCT	0	--[1]	--[1]	
Adults Back to River	STW	--	--	--	
	STS	--	--	--	
	SCT	--	--	--	
Percent Survival	STW	--	3.2%	1.8-5.8%	
	STS	--	2.7%	1.5-3.7%	
	SCT	--	2.3%	1.7-3.1%	

N/A=Not applicable.
[1] Not estimated for this report.

Objecfive 2

Measures	Species	Hatcherv Goal	5-Year Averaae	Ranae	Constraints
Volitional Release	All	Yes	No	--	3
Proper Release Size	All	Yes	Yes	--	
Proper Release Time	All	Yes	Yes	--	

Objective 3

Measures	Species	Hatcherv Goal	5-Year Averaae	Ranae	Constraints
Collect Adults Throughout Run	**STW**	**Yes**	**Yes**	_	
	STS	**N/A**	N/A	N/A	
	SCT	Yes	Yes	--	
Spawning Pop. >200	STW	*Yes*	*Yes*	--	
	STS	**N/A**	**N/A**	**N/A**	
	SCT	Yes	Yes	_	
Spawning Ratio Male:Female	**STW**	**2:1**	1.21:1	0.89:1-1.39:1	
	STS	**N/A**	N/A	**N/A**	
	SCT	**2:1**	**0.93:1**	0.77:1 - 1.07:1	
Acceptable Stocks	STW	*Yes*	Yes	--	
	STS	*Yes*	Yes	--	
	SCT	*Yes*	Yes	--	

Objecfive 4

Measures	Species	Hatcherv Goal	5-Year Averaae	Ranae	Constraints
Adhere to Disease Policy	STW	Yes	Yes	_	
	STS	Yes	Yes	--	
	SCT	Yes	Yes	_	

*History of Reportable **Pathogens—1990-1995***

Species/Stock	Water Inc.	Supply Rear.	Virus	BKD	Furunc./ ERM	Other/Comments
Beaver Creek Hatchery	*G*	G,SA				
SCT/Elochoman R			IHN			
STS/Washougal R			IHN			
STW/Elochoman R			IHN			
Gobar RP	N/A	SA				
STS/Washougal R						
STW/Elochoman R						

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
TSS Effluent	All	5 mg/L	N/A	N/A	
Settleable Solids	All	0.1 ml/L	N/A	N/A	
In-hatchery Water Temperatures	All	50-56°F	N/A	N/A	

Objective 6

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No		
Develop and Review Future Brood Doc.	All	Yes	No	--	
Develop and Review Current Brood Doc.	All	Yes	No	--	

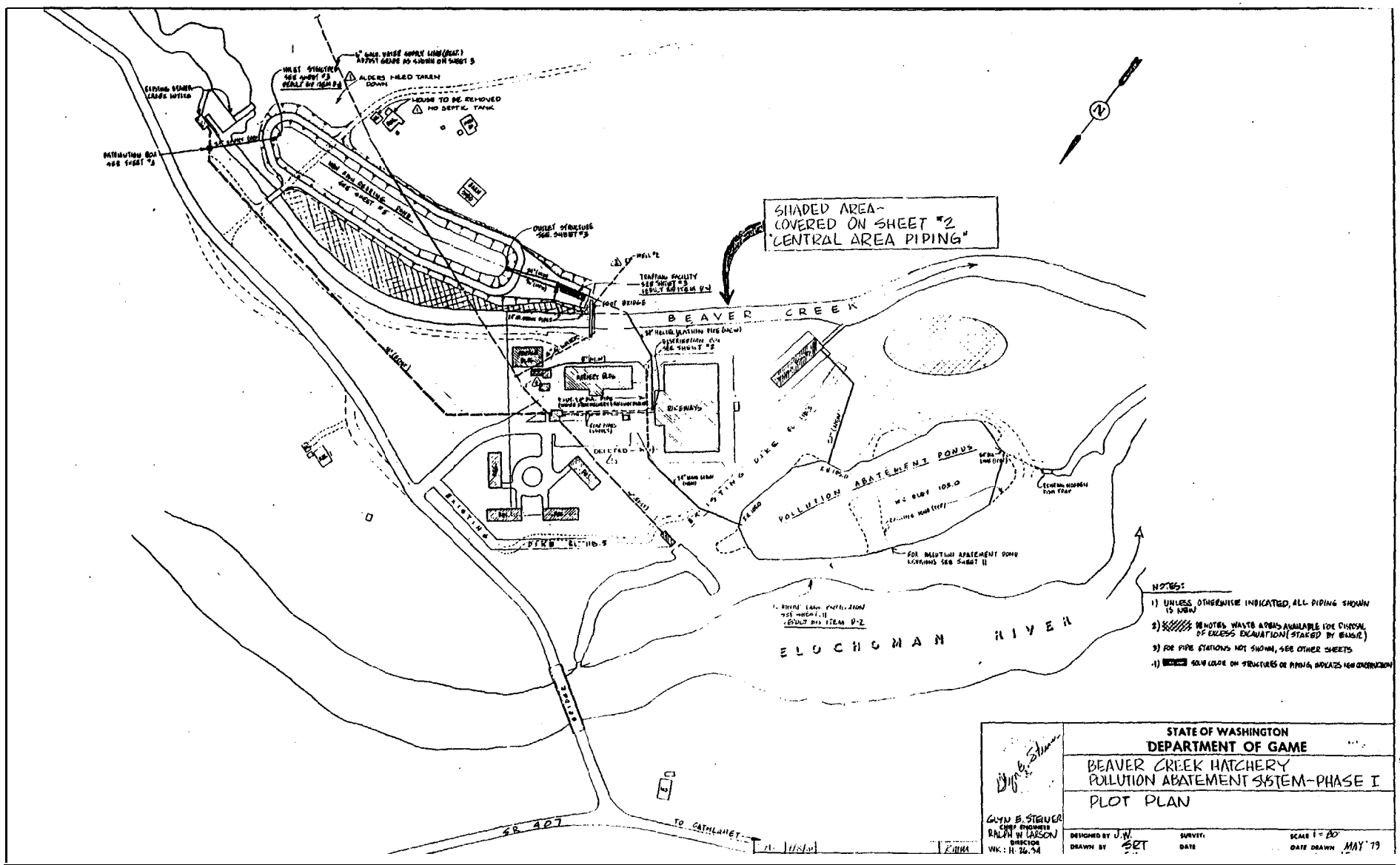
Constraints/Comments-Beaver Creek Hatchery/Gobar Pond

1. Scars on some returning adults indicate predation by seals in the Columbia River estuary.

2. Disease problems since 1983 with IHN and Ich have limited production.

3. Physical features of the hatchery are not conducive to volitional release. Smolts from Gobar Pond are released volitionally.

4. Satellite facilities on the South fork Toutle and Coweeman River are also supplied with fish from this facility (25,000 summer steelhead smolts to the South Fork Toutle, 5,000 sea-run cutthroat to Coweeman Pond #1, and 9,000 winter steelhead to Coweeman Pond #2).



STATE OF WASHINGTON
DEPARTMENT OF GAME

BEAVER CREEK HATCHERY POLLUTION ABATEMENT SYSTEM-PHASE I

PLOT PLAN

GLYN B. STEUER
CHIEF ENGINEER
RALPH W LARSON
DIRECTOR
W.K.: H-26.94

DESIGNED BY J.W. | SURVEY: | SCALE 1" = 80'
DRAWN BY SRT | DATE | DATE DRAWN MAY '79

Chelan PUD Hatchery/Turtle Rock

INTRODUCTION

Chelan PUD Hatchery is located on the Columbia River above Rocky Reach Dam near Chelan Falls, Washington. Site elevation is 750 feet above sea level. The hatchery is located adjacent to WDFW's Chelan Trout Hatchery. These two facilities are operated as a complex by the same staff. The Chelan complex is staffed with 4.5 FTE's.

Facility rearing units include 2 portable vinyl raceways, 16 standard raceways, 8 intermediate raceways, 1 adult holding raceway and a hatchery building with 80 troughs. The Turtle Rock rearing facility, located on an island in the Columbia River near Wenatchee, Washington, is operated as satellite.

Water rights total 14,812 gpm from three sources: a well field, the Columbia River and springs. Columbia River water is no longer used due to concern over IHN contamination. Spring water averages about 500 gpm and is the surplus left over from the state trout hatchery program and local orchard needs. Average total water use is about 3,000 gpm, of which 2,500 gpm is well water (50-57°F). About 4,980 gpm is pumped from the Columbia River at the Turtle Rock facility.

Rearing Facilities at Chelan PUD Hatchery and Turtle Rock

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Adult Raceway	72	10	5	3,600	1	3,600	Concrete	30	Good	Re-use water only
Intermediate Rwys	28	3.8	2	214	8	1,712	Concrete	30	Good	Located indoors
Shallow Troughs	14.3	1	.5	7	80	576	Concrete	30	Good	In tandem
Standard Rwys	89	9.7	2.7	2,308	16	36,928	Concrete	30	Good	2 batteries of 8
Vinyl Lined Portables	80	8	2.6	1,651	2	3,302	Vinyl/steel	10	Good	Located indoors
Spawning Channel	200	36.2	4	29,000	4.	116,000	Conc/gravel	20	Good	

PURPOSE

Chelan PUD Hatchery began operation in 1965 as a mitigation facility for Rocky Reach Dam. Chelan PUD owns the hatchery and funds its operation and maintenance. Washington Department of Fish and Wildlife operates the facility. The facility is used for egg incubation and early rearing of summer steelhead. Fish are transferred to the Turtle Rock facility for final rearing and release. Chelan PUD Hatchery is also used for rearing resident trout and kokanee.

GOALS

Produce summer steelhead, resident trout and kokanee to compensate for lost fish production and recreational and tribal fishing opportunities caused by construction and operation of the Rocky Reach and Chelan hydroelectric projects.

OBJECTIVES

Objective 1: Hatchery Production

Summer Steelhead
Produce 200,000 smolts for off-station release from the Turtle Rock rearing facility.

Trout
Produce 200,000 legal-sized rainbow trout for a variety of off-station releases (paid by reimbursable funds).

Produce 1,070,000 fish of various size and species (paid with state funds).

Kokanee
Produce 2,000,000 fry for release into Lake Chelan.

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 steelhead producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices used at this facility. Only practices associated with anadromous fish production are summarized in this portion of the report.

Objective 1: Hatchery Production

Adult Collection

Adult steelhead are not captured at Chelan PUD Hatchery. Eggs from mid-Columbia steelhead stock are collected and incubated to the eyed stage at Wells Hatchery (located 12 miles upstream) and then transferred to the Chelan PUD Hatchery.

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

Rearing *and Release Strategies-Overview*

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions.

Size at Release: One important strategy for minimizing interactions is to ensure that all fish are released so they will promptly migrate from the subbasin. To accomplish this, fish should be released at a size and condition factor to indicate a smolt condition. For steelhead, a release size of 4.0-8.0 fish per pound with a condition factor of less than 1.0 is considered appropriate. For cutthroat, the release size should be between 3.5 and 5 fish/pound with a condition factor of less than 1.0.

Time of Release: Smolts are released between April 15 and May 15, the time period that research has indicated that optimum returns be expected.

Acclimation: Acclimating smolts to the parent stream water prior to their release can help reduce straying when they return as adults as well as increase survival to adulthood. Acclimation periods from 4 to 6 weeks are required to get maximum

The fish health programs also seek to prevent the introduction, amplification or spread of certain fish pathogens detrimental to hatchery or wild fish.

WDPW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. The standard elements of these programs are outlined below.

Disease Control

- Necropsies of diseased and dead fish are conducted to diagnose the cause of loss.

- Appropriate treatments are prescribed.

- A disease control policy is used to determine how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention

- Clinically healthy fish are examined to assess health status.

- Disease preventative strategies have been implemented, including the use of quality feeds and rearing fish in environmental conditions appropriate to avoid disease events. In addition, antibiotics may be used prophylactically to avoid disease problems.

- A disease prevention policy has been implemented which restricts the introduction of stocks into a facility which may result in the introduction of a new pathogen.

- Sanitation procedures are used which prevent introduction of pathogens into or within a facility.

- Applied research is conducted on new and existing disease prevention techniques.

Fish Health Activities at Chelan PUD Hatchery

Health Monitoring

- Prior to release, fish are given a health exam.

- Whenever abnormal behavior or mortality is observed, the fish health specialist examines the affected fish, makes a diagnosis and recommends the appropriate treatment.

- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Fish and eggs are moved in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Pronhylactic Treatments

- Juvenile fish are administered antibiotics orally when needed to control bacterial infections.

- Formalin (37% formaldehyde) is dispensed into water for control of ecto-parasites on juvenile fish and for fungus control on eggs.

- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

- All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish / egg lots.

- Different fish / egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.

- Tank trucks are disinfected between the hauling of adult and juvenile fish.

- Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Environmental monitoring is conducted at WDFW facilities to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples.

- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples.

- In-hatchery Water Temperatures-daily maximum and minimum readings.

Objective 6: Communicate effectively with other steelhead producers and managers.

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, federal 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Eauilibrium Brood Document for the Columbia River and / or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS-CHELAN PUD HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	STS	N/A	N/A	N/A	
Adult Prespawning Survival	STS	N/A	N/A	N/A	
Egg-take	STS	N/A	N/A	N/A	
Green Egg-to-Fry Survival	STS	90%	94.5%	89.9-97.6%	
Fry-to-Smolt Survival	STS	90%	92.6%	89.4-93.5%	
Fish Releases	STS	200,000	217,300	167-245K	
Egg Transfers	STS	0	--[1]	--[1]	
Fish Transfers	STS	0	—[1]	--[1]	
Adults Back to River	STS	N/A	N/A	N/A	
Percent Survival	STS	--	Unknown	Unknown	

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Volitional Release	STS	No	No	—	
Proper Release Size	STS	Yes	Yes	—	
Proper Release Time	STS	Yes	Yes	--	

N/A=Not applicable.
[1] Not estimated for this report.

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect **Adults** Throughout Run	STS	N/A	N/A	**N/A**	
Spawning Pop. **>200**	STS	N/A	**N/A**	NIA	
Spawning Ratio **Male:Female**	STS	N/A	N/A	**N/A**	
Acceptable Stocks	STS	Yes	Yes	--	

Objective 4

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

History of Reportable Pathogens-1990-1995

Species/Stock	Water Supply Inc.	Rear.	Virus	BKD	Furunc./ ERM	Other/Comments
Chelan Hatchery STS/Mackinaw	*G*	*G*				

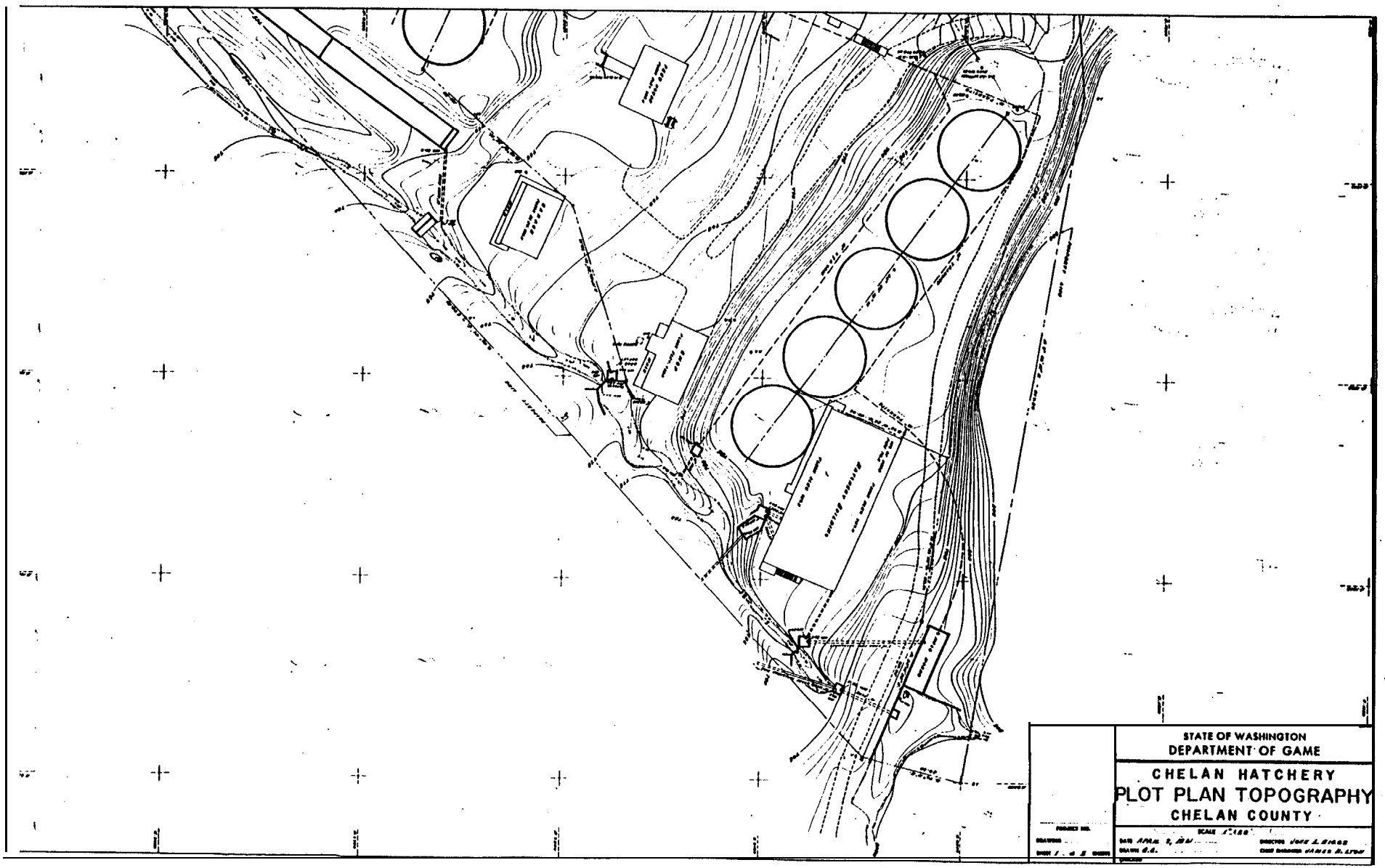
(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
TSS Effluent	All	5 **mg/L**	N/A	N/A	
Settleable Solids	All	0.1 ml/L	**N/A**	N/A	
In-hatchery Water Temperatures	All	**50-56°F**	N/A	N/A	

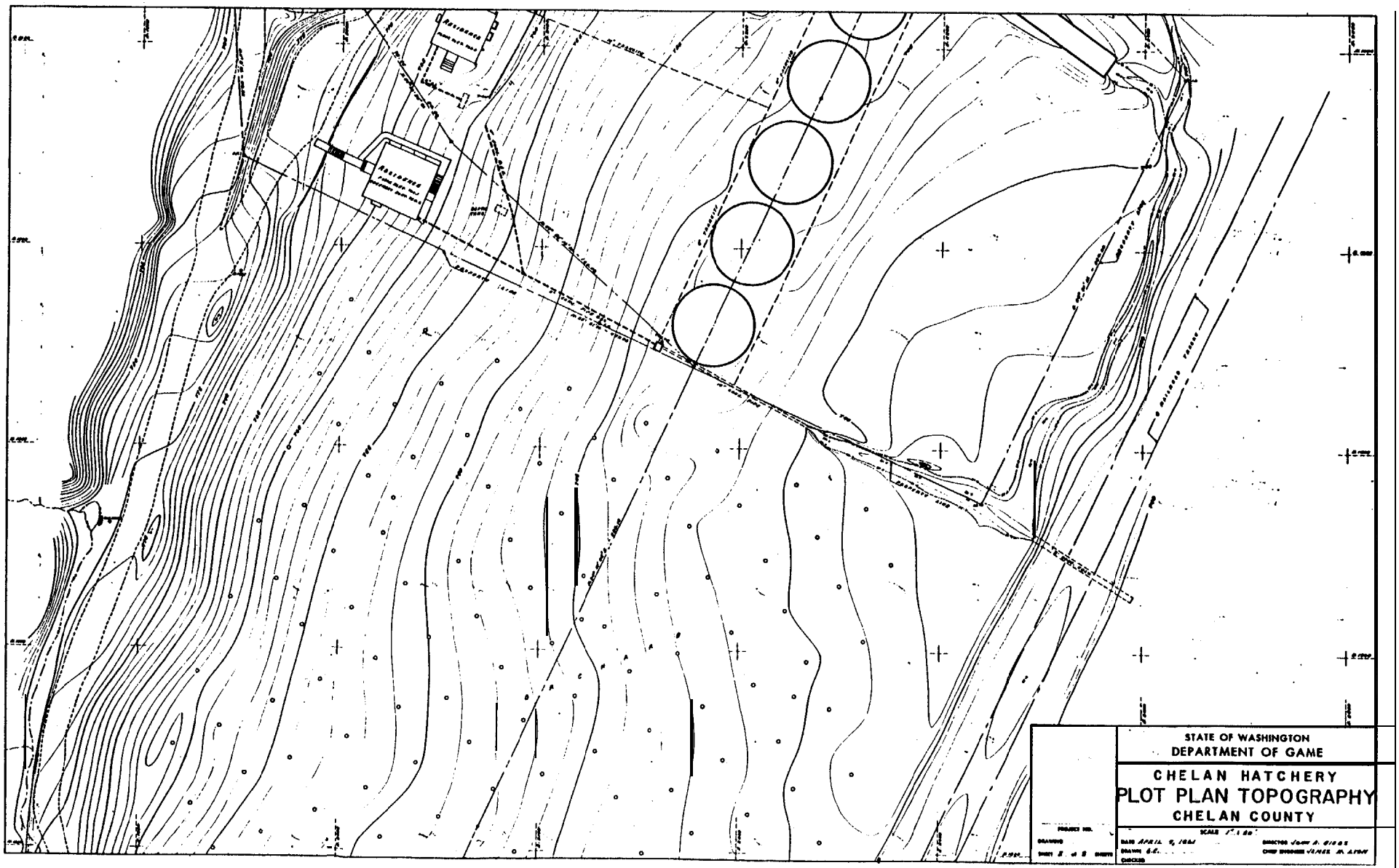
Objective 6

Measures	Species	Hatchery	Goal 5-Year Averaae	Ranae	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	_	
Develop and Review Future Brood Doc.	All	Yes	No	_	
Develop and Review Current Brood Doc.	All	Yes	No	--	



STATE OF WASHINGTON
DEPARTMENT OF GAME

CHELAN HATCHERY
PLOT PLAN TOPOGRAPHY
CHELAN COUNTY


STATE OF WASHINGTON
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Cowlitz Trout Hatchery (Blue Creek)

INTRODUCTION

The Cowlitz Trout Hatchery is located on the Cowlitz River about 42 miles above the mouth. The Cowlitz River is a north bank tributary of the lower Columbia River, just downstream of Longview, Washington. Site elevation is 157 feet above sea level. The facility is staffed with 7 FTE's.

The facility consists of 6 intermediate raceways, 24 raceways, four 5-acre rearing ponds, 3 adult holding raceways, and a hatchery building with 88 troughs and 4 tanks.

Water rights total 30,855 gpm from three sources: two well sources and the Cowlitz River. The two well sources provide a combined flow of about 1,500 gpm while the river provides about 24,000 gpm, when production requires such. In 1991, an ozone water treatment system to treat about 10,000 gpm was installed at the hatchery for control of *Ceratomyxa shasta*.

Currently, well water is used to incubate eggs and early rearing of fry. As fish and water needs increase, ozonated river water is used from June through late-November or early December on fingerlings. Thereafter, untreated river water is used until smolts are released.

Rearing Facilities at Cowlitz Trout Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
"A" Series Rwys	878.8	20	3	5,270	8	42,160	Concrete	28	Fair	
"B" Series Rwys	878.8	20	3	5,270	8	42,160	Concrete	28	Fair	
"C" Series Rwys	878.8	20	3	5,270	8	42,160	Concrete	28	Fair	
"F" Series Rwys	88.3	9.8	2.7	2,388	6	14,328	Concrete	28	Fair	
B-acre Ponds	1,450	160	7	1,624,000	4	6,496,000	Earth	28	Fair	
Adult Raceways	158.8	10	5	7,940	3	23,820	Concrete	28	Fair	Not for rearing
Troughs	14.4	1	.5	7	104	750	Concrete	28	Fair	

PURPOSE

Cowlitz Hatchery began operation in 1967 as a mitigation facility for dams blocking the Cowlitz River. The facility is currently used for adult collection, egg incubation and rearing of winter steelhead, summer steelhead, sea-run cutthroat, tiger muskie, and channel catfish. Tacoma City Light funds the hatchery operation and maintenance.

GOALS

Produce adult winter steelhead, summer steelhead and sea-run cutthroat for sport fisheries while providing adequate escapement for hatchery production. The mitigation goal is to produce 191,000 pounds of smolts and return 38,600 adult steelhead and sea-run cutthroat to the river. Washington Department of Fish and Wildlife determines the stock composition of hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Winter Steelhead

Produce 660,000 smolts for on-station release.

Produce 500,000 (includes 100,000 for HARZA) fingerlings for upriver release.

Produce 60,000 fingerlings for Friends of Cowlitz cooperative.

Provide 50,000 eyed eggs to co-op programs.

Summer Steelhead

Produce 400,000 smolts for on-station release plus 30,000 for Friends of Cowlitz cooperative.

Sea-Run Cutthroat

Produce 120,000 smolts 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 steelhead producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Cowlitz Hatchery is to collect enough adults to maintain the hatchery production program.

Winter Steelhead: Entry of adult hatchery fish into the subbasin occurs from late-October through May with a peak in December and January. Adults are captured and spawned at the hatchery.

Summer Steelhead: Summer steelhead were introduced into the subbasin in 1967. Adults enter the subbasin from June through November. They are captured in summer and fall and spawned at the hatchery from December through January.

Sea-run Cutthroat: Cutthroat enter the subbasin from July through December. Adults are captured at the hatchery from August/September through January.

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

Rearing and Release *Strategies--Overview*

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with

naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions.

Size at Release: One important strategy for minimizing interactions is to ensure that all fish are released so they will promptly migrate from the subbasin. To accomplish this, fish should be released at a size and condition factor to indicate a smolt condition. For steelhead, a release size of 4.0-8.0 fish per pound with a condition factor of less than 1.0 is considered appropriate. For cutthroat, the release size should be between 3.5 and 5 fish/pound with a condition factor of less than 1.0. Mitigation agreement requires steelhead smolts to be 180 mm or greater in length and sea-run cutthroat to be 210 mm or greater in length.

Time of Release: Smolts should be released between April 15 and May 15, the time period that research has indicated that optimum returns be expected.

Acclimation: Acclimating smolts to the parent stream water prior to their release can help reduce straying when they return as adults as well as increase survival to adulthood. Acclimation periods from 4 to 6 weeks are required to get maximum benefits from this technique. Current investigations are underway to more closely define these requirements.

Volitional Release: The use of volitional release ensures that only actively migrating fish are released from the hatchery pond. The removal of the migrating fish also benefits the remaining population by allowing them more time to feed, reducing the stress on the remaining population by reducing loadings, and may decrease the likelihood of disease occurrence during final rearing.

Marking Programs: All hatchery smolts stocked in systems where they will co-mingle as adults with an under-escaped wild run are marked with an adipose clip to allow for selective fishery regulations.

Rearing and Release Strategies—Cowlitz Trout Hatchery

The specific fish rearing and release strategies currently used at this hatchery are detailed below.

Winter Steelhead: Rear 660,000 smolts to a size of 4-8 fish/pound and volitionally release approximately 80 percent of the fish on-station between April 15 and May 15. The remaining fish are released upstream at the Barrier Dam on May 1. Of this 600,000, 200,000 are taken to the Cowlitz Salmon Hatchery approximately March 1 to be finished rearing and acclimated prior to release from that station. Currently 400,000 late winter steelhead fry of varying size are scatter planted in the upper watershed during late September and early October. Eyed eggs are provided to the Friends of the Cowlitz sports group for enhancement projects. HARZA, a contractor

on the Upper Cowlitz Falls Dam, receives 100,000 late spawning winter steelhead for rearing in net pens. Approximately 75,000 of these are trucked and released below the Barrier Dam and the remaining 25,000 are used experimental release. All fish are marked prior to release.

Summer Steelhead: Rear 400,000 smolts to a size of 48 fish / pound and volitionally release on-station between April 15 and May 15. All fish are marked prior to release.

Sea-run Cutthroat: Rear 120,000 smolts to a size of 3.5-5 fish / pound and volitionally release on-station between April 15 and May 15. All fish are marked prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

Adult hatchery winter steelhead fish are collected and spawned from December through early May. Spawning time has historically been selected for early maturing fish (December / January), but in recent years spawning time has been distributed throughout the entire run.

Sea-run cutthroat broodstock have also been selected for early spawning fish, which inhibits returning hatchery fish from crossbreeding with wild fish. However, in years of low return, nearly all fish are spawned.

Summer steelhead adults are collected at both the salmon and trout hatcheries in summer and fall and spawned from December through January. Generally, early maturing fish are selected although eggs from later takes are also used. No correlation between arrival in the river and spawning time has been established.

Spawning Protocol

The intent is to utilize a spawning population of at least 200 adults and spawn at a 1:1 male-to-female ratio for all species. However, with sea-run cutthroat, difficulty in obtaining sperm has sometimes resulted in multiple males being used per female. Most egg-takes are used in hatchery production.

Acceptable Stocks

When the hatchery was first started, a portion of the eggs for rearing and release into Blue Creek were Beaver Creek stock, this continued from 1968-1975. Since that time, eggs from other sources are not imported to Cowlitz as sufficient Cowlitz broodstock have been available.

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 WDFW hatcheries is to produce healthy smolts that will survive well and contribute to the sport fishery. The fish health programs also seek to prevent the introduction, amplification or spread of certain fish pathogens detrimental to hatchery or wild fish.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. The standard elements of these programs are outlined below.

Disease Control

- Necropsies of diseased and dead fish are conducted to diagnose the cause of loss.

- Appropriate treatments are prescribed.

- A disease control policy is used to determine how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention

- Clinically healthy fish are examined to assess health status.

- Disease preventative strategies have been implemented, including the use of quality feeds and rearing fish in environmental conditions appropriate to avoid disease events. In addition, antibiotics may be used prophylactically to avoid disease problems.

- A disease prevention policy has been implemented which restricts the introduction of stocks into a facility which may result in the introduction of a new pathogen.

- Sanitation procedures are used which prevent introduction of pathogens into or within a facility.

- Applied research is conducted on new and existing disease prevention techniques.

Fish Health Activities at Cowlitz Hatchery

Health Monitoring

- At spawning, a minimum of 60 ovarian fluids, 60 milts and 60 kidney/spleens are examined for viral pathogens from each fish lot.

- Prior to transfer or release, fish are given a health exam.

- Whenever abnormal behavior or mortality is observed, the fish health specialist examines the affected fish, makes a diagnosis and recommends the appropriate treatment.

- Reporting and control of selected fish pathogens are done in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Fish and eggs are moved in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor (100 ppm for 60 minutes) as a bacterial and viral disinfectant.

- Juvenile fish are administered antibiotics orally when needed to control bacterial infections.

- Formalin (37% formaldehyde) is dispensed into water for control of ecto-parasites on juvenile fish and for fungus control on eggs.

- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

- An ozone treatment plant has been installed to kill infectious stage of *Ceratomyxa Shasta*. Early results have shown that this treatment significantly reduces mortality caused by this disease.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

- All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish / egg lots.

- Different fish / egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.

- Tank trucks are disinfected between the hauling of adult and juvenile fish.

- Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Environmental monitoring is conducted at WDFW facilities to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples.

- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples.

- *In-hatchery Water* Temperatures-daily maximum and minimum readings.

Objective 6: Communicate effectively with other steelhead producers and managers.

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, federal 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Eauilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—COWLITZ TROUT HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Averaae	Range	Constraints
Adult Capture	STW	N/A	N/A	N/A	1
	STS	1,000	1,395	707-2,281	1
	SCT	5,000	1,500	383-2,947	1
Adult Prespawning Survival	STW	--	96.5%	95,4-97.6%	
	STS	_	86.1%	84.3-97.8%	
	SCT	--	92.8%	91.2-95.3%	
Egg-take	STW	1,800,000	1,933,649	1.6-2.1 million	
	STS	700,000	710,541	0.57-l .1 million	
	SCT	250,000	305,000	0.5-l .1 million	2
Green Egg-to-Fry Survival	STW	72%	88.1%	76-94%	
	STS	72%	88.7%	85-92%	
	SCT	72%	78.8%	66-89%	
Fry-to-Smolt Survival	STW	83%	42.5%	36-55%	2,3
	STS	83%	29.2%	13-45%	2,3
	SCT	83%	37.8%	3-83%	2,3
Fish Releases	STW	660,000	822,071	524K-1,179K	
	STS	400,000	255,949	82K-451K	
	SCT	115,000	76,888	10K-110K	
Egg Transfers	STW	50,000	_[1]	--[1]	
	STS	0	--[1]	--[1]	
	SCT	0	_[1]	_[1]	
Fish Transfers	STW	0	--[1]	--[1]	
	STS	0	_[1]	_[1]	
	SCT	0	--[1]	_[1]	
Adults Back to River	STW	--	_	_	
	STS	N/A	N/A	N/A	
	SCT	_	_	--	
Percent Survival	STW	4.0%	2.66%	1.41-4.06%	
	STS	4.0%	5.64%	3.52-7.93%	
	SCT	11.5%	9.38%	4.30-l 4.34%	

N/A=Not applicable.
[1] Not estimated for this report.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Ranae	Constraints
Volitional Release	All	No	No	--	
Proper **Release** Size	All	Yes	Yes	–	
Proper Release Time	All	Yes	Yes	–	

Objective 3

Measures	Species	Hatchery Goal	S-Year Averaae	Range	Constraints
Collect Adults Throughout Run	STW	Yes	Yes	–	
	STS	Yes	Yes	--	
	SCT	Yes	Yes	–	
Spawning Pop. >200	STW	Yes	Yes	--	
	STS	Yes	Yes	--	
	SCT	Yes	Yes	--	
Spawning Ratio Male:Female	STW	1:1	1.26:1	1.04:1 - 1.82:1	
	STS	1:1	1.04:1	0.62:1 - 1.58:1	
	SCT	1:1	1.23:1	1.13:1 - 1.37:1	
Acceptable Stocks	STW	Yes	Yes	–	
	STS	Yes	Yes	--	
	SCT	Yes	Yes	–	

Objective 4

Measures	Species	Hatchet-v Goal	5-Year Averaae	Ranae	Constraints
Adhere to Disease Policy	STW	Yes	Yes	--	
	STS	Yes	Yes	–	
	SCT	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

Species/Stock	Water Supply Inc. Rear.	Virus	BKD	Furunc./ ERM	Other/Comments
Blue Creek Hatchery	G G,SA,ST				
SCT/Cowlitz R		IHN			
STS/Cowlitz R		IHN			
STW/Cowlitz R		IHN			

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Ranae	Constraints
TSS Effluent	All	5 mg/L	N/A	N/A	
Settleable Solids	All	0.1 ml/L	N/A	N/A	
In-hatchery Water Temperatures	All	50°-56°F	N/A	N/A	

Objective 6

Measures	Species	Hatchery Goal	5-Year Average	Ranae	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	*Yes*	*No*	--	
Develop and Review Future Brood Doc.	All	*Yes*	*No*	--	
Develop and Review Current Brood Doc.	All	*Yes*	*No*	--	

Constraints/Comments—Cowlitz Trout Hatchery

1. Only a portion of the winter steelhead are retained for spawning. Fish are recycled back to the river and many fish enter the trap repeatedly. In addition, summer steelhead, winter steelhead and sea-run cutthroat are live-spawned and returned to the river.

2. Fry-to-smolt survival and number of eggs taken have been altered since the 1991 completion of the ozone water treatment system.

3. Fry-to-smolt survival reduced because of bird predation,

Cowlitz Salmon Hatchery (Salkum)

INTRODUCTION

Cowlitz Salmon Hatchery is located on the Cowlitz River (river mile 45) approximately 10 miles from Mossyrock, Washington. Elevation of the facility is 250 feet above sea level.

Cowlitz is a large hatchery that includes a fish ladder, adult return separation facility, 36 modified Burrows ponds (14 of which can be used for juvenile or adult holding), 18 kettles, hatchery building and maintenance facilities. The facility is staffed with 13.83 FTE's.

Water rights are held by Tacoma City Light and total 89,776 gpm (200 cfs) from the Cowlitz River and 1,000 gpm from wells. The hatchery is supplied from three sources, all pumped. The majority of water is supplied from the Cowlitz River with an average 68,800 gpm available to the rearing ponds. An additional 14,000 gpm is available for the fish separator and ladder. The remaining two sources are C-wells (500 gpm) and PW-wells (500 gpm). The wells are only used between September and April, normally for egg incubation and early fry rearing.

Rearing Facilities at Cowlitz Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Heath Incubators					4,320		Fiberglass	28	Fair-Poor	
Burrows Ponds				15,000	31	465,000	Concrete	2 8	Good	
Burrows Ponds				11,000	5	55,000	Concrete	28	Good	

PURPOSE

The hatchery was built in 1967 and is owned and funded by Tacoma City Light as mitigation for the fishery impacts caused by Mossyrock and Mayfield dams. The facility is used for adult collection, egg incubation, and rearing of fall chinook, spring chinook and late (Type-N) coho. It also provides some eggs and fish for volunteer and/or educational fish rearing projects. Steelhead and cutthroat trout are also collected at this facility, with some fish shipped upstream and some downstream.

GOALS

The mitigation goal is established at 17,300 spring chinook adults, 8,300 fall chinook adults and 25,500 coho adults returning to Cowlitz River barrier dam.

OBJECTIVES

Objective 1: Hatchery Production

Fall Chinook
Produce 6,500,000 subyearlings for on-station release.

Provide 10,500 eggs/fish to co-op programs.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Type-N Coho
Produce 4,700,000 yearlings for on-station release.

Produce 800,000 to 1,200,000 subyearlings for upstream resident coho fishery.

Provide 61,200 eggs/fish to co-op programs.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Spring Chinook
Produce 1,752,000 yearlings and subyearlings for on-station release.

Provide 60,000 eggs/fish to co-op programs.

Provide fingerlings for Upper Cowlitz Anadromous Fish Restoration

Provide eggs/fish (surplus to on-station needs) to other facilities.

Steelhead
Imprint 80,000-160,000 steelhead smolts - April 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 state and federal water quality standards.

Objective 6: Communicate effectively with other salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The primary intent of the adult collection procedures at Cowlitz Hatchery is to collect enough adults to 1) sustain the mitigation program through sufficient broodstock returns, 2) provide restocking of the upper Cowlitz watershed with coho, spring chinook and fall chinook adults, and 3) provide a limited number of eggs to other hatchery programs.

Fall Chinook: Adult fall chinook return from mid-August until November. Peak spawning usually occurs in mid-October. Broodstock are collected and separated at the hatchery.

Spring Chinook: Adults return to the Cowlitz River from March through July. Spawning occurs from August to September with a peak usually in September. Adults are collected and separated at the hatchery.

Type-N Coho: Adults return from mid-September to February. Peak spawning occurs in late November and early December. Hatchery broodstock are collected and separated on-site.

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 retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water 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 the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Fall Chinook: Rear 6.5 million fish to a size of 50-80 fish / pound and release on-station (acclimated) in May-June.

Type-N Coho: Rear 800,000 - 1.2 million coho to a size of 50 fish / pound and release into upper Cowlitz River tributaries and Riffe Lake in July-August. Rear 4.7 million coho to a size of 20 fish / pound and release on-station (acclimated) in May-June the following year.

Spring Chinook: Rear approximately 100,000 spring chinook to a size of 30-40 fish / pound and release on-station (acclimated) from May to July. Rear 1,440,000 fish to a size of 4 fish / pound and release on-station (acclimated) in March-April of the following year.

Steelhead: Imprint 80,000 to 160,000 smolts for April release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

Adults are collected throughout the entire run at the Cowlitz Salmon Hatchery adult fish separation facility to ensure that the run timing for these stocks is maintained. Any fish identified as non-Cowlitz origin are not used in spawning.

Spawning Protocol

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Spring chinook eggs for this facility were originally obtained from the Willamette River as well as the Cowlitz River. Tule fall chinook eggs were obtained from the Toutle River. Currently, importing eggs / fish from other facilities is not done at this hatchery and eggs from hatchery-returning adults are always given priority for station use. The stocks approved for use at the Cowlitz Hatchery are listed below.

Fall Chinook
1 Cowlitz River fall chinook

Type-N (Late) Coho
1 Cowlitz River Type-N (early, middle and late components)

Spring Chinook
1 Cowlitz River spring chinook

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 WDFW hatcheries is to produce healthy smolts that will contribute to the fishery. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW 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.
- Use a disease control policy 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 perform necropsies of clinically healthy 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 and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.

- 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) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Cowlitz Salmon Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minirnum of ten fish per lot. Findings are reported on WDFW Form FH01.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each stock.

- At spawning, an Enzyme Link Immunosorbent Assay (ELISA) is conducted on kidney tissue samples from all spring chinook females. ELISA is used to

detect the bacterium which causes kidney disease (*Renibacterium salmoninarum).*

- 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 observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Pronhylactic Treatments

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

- At spawning, eggs are water-hardened in iodophor as a disinfectant.

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

- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

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

- Different fish / egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.

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

- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to incubation room or exit from spawning area) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. 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 parameters are currently monitored at this hatchery:

- Total Suspended *Solids (TSS)*—1 time per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.

- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.

- *In-hatchery Water Temperatures*—maximum and minimum daily.

- *In-hatchery Dissolved Oxygen*- a s required by steam flow or weather conditions.

- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent* Water Temperatures-continuous monitoring
- *Air* Temperatures-continuous monitoring
- *Influent/Effluent Dissolved* Oxygen-continuous monitoring

- *Influent pH/Conductivity*—continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

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, federal 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, Oregon Department of Fish and Wildlife, 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS-COWLITZ SALMON HATCHERY

Objective I

Measures	Species	Hatchery Goal	5-Year Averaae	Ranae	Constraints
Adult Capture	CHS	17,300	5,960	4,642-7,922	1
	CHF	8,300	5,309	2,356-l 1,376	1
	Type-N COH	25,500	23030	5,641-46,303	1
Adult Prespawning Survival	CHS	90%	95.5%	91.6-96.8%	
	CHF	90%	89.6%	81.9-95.9%	
	Type-N COH	90%	95.3%	93.2-97.4%	2
Egg-take	CHS	2,132,000	3,946,600	3,337K-5,472K	
	CHF	7,660,000	8,239,200	5,179K-13,040K	
	Type-N COH	7,010,000	9,090,400	6,465K-10,634K	
Green Egg-to-Fry Survival	CHS	90%	84.9%	74.3-90.6%	3
	CHF	90%	88.3%	80.0-93.6%	3
	Type-N COH	90%	86.6%	82.1-91.4%	3
Fry-to-Smelt Survival	CHS	90%	88%'	61.3-96.6%[1]	
	CHF	90%	96.4%	91-98.6%	
	Type-N COH	90%	74.9%	53.6-82.5%	2
Fish Releases	CHS	1,440,000	940,651 [2]	518K-1,252K	
	CHF	6,500,000	6,572,540[3]	4,303K-8,060K	
	Type-N COH	4,700,000	4,288,160[4]	3,177K-4,686K	
Transfers to Co-ops (Eggs/Fish)	CHS	60,000	57,856	2K-57K[5]	
	CHF	10,500	--	_	
	Type-N COH	61,200	197,400	1 OK-870K	
Other Transfers (Eggs/Fish)	CHS	300K-2,000K	86,300	57K-115K	
	CHF	300K-8,000K	266,500	OK-526K	
	Type-N COH	2,000K-8,000K	129,200	0-2,226K	
Adults Passed Upstream	CHS	500[6]	1,188'	762-2,303	1
	CHF	--	382[8]	O-382	1
	Type-N COH	10,000	12,909	1,994-28,660	1

N/A=Not applicable.
[1] Average of four broods, 1988-1991.
[2] Does not include subyearling releases. Average of four broods, 1988-1991.
[3] Includes fall releases.
[4] Data from five broods, 1987-1991.
[5] Two years of data. One year's transfer was 2,000 fish.
[6] Passed downstream.
[7] Three broods only, 1991 and 1993.
[8] One year only, 1993.

Objective 1 (continued)

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Percent Survival	CHS	1.0%	2.70%	0.39-7.44%	4
	CHF	2.5%	1.09%	0.04-3.17%	
	Type-N COH	3.0%	3.80%	1.66-7.32%	

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Release smolts	CHS	Yes	9.8%	9.3-10.4%	2
CV<10%	CHF	Yes	10.4%	9.1-11.8%	2
	Type-N COH	Yes	9.6%	10.0-10.8%	2
Acclimation	CHS	Yes	Yes	--	
	CHF	Yes	Yes	--	
	Type-N COH	Yes	Yes	--	
Volitional Release	CHS	Yes	No	--	5
	CHF	Yes	No	--	5
	Type-N COH	Yes	No	--	5

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults	CHS	Yes	Yes	Yes	
Throughout Run	CHF	Yes	Yes	Yes	
	Type-N COH	Yes	Yes	Yes	
Spawning Pop.	CHS	Yes	Yes	Yes	
>500	CHF	Yes	Yes	Yes	
	Type-N COH	Yes	Yes	Yes	
Spawning Ratio	CHS	1:3[1]	0.8:1	0.7:1 - 1.1:1	
Male:Female	CHF	1:3[1]	0.8:1	0.8:1 - 1.1:1	
	Type-N COH	1:3[1]	0.8:1	0.7:1 - 0.8:1	

[1] Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

Objective 4

Measures	Species	Hatcherv Goal	5-Year Average	Ranae	Constraints
Adhere to Disease Policy	CHS	Yes	Yes	--	6
	CHF	Yes	Yes	--	6
	Type-N COH	Yes	Yes	--	6

History of Reportable Pathogens—1990-1995

Species/Stock	Water Supply Inc.	Rear.	Virus	BKD	Furunc./ ERM	Other/Comments
Salkum Hatchery	G,SA	G,SA				
CHS/Cowlitz R			IHN	+		
CHF/Cowlitz R			IHN	+		Paramyxovirus
COH/Type-N				+		
COH/Type-S				+		

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

Measures	Species	Hatchery Goal	5-Year Averaae	Ranae	Constraints
TSS Effluent	All	5 mg/L	3.6	nd-18	
TSS Max Effluent	All	15 mg/L	5.7	5-27	
SS Effluent	All	0.1 ml/L	Trace	Trace-O. 1	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1 .O ml/L	N/A	N/A	
Downstream Temp	All	cl 8.0°C	12.1	11.2-l 3.4	
Downstream DO	All	Vanes	11.0 mg/L	10.0-12.5	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

Measures	Species	Hatchery Goal	5-Year Averaae	Ranae	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	7
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	8
Develop and Review Future Brood Doc.	All	Yes	Yes		7
Develop and Review Current Brood Doc.	All	Yes	Yes		7

Constraints/Comments—Cowlitz Salmon Hatchery

1. Harvest rates set on other tule stocks impact escapement to the hatchery. Lack of adequate broodstock results in failure to pass fish upstream. Poor survival of some broods of spring chinook or tule fall chinook results in lowered escapement. Disease transmission concerns have reduced or eliminated putting fall chinook upstream.

2. Poor pond design and excessive handling during the sorting process can increase adult mortalities. The poor pond design can also increase the size variation in juvenile populations and increase mortality due to increased disease problems. To counter the increased disease problems, numerous prophylactic and therapeutic drug treatments are used. Because ponds operate at efficiency with large numbers of juvenile fish, several different egg-takes are often combined in one pond which can increase size variation.

3. Iron bacteria in the well water used for incubation can increase mortality.

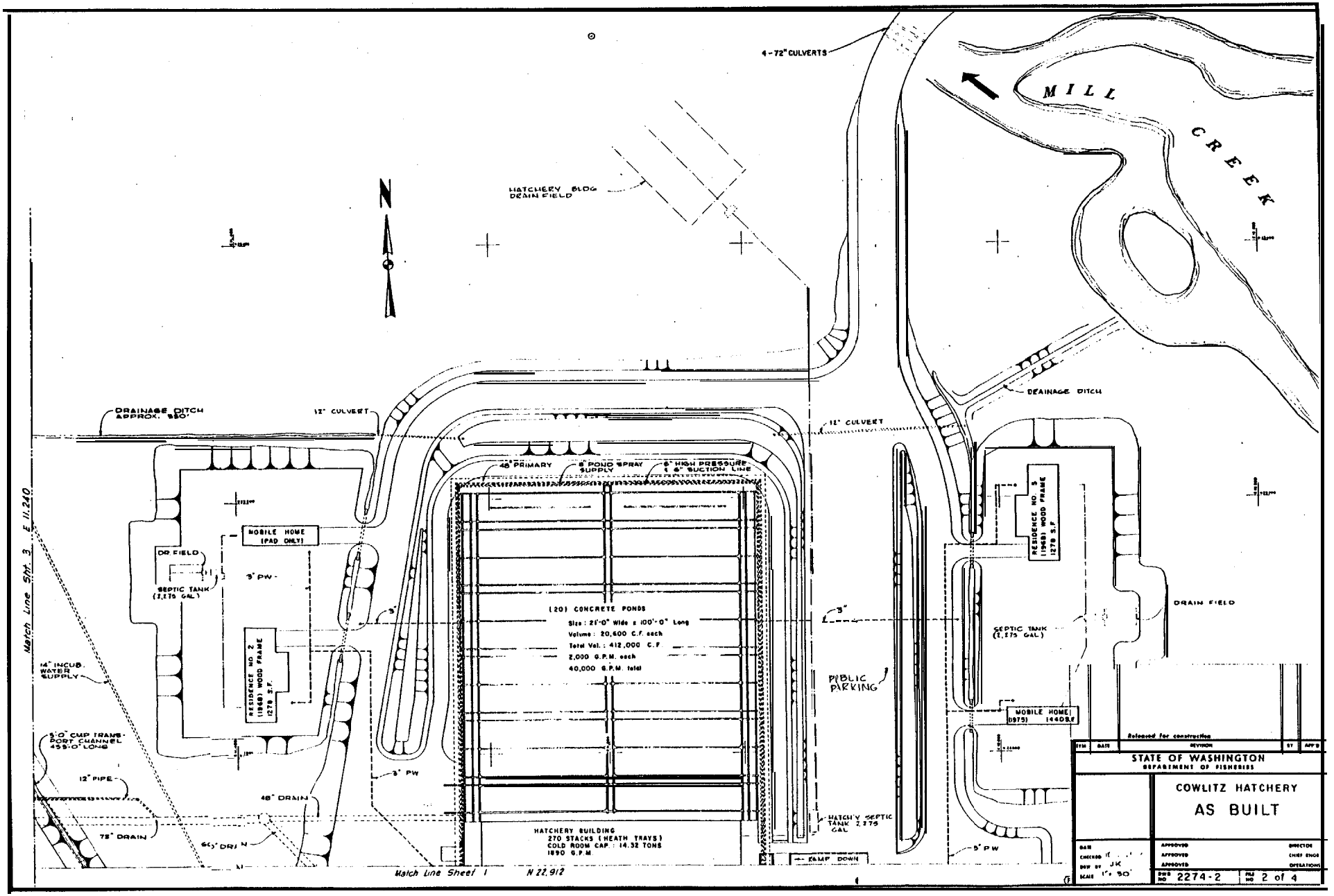
4. Lack of current, continuous tag data.

5. Ponds are not designed for volitional release.

6. Leaky valves allow seepage of river water into well lines; therefore, well water is not pathogen free. Fish can move from one pond to the next because of faulty seals and submerged water inflow system. Leakage occurs between adjacent rearing ponds and kettles; therefore, water is exchanged freely.

7. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.

8. A comprehensive basin-wide production plan has not been completed at this time.

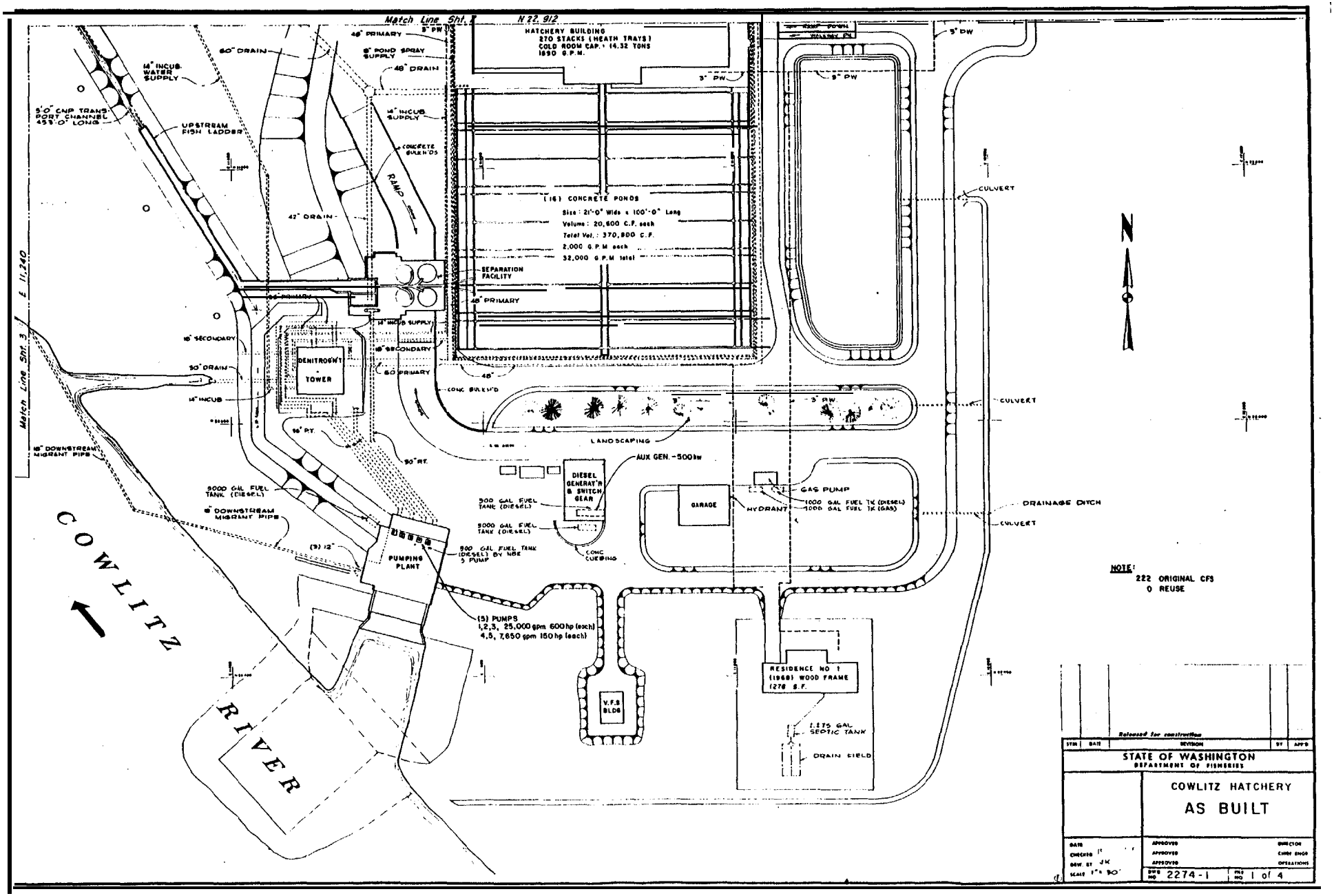


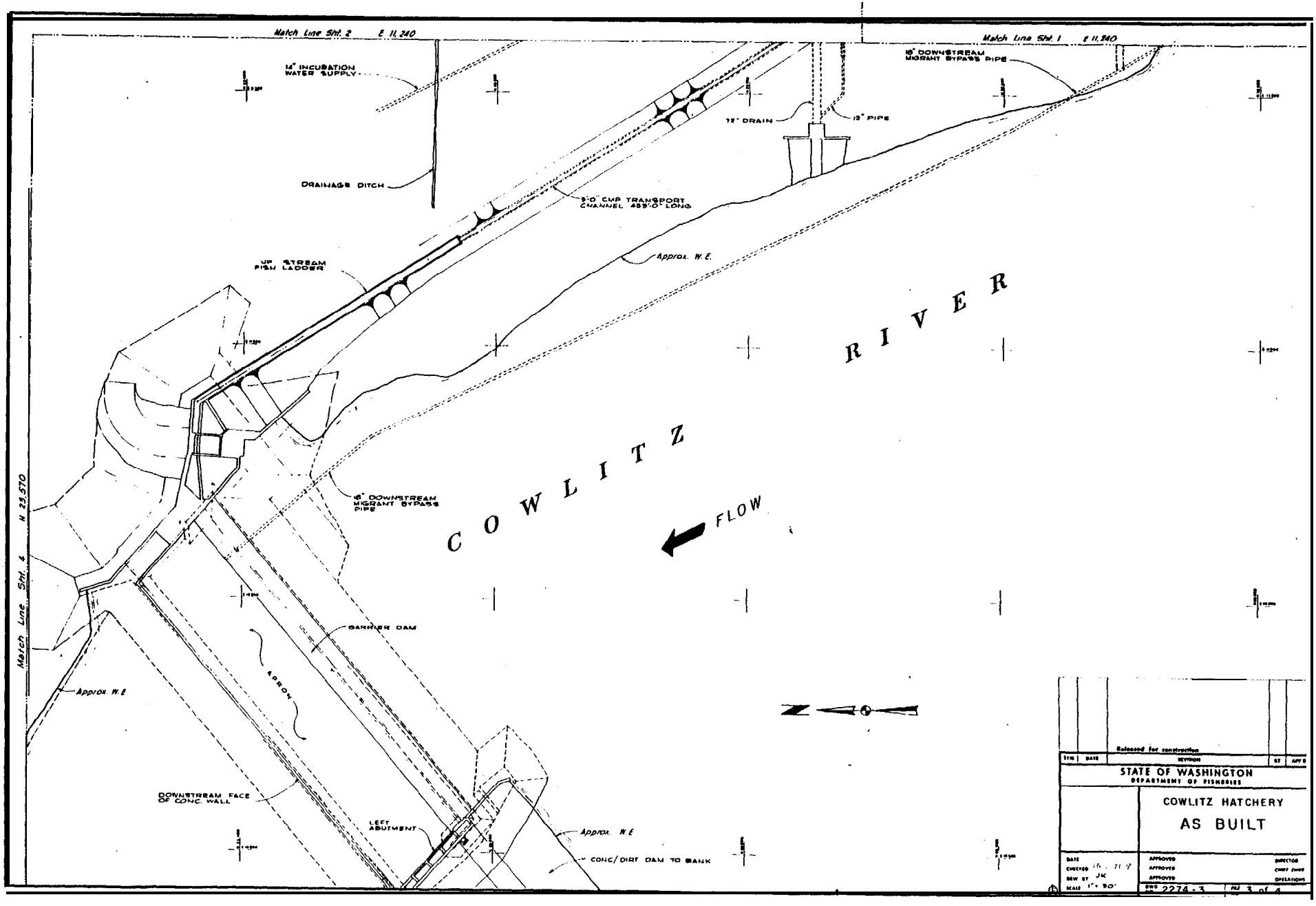
ITM	DATE	REVISION	BY	APP'D
		Released for construction		

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES

COWLITZ HATCHERY
AS BUILT

DATE	APPROVED	DIRECTOR
CHECKED [illegible]	APPROVED	CHIEF ENGR
DRW BY JK	APPROVED	OPERATIONS
SCALE 1" = 50'	DWG NO 2274-2	FILE NO 2 of 4


Match Line Sht. 2
N 22, 912
E 11,240
Match Line Sht. 3
HATCHERY BUILDING
270 STACKS (HEATH TRAYS)
COLD ROOM CAP. = 14.32 TONS
1650 G.P.M.
(16) CONCRETE PONDS
Size: 21'-0" Wide x 100'-0" Long
Volume: 20,600 C.F. each
Total Vol.: 370,800 C.F.
2,000 G.P.M. each
32,000 G.P.M. total
SEPARATION FACILITY
DENITROGN TOWER
PUMPING PLANT
DIESEL GENERAT'R & SWITCH GEAR
AUX GEN. -500kw
GARAGE
GAS PUMP
HYDRANT
1000 GAL FUEL TK (DIESEL)
1000 GAL FUEL TK (GAS)
5000 GAL FUEL TANK (DIESEL)
500 GAL FUEL TANK (DIESEL)
500 GAL FUEL TANK (DIESEL) BY NBE 5 PUMP
CONC CURBING
LANDSCAPING
DRAINAGE DITCH
CULVERT
RAMP DOWN
RAILWAY PK
(5) PUMPS
1,2,3, 25,000 gpm 600 hp (each)
4,5, 7,650 gpm 150 hp (each)
RESIDENCE NO 1
(1968) WOOD FRAME
1270 S.F.
V.F.S BLDG
1,275 GAL SEPTIC TANK
DRAIN FIELD
UPSTREAM FISH LADDER
5'0" CMP TRANSPORT CHANNEL 455'-0" LONG
COWLITZ RIVER
N
NOTE:
222 ORIGINAL CFS
0 REUSE
Released for construction
STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
COWLITZ HATCHERY
AS BUILT
DWG NO 2274-1
SHT NO 1 of 4


Match Line Sht. 2 E 11,240
Match Line Sht. 1 E 11,340
Match Line Sht. 4 N 23,570
14" INCUBATION WATER SUPPLY
DRAINAGE DITCH
18" DOWNSTREAM MIGRANT BYPASS PIPE
12" DRAIN
12" PIPE
5'-0" CMP TRANSPORT CHANNEL 459'-0" LONG
Approx. W.E.
UP STREAM FISH LADDER
C O W L I T Z R I V E R
FLOW
18" DOWNSTREAM MIGRANT BYPASS PIPE
BARRIER DAM
APRON
Approx. W.E
DOWNSTREAM FACE OF CONC. WALL
LEFT ABUTMENT
Approx. W.E
CONC/DIRT DAM TO BANK
Released for construction
STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
COWLITZ HATCHERY
AS BUILT
DRG. 2274-3
SHT. 3 of 4

Eastbank Hatchery

INTRODUCTION

Eastbank Hatchery is located on the east side of the Columbia River near Rocky Reach Dam, 7 miles north of Wenatchee, Washington. The hatchery is staffed with 2 FTE's.

The former Washington Department of Wildlife portion of the hatchery consists of one raceway, two 0.5-acre rearing ponds, and a hatchery building with 4 fiberglass troughs and 16 vertical incubator stacks. Eastbank Hatchery uses well water and this portion of the hatchery uses up to 10 cfs.

PURPOSE

Eastbank Hatchery began operation in 1989 as mitigation for lost steelhead production caused by Rock Island Dam. It is funded by the Chelan County PUD. The facility is used for egg incubation and rearing of summer steelhead.

GOALS

Produce adult summer steelhead to replace lost steelhead production caused by the construction and operation of Rock Island Hydroelectric Project.

OBJECTIVES

Objective 1: Hatchery Production

Produce 200,000 summer steelhead smolts for off-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 steelhead producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

No adult steelhead are collected at Eastbank Hatchery. Eggs are shipped in from Wells Hatchery.

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

Rearing and Release Strategies-Overview

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions.

Size at Release: One important strategy for minimizing interactions is to ensure that all fish are released so they will promptly migrate from the subbasin. To accomplish this, fish should be released at a size and condition factor to indicate a smolt condition. For steelhead, a release size of 4.0-8.0 fish per pound with a condition factor of less than 1.0 is considered appropriate. For cutthroat, the release size should be between 3.5 and 5 fish/pound with a condition factor of less than 1.0.

Time of Release: Smolts should be released between April 15 and May 15, the time period that research has indicated that optimum returns be expected.

Acclimation: Acclimating smolts to the parent stream water prior to their release can help reduce straying when they return as adults as well as increase survival to adulthood. Acclimation periods from 4 to 6 weeks are required to get maximum benefits from this technique. Current investigations are underway to more closely define these requirements.

Volitional Release: The use of volitional release ensures that only actively migrating fish are released from the hatchery pond. The removal of the migrating fish also benefits the remaining population by allowing them more time to feed, reducing the stress on the remaining population by reducing loadings, and may decrease the likelihood of disease occurrence during final rearing.

Markine Programs; All hatchery smolts stocked in systems where they will co-mingle as adults with an under-escaped wild run are marked with an adipose clip to allow for selective fishery regulations.

Rearing and Release Strategies-Eastbank Hatchery

The specific fish rearing and release strategies currently used at this hatchery are detailed below.

Summer Steelhead: Summer steelhead is the only fish stock reared at this hatchery. The current strategy is to rear 200,000 fish to a size of 4-8 fish/pound and release in the Wenatchee River from April 15 to May 15. Additional summer steelhead from Chelan Hatchery are reared from November to April at Turtle Rock, and a portion of that program is released into the Entiat River in addition to the Wenatchee River.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

No adults are collected at this facility (see Wells Hatchery Plan).

Spawning Protocol

No steelhead are spawned at this facility (see Wells Hatchery Plan).

Acceptable Stocks

Eggs are obtained from steelhead returning to Wells Hatchery, an upper Columbia River facility. This egg source is thought to be appropriate for adult steelhead returning to the upper Columbia River.

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 WDFW hatcheries is to produce healthy smolts that will survive well and contribute to the sport fishery. The fish health programs also seek to prevent the introduction, amplification or spread of certain fish pathogens detrimental to hatchery or wild fish.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. The standard elements of these programs are outlined below.

Disease Control

- Necropsies of diseased and dead fish are conducted to diagnose the cause of loss.

- Appropriate treatments are prescribed.

- A disease control policy is used to determine how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention

- Disease preventative strategies have been implemented, including the use of quality feeds and rearing fish in environmental conditions appropriate to avoid disease events. In addition, antibiotics may be used prophylactically to avoid disease problems.

- A disease prevention policy has been implemented which restricts the introduction of stocks into a facility which may result in the introduction of a new pathogen.

- **Sanitation** procedures are used which prevent introduction of pathogens into or within a facility.

- Applied research is conducted on new and existing disease prevention techniques.

Fish Health Activities at Eastbank Hatchery

Health Monitoring

- Prior to release, fish are given a health exam.
- Whenever abnormal behavior or mortality is observed, the fish health specialist examines the affected fish, makes a diagnosis and recommends the appropriate treatment.
- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Fish and eggs are moved in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Juvenile fish are administered antibiotics orally when needed to control bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of ecto-parasites on juvenile fish and for fungus control on eggs.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Environmental monitoring is conducted at WDFW facilities to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples.
- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples.
- *In-hatchery* Wafer Temperatures-daily maximum and minimum readings.

Objective 6: Communicate effectively with other steelhead producers and managers.

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.

Intemated Hatchery Onerations 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, federal 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS-EASTBANK HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Ranae	Constraints
Adult Capture	STS	N/A	N/A	N/A	
Adult Prespawning Survival	STS	N/A	N/A	N/A	
Egg-take	STS	N/A	N/A	N/A	
Green Egg-to-Fry Survival	STS	90%	91.4%	82.6-98.8%	
Fry-to-Smolt Survival	STS	90%	90.1%	81 .O-99.2%	1
Fish Releases	STS	200,000	186,143	167K-200K	1
Egg Transfers	STS	0	_[1]	--[1]	
Fish Transfers	STS	0	--[1]	_[1]	
Adults Back to River	STS	N/A	N/A	N/A	
Percent Survival	STS	--	Unknown	Unknown	

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Ranae	Constraints
Volitional Release	STS	No	No	--	
Proper Release Size	STS	Yes	Yes		
Proper Release Time	STS	Yes	Yes	--	

N/A=Not applicable.
[1] Not estimated for this report.

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Ranae	Constraints
Collect Adults Throughout Run	STS	N/A	N/A	N/A	
Spawning Pop. >200	STS	N/A	N/A	N/A	
Spawning Ratio Male:Female	STS	N/A	N/A	N/A	
Acceptable Stocks	STS	Yes	Yes	--	

Objective 4

Measures	Species	Hatchery Goal	5-Year Average	Ranae	Constraints
Adhere to Disease Policy	STS	Yes	Yes	--	

History of Reportable Pathogens—1990-1995

Species/Stock	Water Inc.	Supply Re	a Virus	BKD	Furunc./ ERM	Other/Comments
Eastbank Hatchery STS/Wells	G	G				
Turtle Rock RP STS/Wells	N/A	SA	IPN			

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

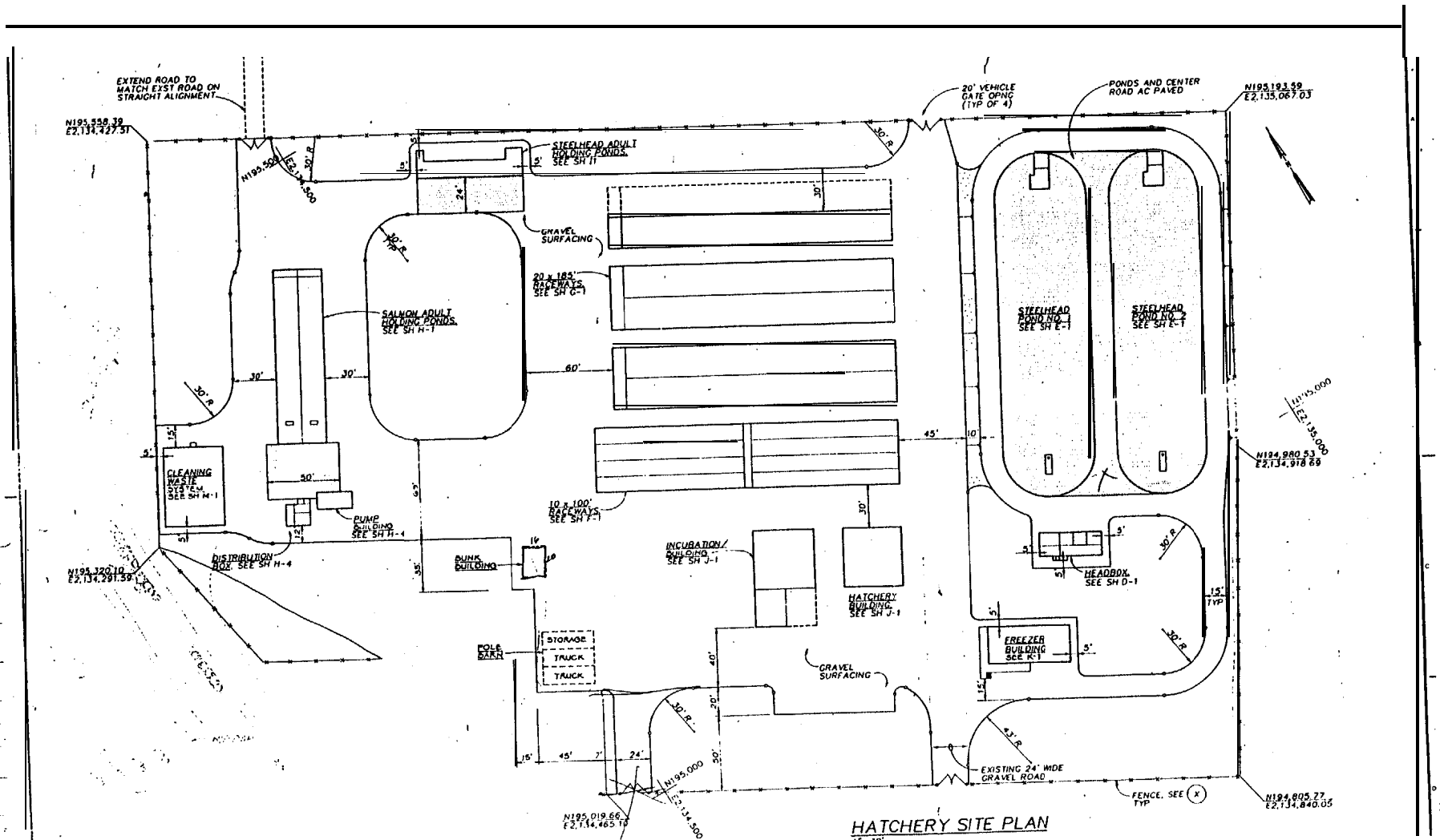
Measures	Species	Hatcherv Goal	B-Year Averaae	Range	Constraints
TSS Effluent	All	5 mg/L	N/A	N/A	
Settleable Solids	All	0.1 ml/L	N/A	N/A	
In-hatchery Water Temperatures	All	5556°F	N/A	N/A	

Objective 6

Measures	Species	Hatcherv Goal	5-Year Averaae	Ranae	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes	--	
Develop and Review Equil. Brood Doc.	All	Yes	No	--	
Develop and Review Future Brood Doc.	All	Yes	No	--	
Develop and Review Current Brood Doc.	All	Yes	No	--	

Constraints/Comments-Eastbank Hatchery

1. Inability to cool water during the early rearing period results in a wide range of smolt sizes at release and a high percentage (up to 20 percent) of precocious males. Currently chilled water has been plumbed into the incubator stacks and the small indoor rearing troughs. The use of chilled water has reduced the percentage of precocious males to 3% during initial trials.



HATCHERY SITE PLAN

1" = 30'

DESIGNED	JSON			REUSE OF DOCUMENTS	VERIFY SCALE	PUBLIC UTILITY DISTRICT NO. 1 OF CHELAN COUNTY, WASHINGTON	HATCHERY SITE PLAN
DRAWN	DR'N L L FAGAN			THIS DOCUMENT AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF CH2M HILL AND IS NOT TO BE USED IN WHOLE OR IN PART FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CH2M HILL	BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY		EASTBANK ENTERPRISE
CH2M HILL	CHK						SHEET 7
APPROVED	APPD	NO	DATE	REVISION	BY	APPD	DWG NO 8-1
							DATE DEC 1988
							PROJ NO 522871.9'

Rock Island Hatchery Complex
(Eastbank and Satellites)

INTRODUCTION

The Rock Island Hatchery Complex consists of a central hatchery (Eastbank) and five satellite rearing facilities. The five satellite facilities are located on four different rivers (Wenatchee, Chiwawa, Methow and Similkameen). The Eastbank facility is located on the mainstem Columbia River just above Rocky Reach Dam, approximately 10 miles north of East Wenatchee, Washington. The hatchery was built to mitigate for smolt losses at Rock Island Dam and serves as a hub for the five satellite facilities. The hatchery began operation in 1989. Hatchery funding is provided by Chelan County PUD. The facility is operated by WDFW and a total of 7.5 FTE's are provided.

The facility consists of two adult salmon holding ponds, eight raceways, and five raceways. There is one (10' x 70') adult steelhead holding pond and two (0.5-acre) steelhead rearing ponds. A hatchery building houses shallow troughs and numerous double stacks of vertical incubators.

Rearing Facilities at Eastbank and Rock island Hatchery Complex

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Raceway				22,000	5	110,000	Concrete	6	Good	
Raceway				3,700	7	25,900	Concrete	6	Good	
Rearing Pond				52,000	2	104,000	Concrete	6	Good	
Shallow Troughs				30	6	180	Concrete	6	Good	
Raceway				3,760	1	3,760	Concrete	6	Good	
Rearing Pond				36,000	30	1,080,000	Concrete	6	Good	
Rearing Pond				2,386	1	2,386		6	Good	Similkameen Pond
Raceway				168	2	336	Concrete	6	Good	Similkameen
Rearing Pond				75,000	2	150,000		6	Good	Chiwawa Pond
Net Pens				7,400	a	59,200	Synth. Mesh	6	Good	Lake Wenatchee
Rearing Pond				115,200	1	115,200	Lined Pond	6	Good	Dryden
Rearing Pond				53,400	1	53,400	Lined Pond	6	Good	Carlton Pond

Four deep aquifer wells provide up to 53 cfs of water at a relatively constant temperature. The hatchery has chillers to cool the incubation water and retard egg and alevin development. Satellite facilities associated with Eastbank Hatchery include the Lake Wenatchee net pens, and the Chiwawa, Dryden, Similkameen and Methow rearing ponds. As an aggregate, these facilities are supplied with approximately 89 cfs of river water.

The Chiwawa/Lake Wenatchee complex has a rearing site located on the Chiwawa River approximately one mile upstream of the confluence with the Wenatchee River. The hatchery has an office, two large rearing ponds, a removable, picket diffuser weir and trap. The facility rears only spring chinook. The facility has two water sources: the Chiwawa River (21 cfs, pumped) or the Wenatchee River (12 cfs, pumped). The latter water source is available for use from November until March when ice forms in the Chiwawa River. In addition to rearing spring chinook, sockeye juveniles are reared in six floating net cages on Lake Wenatchee. Two additional floating cages are used for holding adult sockeye until spawning. These two cages are kept separate from the remaining six cages to prevent disease transmittal. The remaining six cages are used for rearing juvenile sockeye until their release into Lake Wenatchee in the fall. This facility is staffed with 2.75 FTE's.

The Dryden rearing facility consists of a large, lined rearing pond located adjacent to the Wenatchee River in Dryden, Washington. It is used to acclimate Wenatchee summer chinook. The water supply (32 cfs) originates from an irrigation canal that takes water from the Wenatchee River at Dryden Dam. The intake is located less than a mile upstream of the pond. There are no buildings at this site.

The Similkameen rearing facility is located on the Similkameen River near Oroville, Washington. The facility has an office, small shop and a large rearing pond used for rearing Okanogan summer chinook. The water supply (21 cfs) is pumped from the Similkameen River. An aeration system was recently installed to supply oxygen to the pond during periods when water flow is shut off, due to ice formation or toxic spills in the river. The facility is staffed with 1.75 FTE's.

The Methow facility consists of a large, lined rearing pond located on the Methow River near Twisp, Washington. There is a also a small office on site. This facility is used to acclimate Methow summer chinook. Water (15 cfs) is pumped from the Methow River.

PURPOSE

Eastbank Hatchery and the various satellite facilities began operating in 1989. The hatchery complex is one of three components of the mitigation agreement relating to the construction of Rock Island Dam. The mitigation agreement requires that

hatchery production be equivalent to the number of naturally produced adults lost due to smolt mortality at Rock Island Dam. Furthermore, the mitigation agreement requires that the hatchery program be consistent with maintenance of genetically distinct stocks or populations.

The satellite facilities serve two functions: 1) collection of native salmon for broodstock, and 2) a site to rear and release salmon progeny from each river's respective broodstock. Broodstock selection and spawning protocols reflect the need to maintain genetic diversity of these separate populations.

GOALS

Use artificial propagation to replace adult production lost due to smolt mortality at the Rock Island Project, while not reducing the natural production or long-term fitness of salmon and steelhead populations in the mid-Columbia River. The Rock Island Settlement Agreement has specific goals for meeting the mitigation agreement. The specific goals for hatchery production are to trap sufficient broodstock to meet programmed release numbers, and use fish cultural methods that result in 1) maintenance of the genetic integrity of the native stock, and 2) the release of high quality smolts from the facility.

OBJECTIVES

Objective 1: Hatchery Production

Produce 672,000 yearling spring chinook for release into the Chiwawa River from the Chiwawa rearing facility to replace 1,750 adults.

Produce 864,000 yearling summer chinook for release into the Wenatchee River from the Dryden rearing pond to replace 1,990 adults.

Produce 200,000 subyearling sockeye for release into Lake Wenatchee from the Lake Wenatchee net pens to replace 1,800 adults.

Produce 400,000 yearling summer chinook for release into the Methow River from the Methow rearing pond to replace 600 adults.

Produce 576,000 yearling summer chinook for release into the Similkameen River from the Similkameen rearing pond to replace 864 adults.

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 salmon producers and managers in the Columbia River Basin, and with the spill coordination subcommittee.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Chiwawa Spring Chinook: There have been insufficient numbers of broodstock collected every year since this facility began operating. The picket diffuser floating weir has not been effective in trapping adults. In 1992, the weir was washed out prior to the arrival of adults. Because of the ineffectiveness of the trap, gaffing or seining adult fish in the river spawning beds has been necessary to obtain eggs. Unripe adults are transported to Eastbank Hatchery for holding and subsequent spawning. Eggs taken from ripe females at the gaffing/seining sites are also taken to Eastbank Hatchery. If the weir is operating as designed, no more than one-third of the trapped adults are kept for broodstock and the remaining fish are allowed to pass upstream. Protocols for each year's adult collection are developed in the year of return.

Wenatchee Summer Chinook: Insufficient numbers of adults had been collected until adult program goals were met in 1993. Temporary modifications at Dryden Dam in 1992 were largely successful in increasing the number of fish trapped. Permanent modifications were completed in the summer of 1992. When insufficient

numbers of broodstock are captured at Dryden Dam, up to 25 percent of the needed broodstock can be trapped at Tumwater Dam. Unripe females are transported to Eastbank Hatchery for holding and subsequent spawning.

Lake Wenatchee Sockeye: Sufficient numbers of adults are captured at Tumwater Dam on the mainstem Wenatchee River. Adults are transported to Lake Wenatchee net pens until maturity. Unfertilized eggs are transported to the Eastbank Hatchery for incubation. Fry are then returned to the net pen complex and reared until the fall when they are released into the lake. On occasion, females excess to program needs are inadvertently retained because of the difficulty in sexing the fish at the time of capture. Beginning in 1993, these excess adults will be released into Lake Wenatchee to spawn naturally in the tributaries.

Methow/Okanogan Summer Chinook: Adults are captured at the fish ladder at Wells Dam or as volunteers to the Wells Hatchery collection channel. The fish are held at Wells Hatchery until maturity and then spawned. The eggs are transported to Eastbank.

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

Rearing and Release Strategies

Fish production at Rock Island Hatchery Complex is intended to replace fishery losses caused by Rock Island Dam while maintaining genetically distinct populations or stocks. To accomplish this goal, hatchery rearing and release procedures include acclimation to parent river water for a minimum of six weeks prior to release. This imprinting is expected to reduce the staying of these stocks into other areas **that contain** different stocks of fish and reduce interbreeding. The rearing and release strategies are specifically designed to 1) imprint the hatchery fish so that returning hatchery adults will spawn with the donor stock, and 2) minimize adverse interactions (i.e., competition for food and habitat) between hatchery-released and naturally produced smolts. All spring/summer chinook stocks are reared as yearlings to increase survival and reduce river residence time. The specific rearing and release strategies for each satellite facility are outlined below.

Chiwawa Spring Chinook: Transfer 700,000 subyearlings from Eastbank Hatchery to the Chiwawa Pond in September; rear and acclimate on parent river water to a size of approximately 12 fish/pound; allow fish to volitionally migrate in April-May.

Lake Wenatchee Sockeye: Transfer 230,000 fry from Eastbank Hatchery to the Lake Wenatchee net pens in March; rear fish to a size of approximately 24 fish/pound and release fish to the lake in October. The fish will reside in the lake for several months before migrating.

Wenatchee River Summer Chinook: Transfer 900,000 yearling fish from Eastbank Hatchery to Dryden Pond in February; rear and acclimate on parent river water to a size of approximately 12 fish / pound; allow fish to volitionally migrate in April-May.

Okanogan and Methow Summer Chinook: Transfer 600,000 subyearlings from Eastbank Hatchery to the Similkameen Pond in October; rear and acclimate on parent river water to a size of approximately 10 fish / pound; allow fish to volitionally migrate in April-May. Transfer 425,000 yearling fish from Eastbank Hatchery to the Methow Pond in February; rear and acclimate to parent river water until release. These fish are volitionally released in April-May at a size of 10 fish / pound.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

The hatchery practices established for broodstock selection and spawning are critical for maintaining the genetic diversity of each unique population or stock. Broodstock trapping is designed to remove representative members from the donor population in a random manner, and in a way to ensure that all segments (age and return timing) of the run are represented. The specific broodstock selection and spawning protocols for Rock Island Hatchery Complex are outlined below.

Chiwawa Spring Chinook: The trap used at Chiwawa serves three functions: 1) it collects all sizes and ages of returning adults, 2) it allows for segregation of hatchery- or natural-origin fish, and 3) when not collecting broodstock, the trap passes fish upstream with minimal delay. The broodstock selection strategy for Chiwawa spring chinook is to retain no more than 30 percent of the naturally produced adults returning to the river and pass all hatchery-origin fish upstream. The mating guidelines include the splitting of gametes of each sex into subsets for cross mating, spitting of eggs into sufficient numbers of subsets to accommodate 1:1 matings with males (particularly if there are more males), live spawning of individual males, and cryopreservation of milt for use in successive years.

Lake Wenatchee Sockeye: The strategy is to trap only enough adults to meet hatchery needs and spawn at 1:1 male-to-female ratio using two female and two male pools of gametes. Only Wenatchee River sockeye are used for broodstock.

Wenatchee River Summer Chinook: The broodstock section strategy is to collect only naturally produced salmon for broodstock. In 1992, both hatchery and wild fish were retained. The fish are spawned at a 1:1 male-to-female ratio. Gametes of the least numerous sex are split into subsets and these are crossed with gametes from a

different individual of the more numerous sex. Males are also live-spawned when necessary.

Okanogan and Methow Summer Chinook: Broodstock collection for the Similkameen and Methow facilities is done concurrently with broodstock collection for the Wells Hatchery. Fish trapped at the east fishway of Wells Dam are used for the Similkameen and Methow programs, and fish volunteering into Wells Hatchery are used primarily for the Wells program although shortfalls in the Similkameen / Methow needs can be made up with volunteer fish. To prevent inclusion of fall chinook stock into the summer chinook gene pool, broodstock collection at both capture sites is curtailed on August 28. Also, gametes from fish with coded-wire tags are held separately until the origin of fish is determined. Only summer chinook are used in these programs. A 1:1 mating scheme is employed.

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 WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural production. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW 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.
- Use a disease control policy 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 perform necropsies of clinically healthy 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 and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.

- 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) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows. Proper feeding practices are used to discourage over-feeding of the fish and over-accumulation of uneaten food or feces. Ponds or raceways are vacuumed to maintain cleanliness and reduce stress caused by other cleaning methods.

Fish Health Activities at Rock Island Hatchery Complex

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each fish lot.

- At spawning, an Enzyme Link Immunosorbent Assay (ELISA) is conducted on kidney tissue samples from spawned females (Chiwawa spring chinook, Wenatchee sockeye, and Wenatchee, Similkameen and Methow summer

chinook). ELISA is used to detect the bacterium which causes kidney disease (*Renibacterium salmoninarum*). Progeny from females with similar ELISA levels are grouped and reared together to reduce the horizontal transmission of this disease.

- 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 observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

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

- At spawning, eggs are water-hardened in iodophor as a disinfectant.

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

- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

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

- Different fish / egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.

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

- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. 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 parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per quarter on pollution abatement pond influent and effluent samples.

- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.

- *In-hatchery Wafer Temperatures*—maximum and minimum daily.

- *In-hatchery Dissolved Oxygen*—as required by steam flow or weather conditions.

- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent* Wafer Temperatures-continuous monitoring
- *Air* Temperatures-continuous monitoring
- *Influent/Effluent Dissolved* Oxygen--continuous monitoring
- *Influent pH/Conductivity*—continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

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 Onerations 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, federal 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, Oregon Department of Fish and Wildlife, 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Eauilibrium Brood Document for the Columbia River and / or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

Evaluation Program

The first phase of the Rock Island Hatchery Complex evaluation program was implemented in 1992. Future areas of evaluation will be developed over time. Annual reports will include genetic monitoring results, disease history, survival estimates, pm-release physiology, and interactions with natural production at the time of fish release and during spawning when adults return.

PERFORMANCE STANDARDS—ROCK ISLAND HATCHERY COMPLEX

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Ranae	Constraints
Adult Capture	Chiwawa CHS	400	65	19-113'	1
	Wenatchee CHR	512	275	81-491	1
	Wenatchee SOC	300	1,533	231-3,529	
	Similkameen CHR	400	N/A	N/A	1
	Methow CHR	291	N/A	N/A	1
Adult Prespawning Survival*	Chiwawa CHS	60%	94.0%	73.7-l 00%	
	Wenatchee CHR	80%	90.0%	84.2-94.5%	
	Wenatchee SOC	80%	84.2%	55.0-99.1%	
	Similkameen CHR	80%	92.0%	N/A	
	Methow CHR	80%	92.0%	N/A	
Egg-take	Chiwawa CHS	830,000	107,995	45K-252K	1
	Wenatchee CHR	1,070,000	634.790	163K-1,134K	1
	Wenatchee SOC	250,000	237,226	139K-334K	
	Similkameen CHR	711,000	1,069,572[3]	940K-1,254K	1
	Methow CHR	525,000	1,069,572[3]	940K-1,254K	1
Green Egg-to-Fry Survival"	Chiwawa CHS	90%	92.7%	88.0-97.1%	
	Wenatchee CHR	90%	81.7%	77.5-88.2%	2
	Wenatchee SOC	90%	85.0%	75.9-90.7%	
	Similkameen CHR	90%	84.9%	82.2-86.8%	2
	Methow CHR	90%	84.9%	82.2-86.8%	2
Fry-to-Smolt Survival[2]	Chiwawa CHS	72%	96.5%'	96.0-98.0%	
	Wenatchee CHR	72%	98.1%'	97.6-98.5%	
	Wenatchee SOC	72%	96.4%'	92.5-99.0%	
	Similkameen CHR	72%	96.3%'	57.4-98.6%	3
	Methow CHR	72%	96.3%'	N/A	
Fish Releases	Chiwawa CHS	672,000	53,170'		1,2
	Wenatchee CHR	864,000	422,200'	124K-648K	1,2
	Wenatchee SOC	200,000	266,675'	168K-372K	
	Similkameen CHR	576,000	447,300'	353K-542K	1,2,3
	Methow CHR	400,000	0[4]	N/A	1,2
Transfers to co-ops (Eggs/Fish)	Chiwawa CHS	0	--	_	
	Wenatchee CHR	0	--	_	
	Wenatchee SOC	0	--	_	
	Similkameen CHR	0	--	_	
	Methow CHR	0	--	--	

N/A=Not applicable.
[1] Data is based on five broods.
[2] Goals are assigned by FERC agreement and do not reflect hatchery expectations.
[3] Three year average. Eggs are taken at Wells Hatchery.
[4] First brood not yet released.

Objective 1 (continued)

Measures	Species	Hatchery Goal	5-Year Averaae	Range	Constraints
Other Transfers (Eggs/Fish)	Chiwawa CHS	0	--	--	
	Wenatchee CHR	0	--	--	
	Wenatchee SOC	0	--	--	
	Similkameen CHR	0	--	--	
	Methow CHR	0	--	--	
Adults Passed Upstream	Chiwawa CHS	--	19	One year only	
	Wenatchee CHR	--	--	fish get by trap	
	Wenatchee SOC	--	1,265[1]	31-3,296	
	Similkameen CHR	--	--	--	
	Methow CHR	--	--	--	
Percent Survival*	Chiwawa CHS	*0.26%*	Unknown	Unknown	1,4
	Wenatchee CHR	*0.23%*	Unknown	Unknown	1,4
	Wenatchee SOC	*0.90%*	Unknown	Unknown	1,4
	Similkameen CHR	0.15%	Unknown	Unknown	1,4
	Methow CHR	0.15%	Unknown	Unknown	1.4

Objective 2

Measures	Species	Hatchery Goal	5-Year Averaae	Range	Constraints
Release smolts CV<10%	Chiwawa CHS	Yes	Unknown	*4.4%*	*5*
	Wenatchee CHR	Yes	Unknown	13.7%	5
	Wenatchee SOC	Yes	Unknown	N/A	*5*
	Similkameen CHR	Yes	Unknown	*9.5%*	*5*
	Methow CHR	Yes	Unknown	16.0%	*5*
Acclimation	Chiwawa CHS	Yes	N/A	N/A	
	Wenatchee CHR	Yes	N/A	N/A	
	Wenatchee SOC	No	N/A	N/A	
	Similkameen CHR	Yes	N/A	N/A	
	Methow CHR	Yes	N/A	N/A	
Volitional Release	Chiwawa CHS	Yes	N/A	N/A	6
	Wenatchee CHR	Yes	N/A	N/A	6
	Wenatchee SOC	No	N/A	N/A	7
	Similkameen CHR	Yes	N/A	N/A	6
	Methow CHR	Yes	N/A	N/A	6

[1] First brood not yet released.
[2] Goals are assigned by FERC agreement and do not reflect hatchery expectations.

Objective 3

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Chiwawa CHS	Yes	N/A	N/A	1
	Wenatchee CHR	Yes	N/A	N/A	1
	Wenatchee SOC	Yes	N/A	N/A	
	Similkameen CHR	Yes	N/A	N/A	
	Methow CHR	Yes	N/A	N/A	
Spawning Pop. >500	Chiwawa CHS	Yes	N/A	N/A	1
	Wenatchee CHR	Yes	N/A	N/A	1
	Wenatchee SOC	No	N/A	N/A	
	Similkameen CHR	Yes	N/A	N/A	1
	Methow CHR	Yes	N/A	N/A	1
Spawning Ratio Male:Female	Chiwawa CHS	1:1	0.46:1	0.16:1 - 0.65:1	
	Wenatchee CHR	1:1	0.61 :1	0.73:1 - 0.90:1	
	Wenatchee SOC	1:1	1.00:1	1.00:1	
	Similkameen CHR	1:1	0.76:1	0.65:1 - 1.00:1	
	Methow CHR	1:1	0.76:1	0.65:1 - 1.00:1	

Objective 4

Measures	Species	Hatcherv Goal	5-Year Average	Ranae	Constraints
Adhere to Disease Policy	Chiwawa CHS	Yes	N/A	N/A	
	Wenatchee CHR	Yes	N/A	N/A	
	Wenatchee SOC	Yes	N/A	N/A	
	Similkameen CHR	Yes	N/A	N/A	
	Methow CHR	Yes	N/A	N/A	

History of Reportable Pathogens-79904995

Species/Stock	Water Supply Inc.	Rear.	Virus	BKD	Furunc./ ERM	Other/Comments
Eastbank Hatchery	G	G				No adult returns to station
CHR/Wenatchee R			IHN	+		
CHR/Wells			IHN	+		
CHS/Chiwawa Fi			IHN	+		BKD by ELISA of broodstock
SOC/Lk Wenatchee			IHN	+		BKD by ELISA of broodstock
Lk Wenatchee NP	N/A	S				
SOC/Lk Wenatchee			IHN			
Dryden RP	N/A	SA				
CHR/Wenatchee R			IHN	+		
Chiwawa RP	N/A	SA				
CHS/Chiwawa			IHN	+		
Similkameen RP	N/A	SA				
CHS/Wells				+		No virus at pens; may have been progeny of IHN+ adults

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish-and Wildlife.)

Objective 5

Measures	Species	Hatchery Goal	5-Year Averaae	Ranae	Constraints
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1 .O ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

Measures	Species	Hatch&v Goal	5-Year Averaae	Ranae	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	
Develop and Review Comp. Basin-wide Production Plan	All	Yes	No	--	
Develop and Review Future Brood Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments-Rock Island Hatchery Complex

1. Trap inefficiencies at some sites result in capturing inadequate numbers of broodstock, particularly during heavy spring runoff. This results in fish spawning upstream of the trap and prevents sampling of fish from the entire run. Poor survival of juveniles or adults may be caused by inadequate water flows, dam passage problems, higher reservoir water temperatures or predation in the reservoirs. Transporting adults to Eastbank may also increase mortality due to handling stress.

2. Softshell disease in eggs may reduce egg-to-fry survival. Unexplained poor fertilization occurs in some egg lots.

3. Thick ice or anchor ice at Similkameen rearing pond can restrict pond flows or kill fish directly.

4. Lack of current, continuous tag data. Only tagged fish are measured to determine mean length and coefficient of variation (CV).

5. Combining progeny of many egg-takes into single rearing ponds can cause size variations in the population. Dropout syndrome in some chinook stocks can also cause size variation problems.

6. Volitional release may be truncated if fish movement does not correspond with timing of water spills on the Columbia River.

7. Fish cannot be volitionally released from net pens. In addition, fish are not outmigrating when released. They reside in the lake over the winter and outmigrate the following spring.

8. A comprehensive basin-wide production plan has not been completed at this time.

Elokomin Salmon Hatchery

INTRODUCTION

Elokomin Hatchery is located on the Elokomin River, 7 miles upstream from the river mouth. The Elokomin River is a north bank tributary of the lower Columbia River below Bonneville Dam. It enters the Columbia at river mile 38, just downstream of Cathlamet, Washington. It is staffed with 4.25 FTE's.

The facility consists of 20 raceways, 3 large ponds and a hatchery building with 6 shallow troughs, 2 deep troughs, 72 stacks of vertical incubators, and 18 freestyle incubators.

Water rights total 20,583 gpm from four sources: the Elokomin River, one well, a small, unnamed stream and Clear Creek. Well water is used for domestic use only. The Elokomin River supplies the majority (94 percent of average flow) of the water used for fish rearing. Water from Clear Creek and an unnamed stream is used for incubation. Actual water available to the hatchery averages 10,100 gpm (range: 8,310 gpm - 14,000 gpm).

Rearing Facilities at Elokomin Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Deep Troughs					12		Concrete	41	Good	
Vertical Incubators					576		Fiberglass	9	Good	
Pond 21				58,000	1	58,000	Earth	41	Poor	
Pond 22	160	100	4	64,000	1	64,000	Earth	41	Good	
Pond 23a	235	64	4	60,100	1	60,100	Asphalt	19	Good	Asphalted in 1981
Pond 23b	235	64	5	75,200	1	75,200	Asphalt	19	Good	Asphalted in 1961
Raceways	80	20	3	4,800	20	96,000	Concrete	41	Good	
Shallow Troughs					6		Concrete	41	Good	

PURPOSE

Elokomin Hatchery was authorized under the Mitchell Act and began operating in 1954 as part of the Columbia River Fisheries Development Program-a program to mitigate for fishery losses caused by human impacts such as hydroelectric system development. Funds for the program are administered by the National Marine Fisheries Service. The facility is used for adult collection, egg incubation and rearing of lower river fall chinook and coho (Type-S and Type-N). The hatchery is currently

operating at maximum production. Tule fall chinook and Type-N coho stocks produced from Mitchell Act hatcheries are managed as species aggregates; therefore, adequate escapement of appropriate species/stocks for each hatchery's egg-take needs is not critical. Mitchell Act hatcheries with insufficient broodstock can receive eggs of appropriate species/stocks from any other Mitchell Act facility with surplus eggs.

GOALS

Produce lower river fall chinook and coho that will contribute to NE Pacific and Columbia River Basin commercial and sport fisheries. Also provide steelhead and cutthroat rearing.

OBJECTIVES

Objective 1: Hatchery Production

Tule Fall Chinook
Produce 4 million subyearlings for on-station release.

Provide 325,000 eggs/fish to co-op programs.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Type-S Coho
Produce 500,000 yearlings for on-station release.

Type-N Coho
Produce 1,200,000 yearlings for on-station release.

Provide eggs/fish (surplus to on-station needs) to other facilities.

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 salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Elokomin Hatchery is to collect as many adults as possible to maintain the hatchery production program and to provide for upstream escapement.

Tule Fall Chinook: Entry of adults into the subbasin occurs from early September to October. Spawning occurs from late September to early November with a peak usually in mid-October. Adults are captured in the lower Elokomin River at a temporary fish collection barrier, then hauled by truck upstream to the hatchery. Low stream flows in September and October prohibit adults from reaching the hatchery site. Production shortfalls are made up with imports from other hatcheries with excess eggs.

Type-S and Type-N Coho: Type-S coho begin entering the Elokomin River in early September. Spawning activity peaks in late October. Type-N coho begin entering the Elokomin River in late October and November. Peak spawning occurs in late November and early December. Adults are captured at a permanent fish collection barrier located at the hatchery site. Stocks are separated based on return timing. Type-S coho are the first to return. When the number of newly arriving adults decreases, the trap is temporarily closed and all captured adults are spawned. The trap is then m-opened and all adults entering after that date are considered Type-N stock. Production shortfalls are made up with imports from other hatcheries with excess eggs.

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 retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water 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 the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Tule Fall Chinook: Rear 4 million fish to a size of 50-80 fish / pound and release on-station into the Elokomin River (acclimated) in June.

Type-S Coho: Rear 500,000 fish to a size of 17 fish / pound and release on-station into the Elokomin River (acclimated) in May-June.

Type-N Coho: Rear 1,200,000 fish to a size of 17 fish / pound and release on-station into the Elokomin River (acclimated) in April-June. Some fish are volitionally released for two weeks before the space is needed for chinook rearing.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection-A// Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained. Any fin-marked fish or fish otherwise identified as non-Elokomin origin are not used in spawning.

Spawning Protocol-All Stocks

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. For these stocks, gametes are pooled and the effective male-to-female ratio may not be 1:1. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Importing eggs / fish from other facilities with acceptable stocks is done to achieve production goals while maintaining regional genetic integrity in times of inadequate hatchery returns. Eggs from hatchery-returning adults are always given priority for station use.

The stocks approved for use at the Elokomin Hatchery have been prioritized and are listed below. Stocks with the number 1 adjacent to their title are most desirable. Stocks with higher numbers are considered to be progressively less well suited.

Tule Fall Chinook
1 Elokomin fall chinook
1 Any other lower Columbia River tule stock

Historically, Kalama Falls and Spring Creek tule stocks have been major donor stocks for Elokomin. However, in each year, releases have included at least some progeny from adults returning to Elokomin hatchery.

Type-S (Early) Coho
1 Elokomm River Type-S
1 Any other Columbia River Type-S stock

All Type-S coho runs were started with Toutle River stock. Since the eruption of Mt. St. Helens, this stock has been maintained at Grays River Hatchery. Grays River has been the major donor since that time.

Type-N (Late) Coho
1 Elokomin River Type-N
2 Any other Colurnbia River Type-N stock

The Type-N coho run at Elokomin was started with both Elokomin and Cowlitz Hatchery Type-N 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 WDFW hatcheries is to produce healthy smolts that will contribute to the fishery. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which

might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW 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.
- Use a disease control policy 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 perform necropsies of clinically healthy 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 and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- 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) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given

length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Elokomin Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each fish 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 observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.

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

- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

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

- Different fish / egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.

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

- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. 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 parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.

- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.

- *In-hatchery Water* Temperatures-maximum and minimum daily.

- *In-hatchery Dissolved* Oxygen-as required by steam flow or weather conditions.

- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent* Water Temperatures-continuous monitoring
- *Air* Temperatures-continuous monitoring
- *Influent/Effluen t Dissolved* Oxygen-continuous monitoring
- *Influent pH/Conductivity*—continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

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. 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, federal 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, Oregon Department of Fish and Wildlife, 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Eauilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS-ELOKOMIN HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Ranae	Constraints
Adult Capture	CHF	2,500	1,669	662-3,677	1
	Type-S COH'	590	2,466	0-7,313	1
	Type-N COH	1,435	5,431	1,100-9,700	1
Adult Prespawning Survival	CHF	90%	72.4%	58.9-82.2%	2
	Type-S COH	90%	86.4%	78.7-93.6%	2
	Type-N COH	90%	92%	80.7-97.5%	2
Egg-take	CHF	5,000,000	2,723,734	1,125K-5,977K	
	Type-S COH[2]	590,000	1,499,550	60K-3,340K	
	Type-N COH	1,435,000	1,921,453	779K-3,733K	
Green Egg-to-Fry Survival	CHF	90%	87.9%	79.3-95.3%	
	Type-S COH	90%	90.3%[3]	83.2-96.4%	
	Type-N COH	90%	80.6%	64.6-91.1%	3
Fry-to-Smolt Survival	CHF	90%	98.2%	78.3-99.4%	
	Type-S COH[1]	90%	94.7%[4]	89.9-97.7%	
	Type-N COH	90%	91.6%	85.0-98.1 %	4
Fish Releases	CHF	4,000,000	3,967,439	1,840K-4,712K	1,2,3,4
	Type-S COH[5]	500,000	568,187[4]	476K-636K	1,2,3,4
	Type-N COH	1,200,00	1,285,093	737K-1,687K	1,2,3,4
Transfers to Co-ops (Eggs/Fish)	CHF	325,000	124,000[6]	124,000	
	Type-S COH	0	111'	111	
	Type-N COH	0	102,600'	102,600	
Other Transfers (Eggs/Fish)	CHF	0-5,400,000	4,270K[6]	4,270K	
	Type-S COH	0	--	_	
	Type-N COH	0-2,100,000	--	--	

N/A=Not applicable.
[1] Based on three broods only. In 1990, Type-S coho were combined with Type-N coho and could not be differentiated.
[2] Eggs taken from two broods only.
[3] Average of two broods.
[4] One brood only, 1988.
[5] Based on three broods. Fish transferred from other hatcheries to make up shortfalls from insufficient egg-takes.
[6] One year only, 1988.
[7] One brood only, 1991.
[8] One year only, 1989.

Objective 1 (continued)

Measures	Species	Hatchery Goal 5-Year Averacae		Ranae	Constraints
Adults Passed Upstream	CHF	250	0	0	
	Type-S COH	500	3,941'	3,941	
	Type-N COH	500	1,004	O-2,722	
Percent Survival	CHF	1.0%	Unknown	Unknown	5
	Type-S COH	3.0%	Unknown	Unknown	5
	Type-N COH	3.0%	2.89%	0.69-4.49%	5

Objective 2

Measures	Species	Hatcherv Goal 5-Year Averaae		Range	Constraints
Release smolts CV<10%	CHF	Yes	6.5%	3.8-8.5%	
	Type-S COH	Yes	7.5%	7.2-10.1%	
	Type-N COH	Yes	7.5%	7.2-10.1%	
Acclimation	CHF	Yes	Yes	--	
	Type-S COH	Yes	Yes	_	
	Type-N COH	Yes	Yes	_	
Volitional Release	CHF	No	No	_	6
	Type-S COH	Yes	No	_	6
	Type-N COH	Yes	Partial	_	6

Objective 3

Measures	Species	Hatcherv Goal B-Year Average		Range	Constraints
Collect Adults Throughout Run	CHF	Yes	Yes	Yes	1
	Type-S COH	Yes	Yes	Yes	1
	Type-N COH	Yes	No	No	1
Spawning Pop. >500	CHF	Yes	Yes	Yes	
	Type-S COH	Yes	No	No	7
	Type-N COH	Yes	Yes	Yes	
Spawning Ratio Male:Female	CHF	1:3[2]	0.9:1	0.8:1 - 1.0:1	
	Type-S COH	1:3[2]	0.8:1	0.5:1 - 1.1:1	
	Type-N COH	1:3[2]	0.90:1	0.7:1 - 1.1:1	

[1] One brood only, 1991.
[2] Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

Objective 4

Measures	Species	Hatchery Goal	5-Year Average	Ranae	Constraints
Adhere to Disease Policy	CHF	Yes	Yes	--	
	Type-S COH	Yes	Yes	--	
	Type-N COH	Yes	Yes	--	

History of Reportable Pathogens-19904995

Species/Stock	Water Supply Inc. Rear.	Virus	BKD	Furunc./ ERM	Other/Comments
Elochoman Hatchery	CS,SA	CS,SA			
CHF/Elochoman R			t		Reovirus
COH/Type-S		VHS			
COH/Type-N			+		
SCT/Elochoman R		IHN			
STS/Washougal R		IHN			
STW/Elochoman R		IHN			

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

Measures	Species	Hatchery Goal	5-Year Averaae	Ranae	Constraints
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1 .O ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

Measures	Species	Hatchery Goal	5-Year Averaae	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	8
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	9
Develop and Review Future Brood Doc.	All	Yes	Yes		
Develop and Review Current Brood Doc.	All	Yes	Yes		

Constraints/Comments—Elokomin Hatchery

1. Tule fall chinook and Type-N coho are not managed for escapement to individual hatcheries. Lack of adequate broodstock is made up by importing eggs from other facilities which have a surplus. The lower river trap captures non-tule stocks which must be removed from the population prior to spawning. In years when water flows are high, coho escape over the dam at the hatchery and are not captured. Survival of tule fall chinook has been low at this facility. Harvest and river flows can influence the sex ratio of returning adults.

2. Transportation of adults and the poorly designed holding pond (uses re-use water) increases stress on the adult fish and increases mortality. High water temperatures in the early fall increase the incidence of furunculosis disease.

3. Poor design of large rearing ponds (use of re-use water and poor flow characteristics) increases disease-related mortalities.

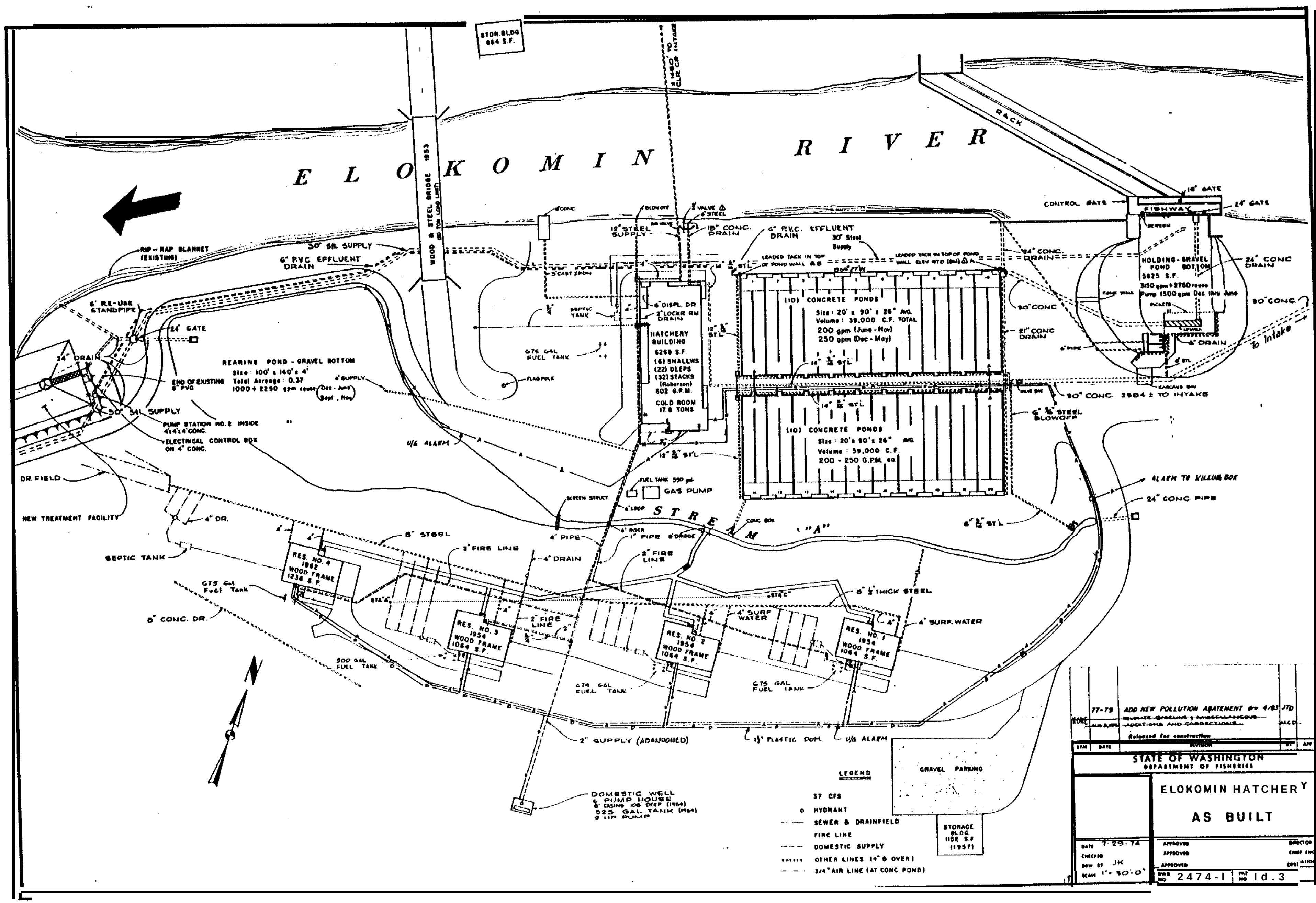
4. Lack of current, continuous tag data.

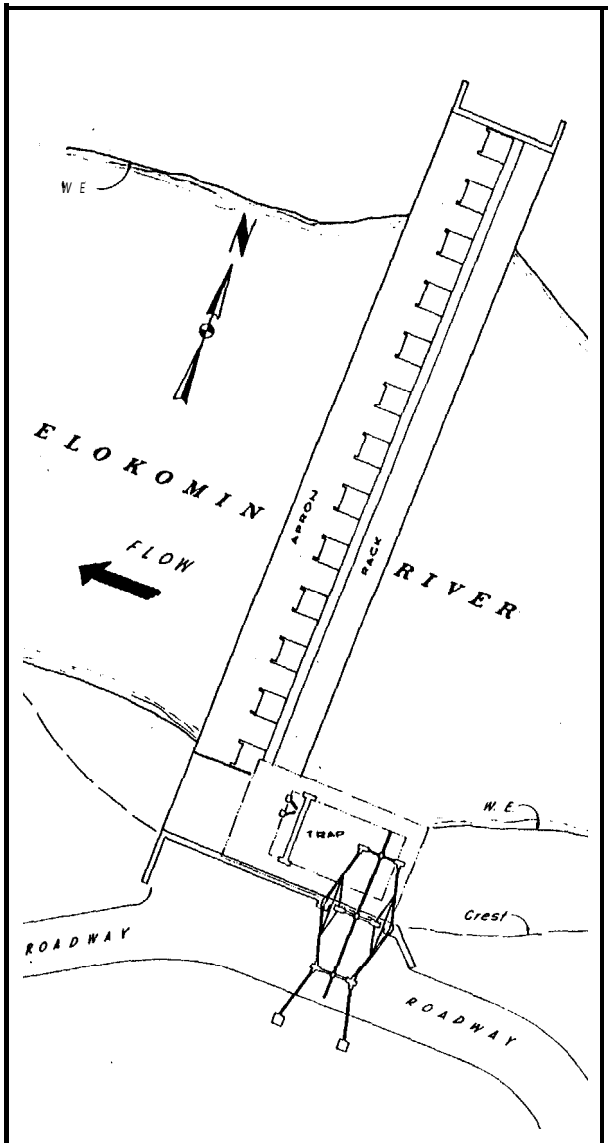
5. Designs of ponds 21 and 22 preclude use of volitional release until funding can be obtained to modify the outlet structures. Fish reared in pond 23 can be volitionally released for only two weeks before the pond space is needed to rear other species.

6. Type-S and Type-N coho cannot be held separately. Therefore, determining escapement and spawning of Type-S coho is difficult.

7. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.

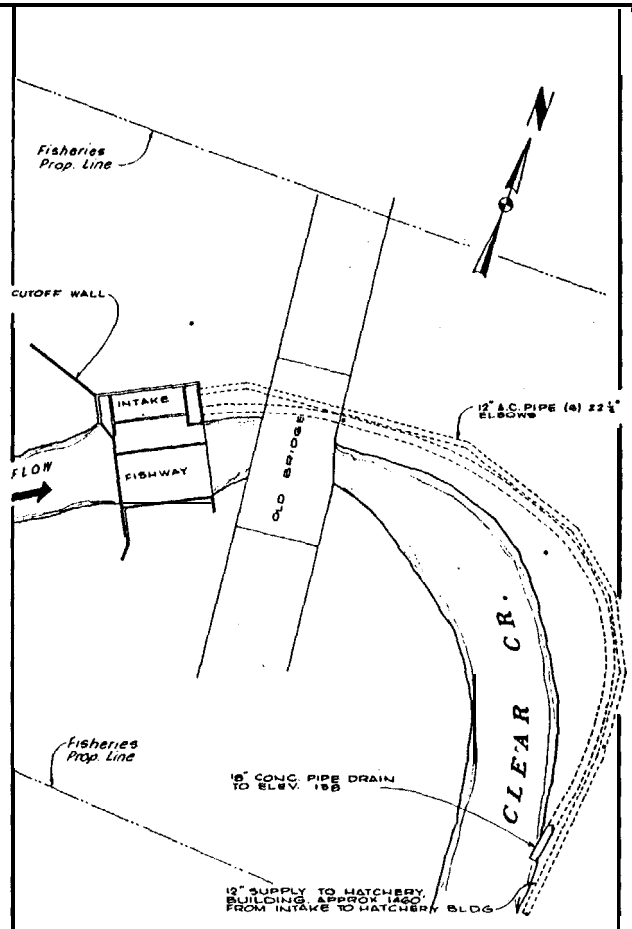
8. A comprehensive basin-wide production plan has not been completed at this time.


E L O K O M I N R I V E R
STOR. BLDG 864 S.F.
WOOD & STEEL BRIDGE 1953
RACK
CONTROL GATE
18" GATE
24" GATE
FISHWAY
HOLDING-GRAVEL POND BOTTOM 5625 S.F.
24" CONC DRAIN
30" CONC.
To Intake
30" CONC. 2884 ± TO INTAKE
RIP-RAP BLANKET (EXISTING)
30" STL SUPPLY
6" P.V.C. EFFLUENT DRAIN
6" RE-USE STANDPIPE
24" GATE
24" DRAIN
REARING POND - GRAVEL BOTTOM
Size: 100' x 160' x 4'
Total Acreage: 0.37
1000 + 2250 gpm reuse (Dec - June) (Sept - Nov)
END OF EXISTING 6" PVC
30" STL SUPPLY
PUMP STATION NO. 2 INSIDE 4x4x4 CONC
ELECTRICAL CONTROL BOX ON 4" CONC.
U/G ALARM
DR. FIELD
NEW TREATMENT FACILITY
12" STEEL SUPPLY
18" CONC. DRAIN
6" P.V.C. EFFLUENT DRAIN
30" Steel Supply
SEPTIC TANK
675 GAL FUEL TANK
FLAGPOLE
HATCHERY BUILDING
6268 S.F.
(6) SHALLWS
(22) DEEPS
(32) STACKS (Roberson)
602 G.P.M.
COLD ROOM 17.6 TONS
(10) CONCRETE PONDS
Size: 20' x 90' x 26" AVG.
Volume: 39,000 C.F. TOTAL
200 gpm (June - Nov)
250 gpm (Dec - May)
(10) CONCRETE PONDS
Size: 20' x 90' x 26" AVG.
Volume: 39,000 C.F.
200 - 250 G.P.M. ea
24" CONC. DRAIN
30" CONC
21" CONC DRAIN
6" 3/8" STEEL BLOWOFF
ALARM TO KILLING BOX
24" CONC. PIPE
FUEL TANK 550 gal
GAS PUMP
STREAM "A"
4" DR.
SEPTIC TANK
8" STEEL
2" FIRE LINE
4" PIPE
4" DRAIN
1" PIPE
2" FIRE LINE
675 Gal Fuel Tank
8" CONC. DR.
RES. NO. 4 1962 WOOD FRAME 1236 S.F.
RES. NO. 3 1954 WOOD FRAME 1064 S.F.
RES. NO. 2 1954 WOOD FRAME 1064 S.F.
RES. NO. 1 1954 WOOD FRAME 1064 S.F.
2" FIRE LINE
4" SURF WATER
8" 1/2 THICK STEEL
4" SURF. WATER
500 GAL FUEL TANK
675 GAL FUEL TANK
675 GAL FUEL TANK
2" SUPPLY (ABANDONED)
1 1/2" PLASTIC DOM.
U/G ALARM
N
DOMESTIC WELL & PUMP HOUSE
525 GAL. TANK (1964)
2 HP PUMP
GRAVEL PARKING
STORAGE BLDG. 1152 S.F. (1957)
LEGEND
37 CFS
HYDRANT
SEWER & DRAINFIELD
FIRE LINE
DOMESTIC SUPPLY
OTHER LINES (4" & OVER)
3/4" AIR LINE (AT CONC POND)
77-79 ADD NEW POLLUTION ABATEMENT
Released for construction
STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
ELOKOMIN HATCHERY
AS BUILT
DATE 1-29-74
DRN BY JK
SCALE 1" = 30'-0"
2474-1
Id. 3



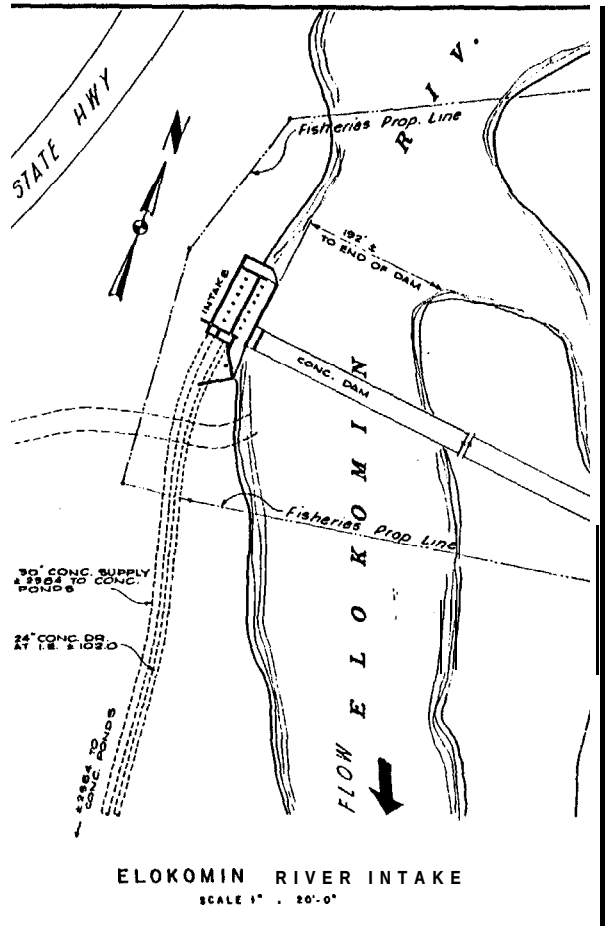
ELOKOMIN TRAP

SCALE 1" = 10'-0"



CLEAR CREEK INTAKE

SCALE 1" = 10'-0"



ELOKOMIN RIVER INTAKE

SCALE 1" = 20'-0"

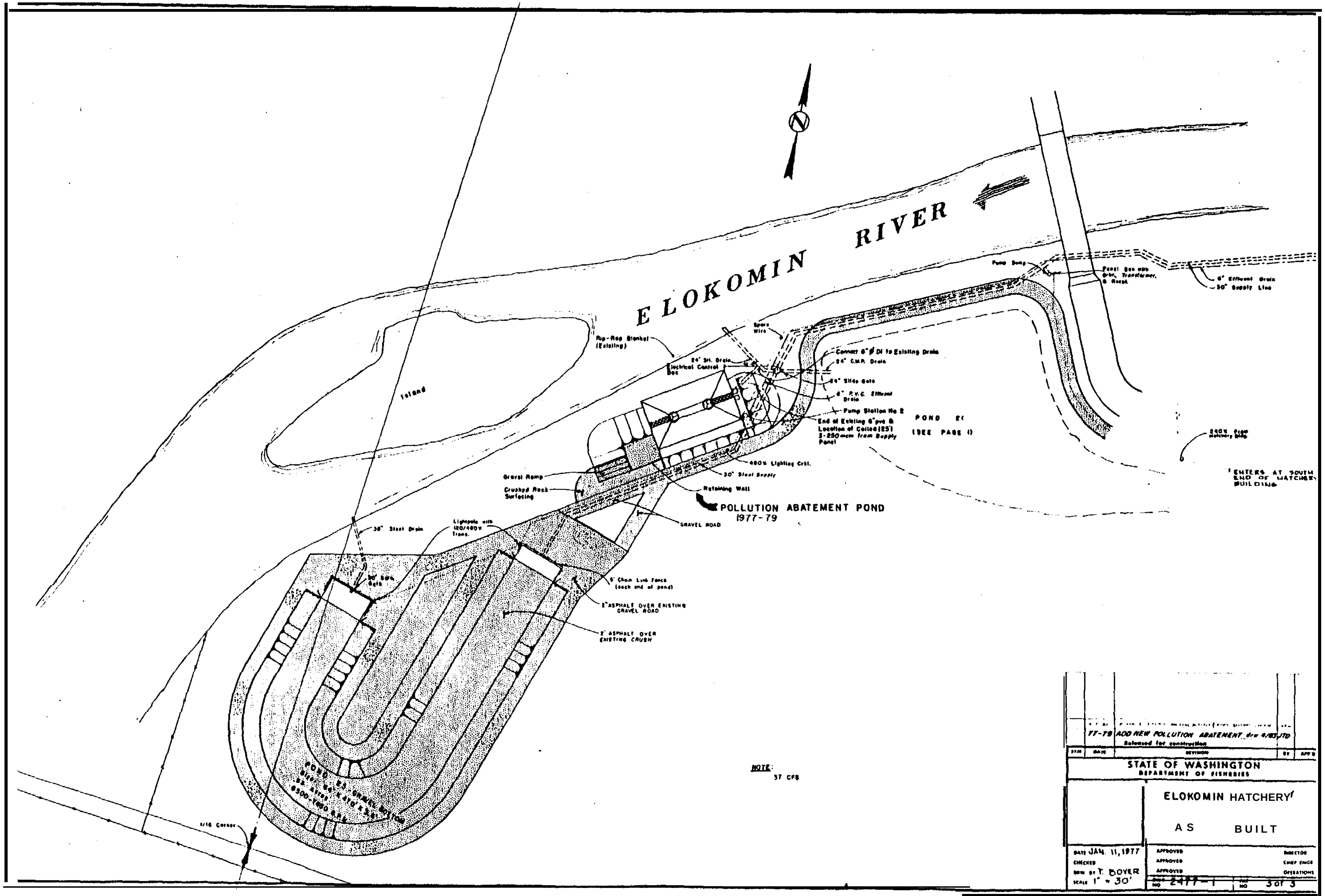
BY	DATE	REVISION	BY	APP
		Released for construction		

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES

ELOKOMIN HATCHERY

AS BUILT

DATE 7-29-74	APPROVED		DIRECTOR
CHECKED	APPROVED		CHIEF ENGR.
DRW BY JK	APPROVED		OPERATION
SCALE AS SHOWN	DWG NO 2474-2	FILE NO 2 of 3	


ELOKOMIN RIVER
Island
Rip-Rap Blanket (Existing)
24" Stl. Drain
Electrical Control Box
Spare Wire
Connect 6" Ø DI to Existing Drain
24" C.M.P. Drain
24" Slide Gate
4" P.V.C. Effluent Drain
Pump Station No 2
End of Existing 6" pvc & Location of Coiled (25') 3-250 mcm from Supply Panel
POND E(
(SEE PAGE 1)
480V. Lighting Crkt.
30" Steel Supply
Retaining Wall
Gravel Ramp
Crushed Rock Surfacing
POLLUTION ABATEMENT POND
1977-79
GRAVEL ROAD
6' Chain Link Fence
2" ASPHALT OVER EXISTING GRAVEL ROAD
2" ASPHALT OVER EXISTING CRUSH
Pump Sump
6" Effluent Drain
30" Supply Line
ENTERS AT SOUTH END OF HATCHERY BUILDING
NOTE:
37 CFS
1/16 Corner
77-79 ADD NEW POLLUTION ABATEMENT
Released for construction
STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
ELOKOMIN HATCHERY
AS BUILT
DATE JAN. 11, 1977
CHECKED
DRN BY T. BOYER
SCALE 1" = 30'
APPROVED DIRECTOR
APPROVED CHIEF ENGR
APPROVED OPERATIONS
DWG NO 2477-1
SHT NO 3 of 3

Grays River Salmon Hatchery

INTRODUCTION

Grays River Hatchery is located at about river mile 2 of the West Fork Grays River, a lower Columbia River tributary. The Washington Department of Fisheries acquired the land on which hatchery is sited from the C.J. Schmond family. The buildings and hatchery facilities are owned by the federal government. John Hancock Pond, an off-station rearing site, was operated as a satellite facility in the past, but is currently not being used. The facility is staffed with 3.5 FTE's.

The facility includes 10 raceways, 1 earthen rearing pond, and 2 concrete adult-holding ponds (also used for juvenile rearing). Water rights total 22,488 gpm from three sources: the West Fork Grays River, an unnamed stream and wells. Most of the water is supplied by gravity flow from an intake located approximately 0.5 miles upstream from the hatchery. During the summer and fall months, virtually the entire river flow is diverted for hatchery use.

Rearing Facilities at Grays River Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition Comment
Deep Troughs					32		Concrete	35	Fair
Vertical Incubators					96		Fiberglass	18	Fair
Raceways	80	20	4.5	5,275	10	52,750	Concrete	35	Poor
Rear/Adult Pond	60	40	4.5	10,800	2	21,600	Concrete	35	Good
Rearing Pond	200	55	4.5	49,500	1	49,500	Dirt	35	Poor
Shallow Trough					1		Concrete	35	Fair

PURPOSE

The hatchery was authorized under the Mitchell Act and began operating in 1961 as part of the Columbia River Fisheries Development Program-a program to mitigate for fishery losses caused by hydroelectric system development. Funds for the program are administered by the National Marine Fisheries Service. The facility is used for adult collection, egg incubation, and rearing of lower river tule fall chinook, early (Type-S) coho, and winter and summer steelhead. The hatchery is currently operating at maximum production (based on deliverable water). Tule fall chinook and Type-N coho stocks produced from Mitchell Act hatcheries are managed as species aggregates; therefore, adequate escapement of appropriate species / stocks for each hatchery's egg-take needs is not critical. Mitchell Act hatcheries with

insufficient broodstock can receive eggs of appropriate species/stocks from any other Mitchell Act facility with surplus eggs.

GOALS

Produce lower river fall chinook, coho, and steelhead 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

Fall Chinook
Produce 1,200,000 subyearlings for on-station release.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Type-S Coho
Produce 150,000 yearlings for on-station release.

Produce 200,000 yearlings for release in Deep River from net pens.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Steelhead
Produce varying numbers of winter and summer steelhead yearlings for release in local streams

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 salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Grays River Hatchery is to collect as many adults as possible to maintain the hatchery production program and to provide upstream escapement. Eggs from acceptable donor stocks are used to supplement hatchery shortfalls. Excess adults to hatchery needs are allowed to pass upstream for natural spawning.

Tule Fall Chinook: Adult fall chinook return in September and October. Spawning occurs from September to November. Adults are captured using a temporary weir located at the hatchery. Low river flows make it very difficult for adults to make it to the hatchery in many years.

Type-S Coho: Adult coho return in September and October. Spawning occurs from October to November with a peak in late October. Adults are also captured using a temporary weir located at the 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 retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water 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 the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Tule Fall Chinook: Rear 1.2 million fish to a size of approximately 75 fish / pound and release on-station (acclimated) in late May or June. Rear 75,000 fish to a size of 25 fish / pound and release on-station (acclimated) in September or October.

Type-S Coho: Rear 350,000 fish to a size of 12-18 fish / pound; transport 200,000 to Deep River net pens for acclimation and release, acclimate remainder to parent river water for a minimum of six weeks; release one group of fish in April and the second group in May.

Winter and Summer Steelhead: Rear varying numbers to release size, release in local streams.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection-All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained.

Spawning Protocol-All Stocks

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. For these situations, gametes are pooled and the effective male-to-female ratio may not be 1:1. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Importing eggs / fish from other facilities with acceptable stocks is done to achieve production goals while maintaining regional genetic integrity in times of inadequate hatchery returns. Eggs from hatchery-returning adults are always given priority for station use. The stocks approved for use at the Grays River Hatchery have been prioritized and are listed below. Stocks with the number 1 adjacent to their title are the most desirable. Stocks with higher numbers are considered to be progressively less well suited.

Tule Fall Chinook
1 Grays River fall chinook
1 Any lower Columbia River tule stock

Twe S (Early) Coho
1 Grays River Type-S
2 Toutle River Type-S

The Type-S coho run was started with Toutle River stock.

Winter Steelhead

Summer Steelhead

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 WDPW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW 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.
- Use a disease control policy 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 perform necropsies of clinically healthy 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 and environmental conditions in the hatchery rearing container based on

historical disease events. It also involves the prophylactic use of vaccines in order to prevent a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.

- 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) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Grays River Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each stock.

- 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 observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.
- Juvenile fish are administered antibiotics orally when needed for the control of bacterial infections.
- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.
- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish / egg lots.
- Different fish / egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.
- Tank trucks are disinfected between the hauling of different fish lots.
- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology (WDOE). 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 parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent / or influent samples. Once per month on pollution abatement pond influent and effluent samples.

- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.

- Upstream *and Downstream* Temperatures-twice per month, June through September. This requirement may be waived by WDOE if no water violations occur.

- *Upstream and Downstream Dissolved Oxygen* (DO&twice per month, June through September. This requirement may be waived by WDOE if no water violations occur.

- In-hatchery *Wafer* Temperatures-maximum and minimum daily.

- *In-hafche y Dissolved Oxygen*- a s required by steam flow or weather conditions.

- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Wafer* Temperatures-continuous monitoring
- *Air* Temperufures-continuous monitoring
- *Influent/Effluent Dissolved Oxygen*—continuous monitoring
- *Influent pH/Conductivity*—continuous monitoring
- *Sfreambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

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): 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. 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, federal 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, Oregon Department of Fish and Wildlife, 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Eauilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS-GRAYS RIVER HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Averaae	Ranae	Constraints
Adult Capture	CHF	706	379	59-698	1
	Type-S COH	415	1,811	102-3,739	1
Adult Prespawning Survival	CHF	90%	91.1%	78.1-97.4%	2
	Type-S COH	90%	92.1%	87.0-98.1%	2
Egg-take	CHF	1,425,000	766,200	52K-31,646K	1
	Type-S COH	415,000	1,453,140	57K-3,282K	1
Green Egg-to-Fry Survival	CHF	90%	84.9%	72.6-93.7%	3
	Type-S COH	90%	93.6%	80.1-94.2%	3
Fry-to-Smolt Survival	CHF	90%	91.0%	78.1-100%	
	Type-S COH	90%	72.9%'	41.7-88.1%	
Fish Releases	CHF	1,200,000	847,700	159K-1,394K	1,5
	Type-S COH	350,000	246,395	132K-375K	1,5
Transfers to Co-ops (Eggs/Fish)	CHF	0	–	–	
	Type-S COH	0	34,300'	34,300	
Other Transfers (Eggs/Fish)	CHF	0-1,930,000	1,532,900[3]	1,532,900	
	Type-S COH	O-2,667,000	1,146,350[1]	219K-2,256K	
	Type-S COH	200,000	200,000	200,000	
Adults Passed Upstream	CHF	50	30	O-118	1
	Type-S COH	150	321	O-l ,526	1
Percent Survival	CHF	1.0%	0.76%	0.04-2.73%	4,6
	CHF (fall rel.)	2.5%	2.84%	0.49-2.96%	4,6
	Type-S COH	2.5%	1.71%	1.81-4.07%	4,6

N/A=Not applicable.
[1] Average of four broods, 1987-1990.
[2] One year only, 1989.
[3] One year only, 1988.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Release smolts	CHF	Yes	8.6%	6.5-l 1.2%	7
CV<10%	Type-S COH	Yes	6.8%	657.0%	7
Acclimation	CHF	Yes	Yes	—	
	Type-S COH	Yes	Yes	—	
Volitional Release	CHF	Yes	No	—	
	Type-S COH	Yes	No	--	a

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults	CHF	Yes	No	--	1
Throughout Run	Type-S COH	Yes	Yes	--	
Spawning Pop.	CHF	Yes	Yes	--	1
>500	Type-S COH	Yes	Yes	—	1
Spawning Ratio	CHF	1:3[1]	0.7:1	0.6:1 - 0.8:1	1
Male:Female	Type-S COH	1:3[1]	0.9:1	0.9:1 - 1.0:1	1

Objective 4

Measures	Species	Hatchery Goal	5-Year Averaae	Ranae	Constraints
Adhere to	CHF	Yes	Yes	—	3
Disease Policy	Type-S COH	Yes	Yes	--	3

[1] Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

History of Reportable Pathogens-19904995

Species/Stock	Water Inc.	Supply Rear.	Virus	BKD	Furunc./ ERM	Other/Comments
Grays River Hatchery	G,SA	GSA				
CHF/Grays R				+		Paramyxovirus
COH/Type-S				+		
STW/Elochoman R			IHN			
STS/Washoughal R			IHN			

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

Measures	Species	Hatchery Goal	S-Year Averaae	Ranae	Constraints
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1 .O ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

Measures	Species	Hatchery Goal	5-Year Averaae	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	9
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	9
Develop and Review Future Brood Doc.	All	Yes	Yes		10
Develop and Review Current Brood Doc.	All	Yes	Yes	--	9

Constraints/Comments-Grays River Hatchery

1. Tule fall chinook and Type-S coho are not managed for escapement to individual hatcheries. Lack of adequate broodstock is made up with importation of eggs from other facilities which have a surplus. Low river flows during the spawning migration coupled with no lower river weir prevents the hatchery from obtaining sufficient broodstock during years where adequate numbers of adult fish are present. However, coho returning during high water events may be able to bypass the temporary weir. Also, in some years there is low survival of chinook or coho from this facility. Harvest levels and migration impedance may result in unequal sex ratios at the hatchery.

2. Inadequate flows and high water temperatures in some years result in overcrowding and higher stress-related mortalities. Pipeline needs cleaning to remove the debris that is restricting water flow to the holding ponds. However, there has not been sufficient funds to accomplish this needed maintenance.

3. Because of funding shortfalls, a portion of the fall chinook has not been reared until fall for release. The fall releases have historically had the highest survival rates at this hatchery.

4. One of the large rearing ponds has a porous bottom which reduces the amount of rearing water. This creates increased rearing densities and higher mortalities.

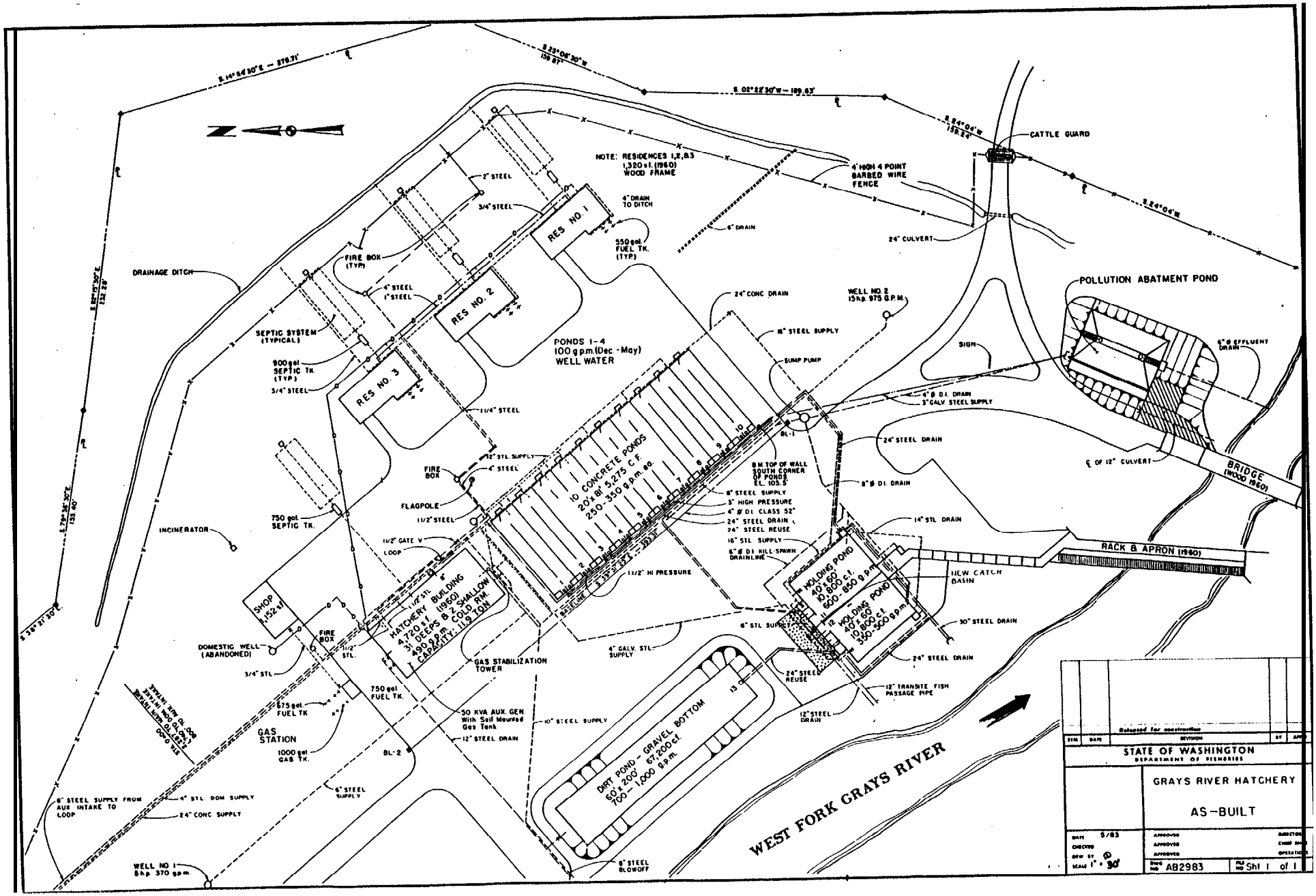
5. Lack of current, continuous tag data to assess survival.

6. Combining progeny from more than one egg-take into a single rearing pond or disease problems during early rearing.

7. Design of rearing pond outlet structures is not conducive to volitional release.

8. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.

9. A comprehensive basin-wide production plan has not been completed at this time.


CATTLE GUARD
4' HIGH 4 POINT BARBED WIRE FENCE
NOTE: RESIDENCES 1,2,&3 1,320 s.f. (1960) WOOD FRAME
RES NO. 1
RES NO. 2
RES NO. 3
550 gal. FUEL TK. (TYP.)
FIRE BOX (TYP.)
4" DRAIN TO DITCH
6" DRAIN
24" CULVERT
DRAINAGE DITCH
SEPTIC SYSTEM (TYPICAL)
900 gal. SEPTIC TK. (TYP.)
750 gal. SEPTIC TK.
INCINERATOR
PONDS 1-4 100 g.p.m.(Dec.-May) WELL WATER
24" CONC DRAIN
WELL NO 2 15 h.p. 975 G.P.M.
8" STEEL SUPPLY
SUMP PUMP
POLLUTION ABATMENT POND
SIGN
6" Ø EFFLUENT DRAIN
4" Ø D.I. DRAIN
3" GALV. STEEL SUPPLY
24" STEEL DRAIN
℄ OF 12" CULVERT
BRIDGE (WOOD 1960)
10 CONCRETE PONDS 20'x 81' 5,275 C.F. 250-350 g.p.m. ea.
BM TOP OF WALL SOUTH CORNER OF PONDS EL. 105.5
8" Ø D.I. DRAIN
6" STEEL SUPPLY
3" HIGH PRESSURE
4" Ø D.I. CLASS 52"
24" STEEL DRAIN
24" STEEL REUSE
16" STL SUPPLY
6" Ø D.I. KILL-SPAWN DRAINLINE
14" STL DRAIN
RACK & APRON (1960)
NEW CATCH BASIN
HOLDING POND 40'x 60' 10,800 c.f. 600-850 g.p.m.
HOLDING POND 40'x 60' 10,800 c.f. 350-500 g.p.m.
30" STEEL DRAIN
24" STEEL DRAIN
12" TRANSITE FISH PASSAGE PIPE
12" STEEL DRAIN
24" STEEL REUSE
FLAGPOLE
FIRE BOX
4" STEEL
12" STL. SUPPLY
11/2" STEEL
11/2" GATE V
LOOP
11/2" HI PRESSURE
SHOP 1,152 s.f.
DOMESTIC WELL (ABANDONED)
FIRE BOX
3/4" STL.
HATCHERY BUILDING (1960) 4,720 s.f. 31 DEEPS & 2 SHALLOW 490 g.p.m. COLD RM. CAPACITY: 119 TON
GAS STABILIZATION TOWER
4" GALV. STL. SUPPLY
6" STL SUPPLY
750 gal. FUEL TK.
675 gal. FUEL TK.
1000 gal. GAS TK.
GAS STATION
50 KVA AUX. GEN With Self Mounted Gas Tank
10" STEEL SUPPLY
12" STEEL DRAIN
BL-2
DIRT POND - GRAVEL BOTTOM 50'x 200' 67,200 c.f. 700 - 1,000 g.p.m.
8" STEEL BLOWOFF
6" STEEL SUPPLY
8" STEEL SUPPLY FROM AUX INTAKE TO LOOP
4" STL DOM SUPPLY
24" CONC SUPPLY
WELL NO 1 8 h.p. 370 g.p.m.
WEST FORK GRAYS RIVER
S 14° 54' 30" E — 378.71'
S 25° 06' 30" W 198.87'
S 03° 22' 30" W — 189.63'
S 24° 04' W 198.89'
S 24° 04' W
N 65° 37' 30" E 232.28'
S 24° 37' 30" E 133.40'
S 38° 21' 30" E
STATE OF WASHINGTON DEPARTMENT OF FISHERIES
GRAYS RIVER HATCHERY
AS-BUILT
Released for construction
DATE 5/83
SCALE 1" = 30'
JOB NO AB2983
DWG NO Shl 1 of 1

Kalama Falls Salmon Hatchery

INTRODUCTION

Kalama Falls Hatchery is located along the Kalama River at about river mile 10. The nearest town is Kalama, Washington located approximately 12 miles south of the hatchery. Site elevation is 100 feet above sea level. The facility is staffed with 5 FTE's.

The rearing units consist of 12 raceways and 6 rearing ponds. The rearing ponds are also used for holding adults. The fish ladder was originally constructed to pass fish around Kalama Falls, but was later modified to trap adults for the hatchery when the facility was built.

Adult fish cannot enter the adult holding ponds directly from the fishway. They are trapped and lifted into trucks and then transported to the holding ponds a few hundred feet away.

Facility water rights total 8,055 gpm from four sources: Kalama River, two unnamed creeks and a well (domestic water). The majority of water is supplied from the Kalama River with the two unnamed creeks providing seasonal water.

Rearing Facilities at Kalama Falls Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Vertical Incubators					960		Fiberglass		Good	
Raceways	80	20	3.5	5,600	12	67,200	Concrete	37	Fair	Some leaks
Rearing/ Adult Ponds	60	40	5	12,000	6	72,000	Concrete	37	Fair	Some leaks

PURPOSE

The hatchery was authorized under the Mitchell Act and began operating in 1958 as part of the Columbia River Fisheries Development Program-a program to mitigate for fishery losses caused by hydroelectric system development. Funds for the program are administered by the National Marine Fisheries Service. The facility is used for adult collection, egg incubation and rearing of fall chinook, spring chinook and late (Type-N) coho. It has also been used in the past as an egg collection facility for early (Type-S) coho. The hatchery is currently operating at maximum production. Tule fall chinook and Type-N coho stocks produced from Mitchell Act hatcheries are managed as species aggregates; therefore, adequate escapement of appropriate species / stocks for each hatchery's egg-take needs is not critical. Mitchell

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 salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Kalama Falls Hatchery is to collect as many adults as possible to maintain the hatchery production program and to provide for upstream escapement.

Spring Chinook: Adults are collected at the hatchery from May through September and are spawned from early September to early October.

Fall Chinook: Entry of adults into the Kalama River occurs from August to November. Spawning occurs from September to November with a peak in October. Most adults are captured at Modrow Trap in the lower Kalama River and trucked to the hatchery.

Type-N Coho: Type-N coho begin entering the Kalama River in late October and November. Peak spawning occurs in late November and early December. Adults are trapped at the 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 retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water 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 the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Act hatcheries with insufficient broodstock can receive eggs of appropriate species/stocks from any other Mitchell Act facility with surplus eggs.

GOALS

Produce lower river fall chinook, spring chinook and 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

Spring Chinook
Produce 550,000 yearlings for transfer to the Lower Kalama Hatchery for extended rearing and release.

Pass 400 adult males upstream.

Fall Chinook
Produce 3,500,000 subyearlings for on-station release.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Pass 250 adults upstream for natural production.

Type-N Coho
Produce 900,000 yearlings 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.

Spring Chinook: Rear 550,000 fish to a size of 200 fish / pound and transfer to the Lower Kalama Hatchery in April-May for final rearing and release.

Fall Chinook: Rear 3.5 million fish to a size of 50-80 fish / pound and release on-station (acclimated) in June.

Type-N Coho: Rear 900,000 fish to a size of 17 fish / pound and release on-station (acclimated) in May.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection-All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained.

Spawning Protocol-All Stocks

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Importing eggs / fish from other facilities with acceptable stocks is done to achieve production goals while maintaining regional genetic integrity in times of inadequate hatchery returns. Eggs from hatchery-returning adults are always given priority for station use. The stocks approved for release from the Kalama Falls Hatchery are listed below.

Spring Chinook
Kalama Falls spring chinook

Fall Chinook
Kalama River fall chinook

Type-N Coho
Any Columbia River Type-N

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 WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW 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.
- Use a disease control policy 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 perform necropsies of clinically healthy 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 and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to prevent a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.

- 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) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Kalama Falls *Hatchery*

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each species.

- 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 observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Pronhylactic Treatments

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

- At spawning, eggs are water-hardened in iodophor as a disinfectant.

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

- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

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

- Different fish / egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.

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

- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. 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 parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.

- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.

- *Upstream and Downstream Temperatures*—twice per month, June through September.

- *Upstream and Downstream Dissolved Oxygen (DO)*—twice per month, June through September.

- *In-hafche* y *Wafer* Temperatures-maximum and minimum daily.

- *In-hafche* y *Dissolved* Oxygen-as required by steam flow or weather conditions.

- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Wafer* Temperatures-continuous monitoring
- *Air* Temperatures-continuous monitoring
- *Influent/Effluent Dissolved* Oxygen--continuous monitoring
- *Influent pH/Conductivity*—continuous monitoring
- *Sfreambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

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 Onerations 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, federal 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, Oregon Department of Fish and Wildlife, 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and / or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS-KALAMA FALLS HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Averaae	Ranae	Constraints
Adult Capture	CHF	3,000	2,796	2,181-3,980	
	CHS	450	989	701-I ,278	
	Type-S COH	N/A	1,871	294-4,877	
	Type-N COH	1,100	1,870	72-3,073	
Adult Prespawning Survival	CHF	90%	82.1%	65.7-92.2%	1
	CHS	90%	78.6%	60.9-91.8%	1
	Type-S COH	90%	90.1%	67.2-97.3%	
	Type-N COH	90%	97.1%	93.2-98.3%	
Egg-take	CHF	4,120,000	7,748,920	5,547K-11,306K	
	CHS	589,000	955,020	334K-1,352K	
	Type-S COH	N/A	466,620	32K-985K	
	Type-N COH	1,060,000	584,840	61 K-I ,251 K	2
Green Egg-to-Fry Survival	CHF	90%	89.1%	87.8-91.6%	3
	CHS	90%	87.5%	82.1-87.5%	3
	Type-S COH	90%	96 6%'	96.6%	3
	Type-N COH	90%	89.2%	84.0-93.0%	
Fry-to-Smolt Survival	CHF	90%	95.9%	94.5-96.7%	
	CHS	90%	94.3%[2]	90.3-96.6%	4
	Type-S COH	N/A	N/A	N/A	
	Type-N COH	90%	88.3%	83.6-93.4%	
Fish Releases	CHF	3,500,000	3,571 ,302[3]	3,538K-3,634K	
	CHS	–[4]	N/A	N/A	
	Type-S COH	–[4]	N/A	N/A	
	Type-N COH	900,000	616,560	342K-952K	2
Transfers to Co-ops (Eggs/Fish)	CHF	0	222,800[5]	222,800	
	CHS	0	--		
	Type-S COH	N/A	N/A	N/A	
	Type-N COH	0	–	–	
Other Transfers (Eggs/Fish)	CHF	500K-6,700K	3,361,640	1428K-6,595K	
	CHS	0	615,300	OK-I ,140K	
	Type-S COH	N/A	415,900	32K-985K	
	Type-N COH	0	548,800'	548,800	

N/A=Not applicable.
[1] One year of data; eggs are shipped out.
[2] Three broods only; fish rearing was switched to Lower Kalama Hatchery.
[3] On average, 202,680 fry are planted.
[4] Transported and released at Lower Kalama Hatchery.
[5] One year only.

Objective I (continued)

Measures	Species	Hatchery Goal	5-Year Averaae	Ranae	Constraints
Adults Passed	CHF	250	171	o-435	1
Upstream	CHS	400	371	O-555 (males)	
	Type-S COH	N/A	558	0-1,778	
	Type-N COH	1,500	151	1-514	2
Percent Survival	CHF	1.0%	Unknown	Unknown	5
	CHS	5.0%	Unknown	Unknown	5
	Type-S COH	N/A	N/A	N/A	
	Type-N COH	5.0%	4.8%	1.1-6.9%	

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Ranae	Constraints
Release smolts	CHF	Yes	N/A	N/A	5
CV<10%	CHS	N/A	N/A	N/A	5
	Type-S COH	Yes	N/A	N/A	5
	Type-N COH	Yes	N/A	N/A	5
Acclimation	CHF	Yes	Yes	--	
	CHS	N/A	N/A	N/A	
	Type-S COH	Yes	Yes	--	
	Type-N COH	Yes	Yes	--	
Volitional Release	CHF	Yes	No	_	1
	CHS	N/A	N/A	N/A	
	Type-S COH	Yes	No	--	1
	Type-N COH	Yes	No	2 years	1

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	CHF	*Yes*	**Yes**	**Yes**	1
	CHS	*Yes*	Yes	Yes	1
	Type-S COH	*Yes*	Yes	Yes	
	Type-N COH	*Yes*	Yes	Yes	
Spawning Pop. >500	CHF	**Yes**	*Yes*	*Yes*	
	CHS	**Yes**	*Yes*	*Yes*	
	Type-S COH	**Yes**	*Yes*	*Yes*	
	Type-N COH	**Yes**	*Yes*	*Yes*	
Spawning Ratio Male:Female	CHF	**1:3**[1]	0.63: 1	**0.33:1 - 0.89:1**	
	CHS	**1:1**	0.93: 1	**0.72:1 -1.10:1**	
	Type-S COH	**1:3**[1]	**0.90:1**	**0.70:1 -1.05:1**	
	Type-N COH	**1:3**[1]	**1.50:1**	**0.49:1 - 3.70:1**	

Objective 4

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

History of Reportable Pathogens—1990-1995

Species/Stock	Water Supply Inc.	Rear.	Virus	BKD	Furunc./ ERM	Other/Comments
Kalama Fall Hatchery	CS,SA	SA				
CHS/Kalama R				+		BKD by ELISA of broodstock
CHF/Kalama R						
COH/Type-N				+		
COH/Type-S			IHN			

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

[1] Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1 .O ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

Measures	Species	Hatchery Goal	5-Year Average	Ranoe	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	–	*6*
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	*7*
Develop and Review Future Brood Doc.	All	Yes	Yes	--	*6*
Develop and Review Current Brood Doc.	All	Yes	Yes	--	*6*

Constraints/Comments-Kalama Falls Hatchery

1. Poorly designed rearing ponds are also used for adult holding. These ponds have poor water flow, poor circulation, and use 100 percent reuse water. During the summer and fall adult holding periods, the combination of poor design and warm water increases prespawning mortality of spring and fall chinook. This reduces the number of fish available for passage upstream and reduces egg availability from all run timing segments.

2. Because this station supplies tule fall chinook eggs to other hatcheries, increased mortality reduces the number of fish that can be passed upstream. During the spring juvenile rearing period, the poor water quality and inadequate flows reduce the hatchery production capacity. The existing pond design makes it difficult to use volitional release and there are currently no funds available to make improvements.

3. Columbia River Type-N coho are not managed to provide adequate escapement to the individual hatcheries.

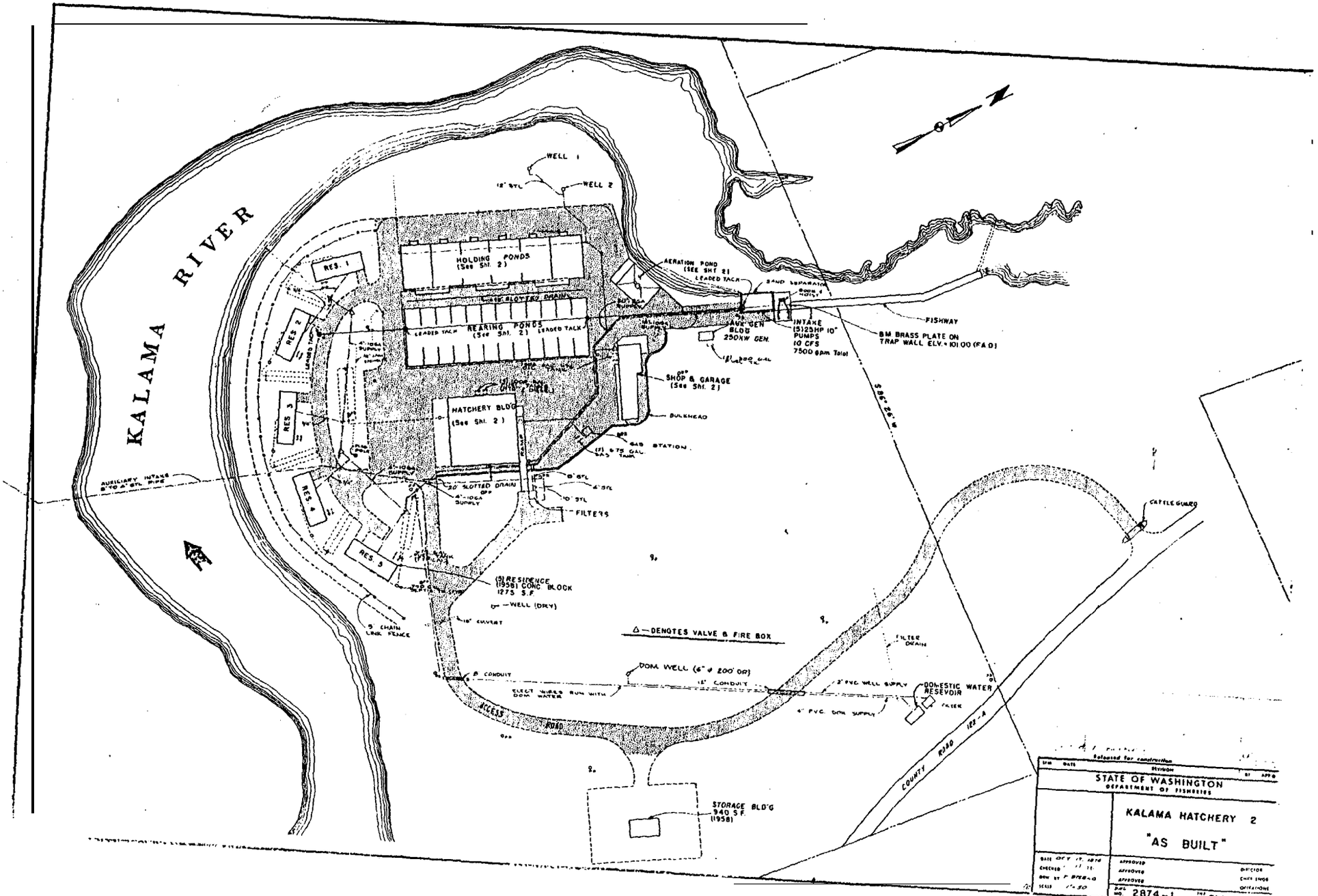
4. Warm water during early incubation and muddy water during the fall rainy periods reduce the egg-to-fry survival of spring and fall chinook, and Type-S coho.

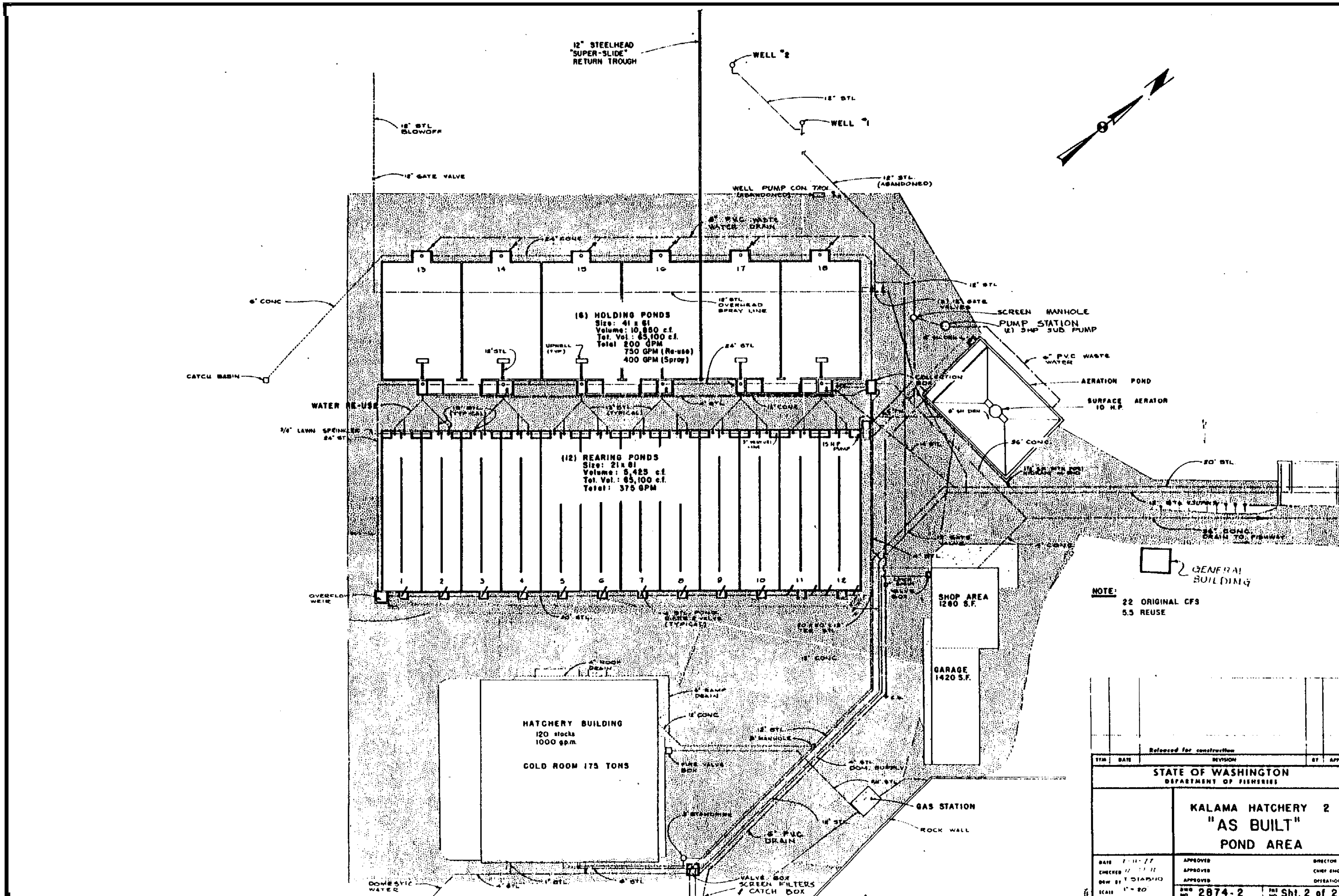
5. Transfer of juvenile spring chinook to Lower Kalama Hatchery results in additional stress on the fish.

6. Lack of current, continuous tag data. Only tagged fish are measured for mean length and coefficient of variation (CV).

7. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.

8. A comprehensive basin-wide production plan has not been completed at this time.


KALAMA RIVER
WELL 1
WELL 2
HOLDING PONDS (See Sht. 2)
REARING PONDS (See Sht. 2)
AERATION POND (SEE SHT 2)
RES. 1
RES. 2
RES. 3
RES. 4
RES. 5
HATCHERY BLD'G (See Sht. 2)
SHOP & GARAGE (See Sht. 2)
AUX. GEN BLDG 250KW GEN.
INTAKE (5)125HP 10" PUMPS 10 CFS 7500 gpm Total
FISHWAY
BM BRASS PLATE ON TRAP WALL ELEV. = 101.00 (F.A.D.)
BULKHEAD
FILTERS
AUXILIARY INTAKE
CATTLE GUARD
(3) RESIDENCE (1956) CONC. BLOCK 1275 S.F.
WELL (DRY)
5' CHAIN LINK FENCE
Δ — DENOTES VALVE & FIRE BOX
DOM. WELL (6" ø 200' DP)
DOMESTIC WATER RESEVOIR
ACCESS ROAD
COUNTY ROAD 169-A
STORAGE BLD'G 940 S.F. (1958)
Released for construction
STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
KALAMA HATCHERY 2
"AS BUILT"
APPROVED
APPROVED
APPROVED
DIRECTOR
CHIEF ENGR.
OPERATIONS
DWG NO 2874-1
SHT NO Sht. 1 of 2



12" STEELHEAD "SUPER-SLIDE" RETURN TROUGH
WELL #2
12" STL
WELL #1
12" STL BLOWOFF
12" GATE VALVE
12" STL. (ABANDONED)
WELL PUMP CON TROL (ABANDONED)
6" P.V.C. WASTE WATER DRAIN
24" CONC
6" CONC
CATCH BASIN
12" STL OVERHEAD SPRAY LINE
(6) HOLDING PONDS
Size: 41 x 61
Volume: 10,850 c.f.
Tot. Vol.: 65,100 c.f.
Total 200 GPM
750 GPM (Re-use)
400 GPM (Spray)
18" STL
UPWELL (TYP)
24" STL
12" STL
SCREEN MANHOLE
PUMP STATION
(2) 5HP SUB PUMP
6" P.V.C. WASTE WATER
AERATION POND
SURFACE AERATOR 10 H.P.
COLLECTION BOX
36" CONC
WATER RE-USE
3/4" LAWN SPRINKLER
24" STL
(12) REARING PONDS
Size: 21 x 61
Volume: 5,425 c.f.
Tot. Vol.: 65,100 c.f.
Total: 375 GPM
15 H.P. PUMP
20" STL
36" CONC. DRAIN TO FISHWAY
OVERFLOW WEIR
(TYPICAL)
12" CONC
SHOP AREA 1280 S.F.
GARAGE 1420 S.F.
GENERAL BUILDING
NOTE:
22 ORIGINAL CFS
5.5 REUSE
HATCHERY BUILDING
120 stacks
1000 gpm.
COLD ROOM 175 TONS
FIRE VALVE BOX
4" ROOF DRAIN
4" SAMP DRAIN
12" CONC
12" STL
MANHOLE
DOM. SUPPLY
GAS STATION
ROCK WALL
6" P.V.C. DRAIN
DOMESTIC WATER
VALVE BOX
SCREEN FILTERS
& CATCH BOX
Released for construction
STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
KALAMA HATCHERY 2
"AS BUILT"
POND AREA
APPROVED DIRECTOR
APPROVED CHIEF ENGR
APPROVED OPERATIONS
DWN BY T. STABNO
SCALE 1" = 80'
DWG NO 2874-2
SHT NO Sht. 2 of 2

Klickitat Salmon Hatchery

INTRODUCTION

Klickitat Hatchery is located in a remote area on the Klickitat River at river mile 42, near the town of Glenwood, Washington. The facility includes a hatchery building, 34 raceways (12 of which are hypalon-lined, above-ground raceways), an adult holding pond and 3 rearing/release ponds.

Water rights total 28,338 gpm from four sources: Indian Ford Springs, an unnamed spring (designated Indian Ford "B"), Wonder Springs and the Klickitat River. The facility is staffed with 5.25 FTE's.

Rearing Facilities at Klickitat Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Deep Troughs					28		Concrete	46	Fair	
Vertical incubators					64		Fiberglass/ Plastic	6	Good	
Vertical Incubators					96		Fiberglass		Poor	
Pond 23	58	41	4	10,300	1	10,300	Concrete		Fair	
Pond 24				82,800	1	82,800	Dirt		Poor	
Pond 25				80,213	1	80,213	Dirt/ Vinyl Liner	12	Poor	
Pond 26				39,560	1	39,560	Dirt/ Vinyl Liner	19	Poor	
Raceways	100	10	3	3,000	22	66,000	Concrete	10	Good	
Shallow Troughs					9		Concrete	46	Fair	

PURPOSE

Klickitat Hatchery was authorized and constructed under the Mitchell Act. It began operation in 1949 as part of the Columbia River Fisheries Development Program-a program to mitigate for fishery losses caused by hydroelectric system development. Funds for the program are administered by the National Marine Fisheries Service. The facility is currently used for adult collection, egg incubation, and rearing of spring chinook, upriver bright (URB) fall chinook and late (Type-N) coho. The hatchery is currently operated at maximum production. URB fall chinook and Type-N coho stocks produced from Mitchell Act hatcheries are managed as species aggregates; therefore, adequate escapement of appropriate species/stocks for each hatchery's egg-take needs is not critical. Mitchell Act hatcheries with insufficient

broodstock can receive eggs of appropriate species / stocks from any other Mitchell Act facility with surplus eggs.

GOALS

Produce adult fall chinook, Type-N coho and spring chinook that will contribute to NE Pacific and Columbia River Basin commercial and sport fisheries.

OBJECTIVES

Objective 1: Hatchery Production

URB Fall Chinook
Produce 4,000,000 subyearlings for on-station release.

Type-N Coho
Produce 1,350,000 yearlings for on-station release.

Spring: Chinook
Produce 1,200,000 subyearlings for release into the upper Klickitat River.

Produce 600,000 yearlings 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 salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Klickitat Hatchery is to collect enough spring chinook adults to maintain the hatchery production program. Neither URB fall chinook or coho are managed for escapement to the hatchery; therefore, most eggs for these rearing programs come from other Columbia Basin hatcheries that have surplus eggs.

Spring Chinook Adults return to the hatchery from May through September. Peak spawning occurs in mid-September. There is usually sufficient adult returns to maintain the spring chinook production goals. Adult return level to support the subyearling release program is not managed for.

URB Fall Chinook: This stock is not managed to provide adequate escapement to the hatchery. This hatchery depends on eggs collected at other Columbia Basin facilities to supply eggs for this program.

Type-N Coho: This stock is not managed to provide adequate escapement to the hatchery. Coho eggs are imported from lower river hatcheries in most years.

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 retention time in downstream migration. When possible, rearing on parent river water, or acclimation for several weeks to parent river water 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 the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

URB Fall Chinook: Rear to a size of 80 fish / pound and release at the hatchery in May-June. For the past two years, approximately 45 percent of the fall chinook production has had exposure to partial river water for three weeks or more prior to release. This acclimation will likely continue in the years ahead.
Type-N Coho: Rear 1,350,000 fish to a size of 20 fish / pound and volitionally release at the hatchery in April-June. Fish are acclimated to parent river water for six months or more prior to release.

Spring Chinook: Rear 1,200,000 fish to a size of 50 fish / pound and release into the upper Klickitat River in June. Rear 600,000 fish to a size of 7-10 fish / pound and release at the hatchery in March-May. A portion of the releases is acclimated to parent river water for 3-6 weeks as part of an experiment. Program changes can be made to acclimate up to 50 percent of the programmed production if the experiment demonstrates that fish survival is enhanced.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection-All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained.

Spawning Protocol-All Stocks

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Importing eggs / fish from other facilities with acceptable stocks is done to achieve production goals while maintaining regional genetic integrity in times of inadequate hatchery returns. Eggs from hatchery-returning adults are always given priority for station use.

The stocks approved for release from the Klickitat Hatchery have been prioritized and are listed below. Stocks with the number 1 adjacent to their title are the most desirable. Stocks with higher numbers are considered to be progressively less well suited.

Fall Chinook
1 Upriver bright (Priest Rapids fall chinook)
2 Mid-Columbia River, Snake River mix fall chinook

Type-N (Late) Coho
1 Any Columbia River Type-N coho

Spring Chinook
1 Klickitat River spring chinook

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 WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW 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.
- Use a disease control policy 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 perform necropsies of clinically healthy 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 and environmental conditions in the hatchery rearing container based on

historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.

- 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) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Klickitat Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each stock.

- At spawning, an Enzyme Link Immunosorbent Assay (ELISA) is conducted on kidney tissue samples from all spring chinook females. ELISA is used to detect the bacterium which causes kidney disease (*Renibacterium salmoninarum*). Progeny from females with similar ELISA levels are grouped and reared together to reduce the horizontal transmission of this disease.

- 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 observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers 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 as a disinfectant.

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

- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

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

- Different fish / egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.

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

- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. 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 parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.

- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.

- In-hatchery Water Temperatures-maximum and minimum daily.

- *In-hatchery Dissolved* Oxygen-as required by steam flow or weather conditions.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water* Temperatures-continuous monitoring
- *Air* Temperatures-continuous monitoring
- *Influent/Effluent Dissolved* Oxygen-continuous monitoring
- *Influent pH/Conductivity*—continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

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.

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Pacific Northwest Fish Health Protection Committee (PNFHPC): 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, federal 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, Oregon Department of Fish and Wildlife, 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Eauilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS-KLICKITAT HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	CHF	2,500	39	O-41	1
	CHS	1,060	767	215-I ,782	
	Type-N COH	1,600	0	0	1
Adult Prespawning Survival	CHF	90%	68.9%	67.4-70.3%	1
	CHS	90%	92.3%	75.0-98.6%	
	Type-N COH	90%	0	0	1
Egg-take	CHF	5,000,000	21 ,115	O-78K	1
	CHS	2,120,000	1,181,140	373K-2,400K	
	Type-N COH	1,600,000	0	0	1
Green Egg-to-Fry Survival	CHF	90%	86.7%	80.1-98.9%	3
	CHS	90%	92.9%	88.6-95.6%	
	Type-N COH	90%	95.2%	88.2-I 00%	3
Fry-to-Smolt Survival	CHF	90%	97.6%	95.7-98.6%	3
	CHS	90%	90.8%	88.0-97.3%	
	Type-N COH	90%	77.0%	72.4-82.9%	3
Fish Releases	CHF	4,000,000	4,295,760	4,152K-4,463K	3
	CHS	600,000	635,580	311 K-783K	
	Type-N COH	1,350,000	1,176,000	950K-1,360K	3
Transfers to Co-ops (Eggs/Fish)	CHF	0	--	--	
	CHS	0	--	_	
	Type-N COH	0	500	500	
Other Transfers (Eggs/Fish)	CHF	0	--	_	
	CHS	1,200,000[1]	1,197,800[2]	1,197,800	
	Type-N COH	0	--	_	
Adults Passed Upstream	CHF	0	0	0	1
	CHS	0	505[3]	O-505	2
	Type-N COH	0	0	0	1
Percent Survival	CHF	1.0%	Unknown	Unknown	4
	CHS	2.5%	Unknown	Unknown	4
	Type-N COH	3.0%	Unknown	Unknown	4

N/A=Not applicable.
[1] Klickitat River programmed fingerling production; usually not achieved.
[2] One brood only, 1988.
[3] One brood only, 1993.

Objective 2

Measures	Species	Hatch&i Goal	5-Year Averaae	Range	Constraints
Release smolts	CHF	Yes	N/A	N/A	5
CV<10%	CHS	Yes	N/A	N/A	5
	Type-N COH	Yes	N/A	N/A	5
Acclimation	CHF	Yes	Partial	- -	6
	CHS	Yes	Experimental/Partial	—	6
	Type-N COH	Yes	Yes	—	
Volitional Release	CHF	No	No	- -	6
	CHS	Partial	Partial	—	6
	Type-N COH	Yes	Yes	—	

Objective 3

Measures	Species	Hatcherv Goal	B-Year Average	Range	Constraints
Collect Adults	CHF	Yes	No	No	
Throughout Run	CHS	Yes	Yes	Yes	
	Type-N COH	Yes	No	No	1
Spawning Pop.	CHF	Yes	No	No	1
>500	CHS	Yes	Yes	Yes	1
	Type-N COH	Yes	No	No	1
Spawning Ratio	CHF	1:3[1]	1.1:1	1:1.1	
Male:Female	CHS	1:3[1]	0.8:1	0.62:1 - 1:1	
	Type-N COH	1:3[1]	No adults	No adults	1

Objective 4

Measures	Species	Hatcherv Goal	5-Year Averaae	Range	Constraints
Adhere to	CHF	Yes	Yes	–	
Disease Policy	CHS	Yes	Yes	–	
	Type-N COH	Yes	Yes	–	

[1] Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

History of Reportable Pathogens—1990-1995

Species/Stock	Water Inc.	Supply Re	Virus	BKD	Furunc./ ERM	Other/Comments
Klickitat Hatchery	G	G,SA				
CHS/Klickitat R			IHN	+		
CHF/URB				+		
COH/Type-N				+		

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

Measures	Species	Hatchery Goal & Year Average	Range	Constraints
TSS Effluent	All	5 mg/L	N/A	N/A
TSS Max Effluent	All	15 mg/L	N/A	N/A
SS Effluent	All	0.1 ml/L	N/A	N/A
TSS PA Effluent	All	100 mg/L	N/A	N/A
SS PA Effluent	All	1.0 ml/L	N/A	N/A
Downstream Temp	All	Varies	N/A	N/A
Downstream DO	All	Varies	N/A	N/A
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A

Objective 6

Measures	Species	Hatch&i Goal	5-Year Averaae	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	8
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	—	8
Develop and Review Future Brood Doc.	All	Yes	No	--	9
Develop and Review Current Brood Doc.	All	Yes	No	--	8

Constraints/Comments—Klickitat Hatchery

1. Both URB fall chinook and Type-N coho fisheries are not managed to provide adequate escapement to this hatchery. Egg shortfalls are made up by importing eggs from other hatcheries that have surplus eggs. Because of inadequate adult returns to the hatchery, fish are not passed upstream.

2. Poor survival has reduced the number of returning adults. This poor survival may be the result of 1) rearing fish in spring water (which delays the migratory response), 2) mortality associated with passage over one dam, or 3) mortality associated with bacterial kidney disease.

3. Eggs are imported from either Priest Rapids or Lyons Ferry hatcheries. Eggs from Lyons Ferry hatchery suffer from softshell disease.

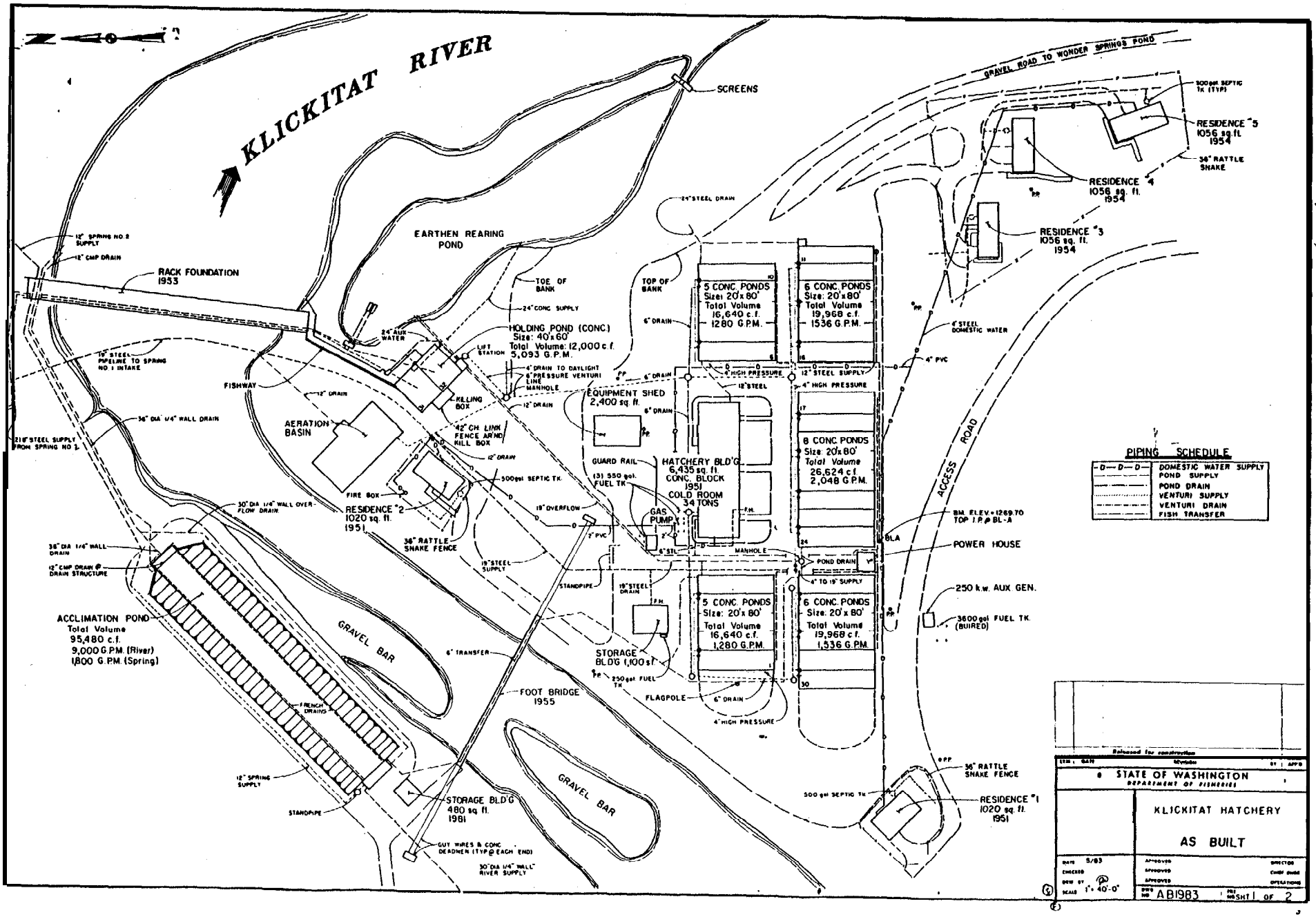
4. Lack of current and continuous tag data.

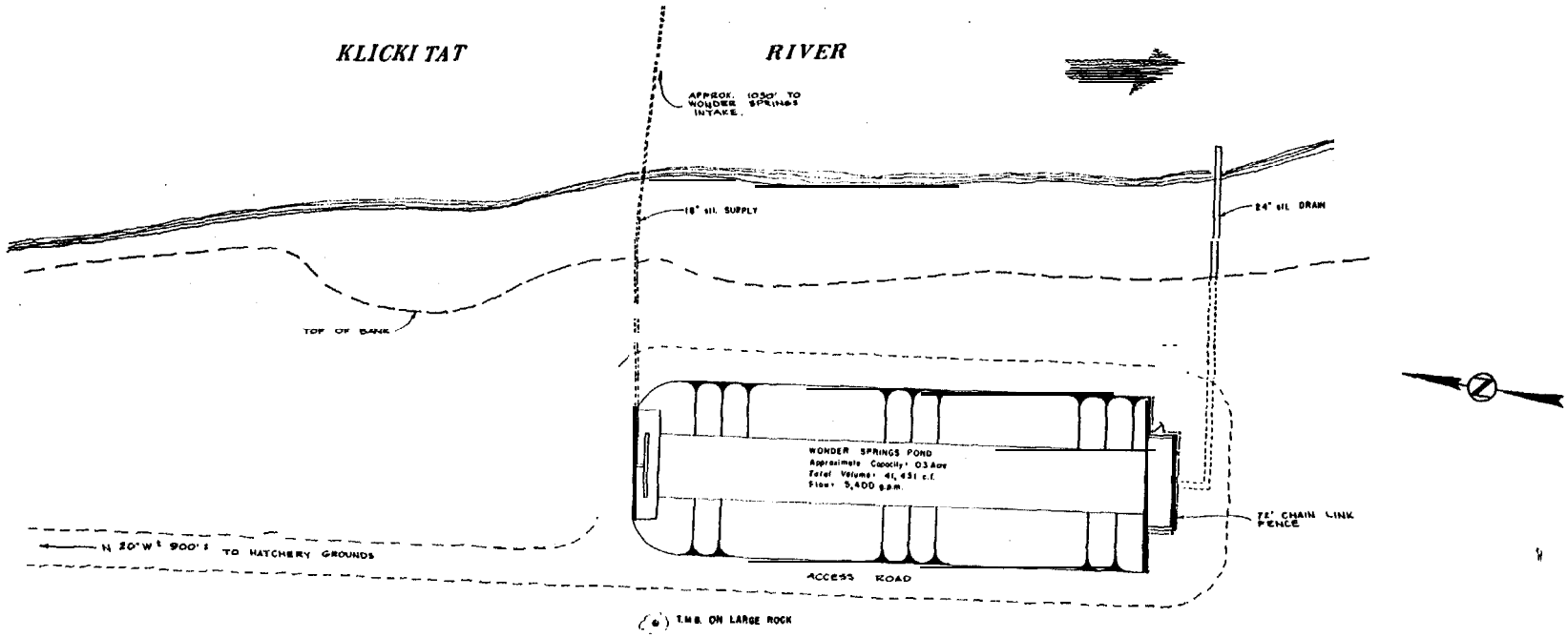
5. Ponding of progeny from numerous egg-takes into single ponds can cause size variations. Rearing of fish in warm spring water causes fast growth rates which requires feeding at ration levels that are too low to promote keeping fish in-size.

6. Use of spring water to rear fish does not promote a strong migratory response in smolts. Therefore, it does not promote volitional release. Without acclimation to ambient river water, the migratory urge is reduced and fish survival may decrease.

7. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.

8. A comprehensive basin-wide production plan has not been completed at this time.


KLICKITAT RIVER
SCREENS
GRAVEL ROAD TO WONDER SPRINGS POND
500gal SEPTIC TK (TYP)
RESIDENCE "5
1056 sq ft
1954
36" RATTLE SNAKE
RESIDENCE "4
1056 sq. ft.
1954
RESIDENCE "3
1056 sq. ft.
1954
12" SPRING NO. 2 SUPPLY
12" CMP DRAIN
RACK FOUNDATION
1953
EARTHEN REARING POND
TOE OF BANK
TOP OF BANK
24" STEEL DRAIN
24" CONC SUPPLY
24" AUX WATER
HOLDING POND (CONC.)
Size: 40'x 60'
Total Volume: 12,000 c.f.
5,093 G.P.M.
LIFT STATION
19" STEEL PIPELINE TO SPRING NO. 1 INTAKE
FISHWAY
4" DRAIN TO DAYLIGHT
6" PRESSURE VENTURI LINE MANHOLE
12" DRAIN
KILLING BOX
36" DIA 1/4" WALL DRAIN
21'6" STEEL SUPPLY FROM SPRING NO 1.
AERATION BASIN
42" CH. LINK FENCE ARND KILL BOX
12" DRAIN
500gal SEPTIC TK.
FIRE BOX
30" DIA 1/4" WALL OVER-FLOW DRAIN
RESIDENCE "2
1020 sq. ft.
1951
36" RATTLE SNAKE FENCE
18" OVERFLOW
2" PVC
19" STEEL SUPPLY
STANDPIPE
36" DIA 1/4" WALL DRAIN
12" CMP DRAIN @ DRAIN STRUCTURE
ACCLIMATION POND
Total Volume
95,480 c.f.
9,000 G.P.M. (River)
1,800 G.P.M. (Spring)
GRAVEL BAR
6" TRANSFER
FRENCH DRAINS
12" SPRING SUPPLY
STANDPIPE
STORAGE BLD'G
480 sq. ft.
1981
GUY WIRES & CONC DEADMEN (TYP @ EACH END)
30" DIA 1/4" WALL" RIVER SUPPLY
FOOT BRIDGE
1955
GRAVEL BAR
5 CONC. PONDS
Size: 20'x 80'
Total Volume
16,640 c.f.
1280 G.P.M.
6 CONC. PONDS
Size: 20'x 80'
Total Volume
19,968 c.f.
1536 G.P.M.
6" DRAIN
4" HIGH PRESSURE
12" STEEL SUPPLY
4" STEEL DOMESTIC WATER
4" PVC
EQUIPMENT SHED
2,400 sq. ft.
12" STEEL
GUARD RAIL
(3) 550 gal. FUEL TK
HATCHERY BLD'G
6,435 sq. ft
CONC. BLOCK
1951
COLD ROOM
34 TONS
GAS PUMP
8 CONC. PONDS
Size: 20'x 80'
Total Volume
26,624 c.f.
2,048 G.P.M.
ACCESS ROAD
BM. ELEV. = 1269.70
TOP I.P. @ BL-A
BLA
POWER HOUSE
MANHOLE
POND DRAIN
4" TO 19" SUPPLY
19" STEEL DRAIN
250 k.w. AUX. GEN.
3600 gal FUEL TK. (BURIED)
5 CONC. PONDS
Size: 20'x 80'
Total Volume
16,640 c.f.
1,280 G.P.M.
6 CONC. PONDS
Size: 20'x 80'
Total Volume
19,968 c.f.
1,536 G.P.M.
STORAGE BLD'G 1,100 sf
250 gal FUEL TK
FLAGPOLE
6" DRAIN
4" HIGH PRESSURE
36" RATTLE SNAKE FENCE
500 gal SEPTIC TK
RESIDENCE "1
1020 sq. ft.
1951
PIPING SCHEDULE
DOMESTIC WATER SUPPLY
POND SUPPLY
POND DRAIN
VENTURI SUPPLY
VENTURI DRAIN
FISH TRANSFER
Released for construction
STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
KLICKITAT HATCHERY
AS BUILT
DATE 5/83
DRAWN BY
SCALE 1" = 40'-0"
DRWG NO AB1983
SHT 1 OF 2



5/83	RE-DRW, SHT 1 & CHECKED SHT 2 Released for construction	JD	
SYM	DATE	DESCRIPTION	BY APP

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES

KLICKITAT HATCHERY

AS BUILT

DATE 11/81	APPROVED	DIRECTOR
CHECKED	APPROVED	CHIEF ENG
DRW BY T BOYER	APPROVED	OPERATIO
SCALE 1" = 20'	JOB NO AB1983	SHT NO Shl. 2 of

Lewis River and Speelyai Salmon Hatcheries

INTRODUCTION

Lewis River Hatchery is located adjacent to the Lewis River, 3 miles downstream from Merwin Dam, about 8 miles east of Woodland, Washington. Elevation of the facility is 64 feet above sea level.

The hatchery began operation in 1932. Currently 66 percent of the funding is provided by PacifiCorp and 34 percent NMFS-Mitchell Act. Budgets at these facilities are a mixture of PacifiCorp and state and federal funds. The facility is staffed with 5.5 FTE's which is shared with Speelyai Hatchery. This staffing level changes in response to budgetary changes.

Rearing units consist of 12 raceways and four 0.5-acre ponds. Facility water rights total 38,613 gpm from three sources: the Lewis River, an unnamed stream and Colvin Creek. Only the Lewis River is currently used for hatchery operations.

Speelyai Hatchery is operated as a satellite facility to the Lewis River Hatchery. It is located in a mountainous area at the upper end of Lake Merwin on the Lewis River, approximately 21 miles east of Woodland. Site elevation is approximately 500 feet above sea level.

Rearing Facilities at Lewis River and Speelyai Hatcheries

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
0.5-acre Ponds				90,000	2	180,000	Concrete		Good	
0.5-acre Ponds				80,000	2	160,000	Concrete		Good	
Deep Troughs					5		Plastic	13	Good	
Vertical incubators					800		Fiberglass	13	Good	FAL
Raceways	100	10	4	4,000	12	48,000	Concrete	12	Good	
Adult Holding	100	40	4.5	18,000	1	18,000	Asphalt	13	Fair	
Deep Trough					1		Plastic		Good	
Vertical Incubators					500		Fiberglass	11	Good	FAL
Raceways	80	20	4.5	7,200	12	86,400	Concrete	26	Fair	
Rearing Pond				18,000	1	18,000	Asphalt	13	Fair	

Speelyai began operation in 1954 and is owned and funded jointly by PP&L and Cowlitz County PUD. The facility has 12 concrete raceways, a 0.14-acre rearing pond, and an adult holding pond (also used to rear fish). It is staffed with 3.2 FTE's which is shared with Lewis River Hatchery when needed. Water rights total 6,732 gpm from Speelyai Creek. All raceways and ponds receive single-pass water.

PURPOSE

Lewis River and Speelyai hatcheries were originally constructed to provide mitigation for hydroelectric system development in the Lewis River System. An almost total remodel and upgrade of all rearing ponds and infrastructure at Lewis River Hatchery was funded with state enhancement funds in 1979 and 1980. The Lewis River Hatchery is used for adult collection, egg incubation and rearing of early (Type-S) and late (Type-N) coho as well as spring chinook. Lewis River also final rears a component of spring chinook from Speelyai for three months. Speelyai Hatchery is used for adult holding, egg incubation and rearing of spring chinook and Type-N coho. All stocks are managed to provide adequate escapement to the hatcheries for future brood needs.

GOALS

Produce adult coho and spring chinook that will contribute to NE Pacific and Columbia River Basin sport and commercial fisheries while providing adequate escapement for hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Lewis River Hatchery

Produce 900,000 yearling spring chinook for on-station release.

Produce 2,100,000 yearling Type-N coho for on-station release.

Produce 1,400,000 yearling Type-S coho for on-station release.

Produce 1,000,000 yearling Type-S coho for upriver release.

Produce 870,000 yearling Type-S coho (from Speelyai) for on-station release.

Provide 14,000 Type-S coho eggs / fish to co-op programs.

Provide 50,000 yearling Type-N coho to co-op programs.

Provide Type-N and Type-S coho eggs / fish (surplus to on-station needs) to other facilities.

Speelyai Hatchery

Rear 315,000 spring chinook yearlings for transfer to the Lewis River Hatchery.

Produce 200,000 Type-S coho yearlings for release into Lake Merwin.

Provide 31,000 Type-S coho eggs / fish to co-op 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 salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Lewis River Hatchery is to collect as many adults as possible to maintain the hatchery production / mitigation program.

Spring Chinook: Adults return to the hatchery and are also trapped at Merwin Dam. Fish are trapped from April to July. They are sorted, inoculated and then transported to Speelyai Hatchery for holding and spawning.

Type-S Coho: Adults return to the hatchery from mid-September to first of November with peak spawning in late October.

Type-N Coho: Adults return to the hatchery from mid-October to late December with peak spawning in early December.

Both early and late coho return to the hatchery or are trapped at Merwin 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 retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water 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 the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Spring Chinook

- Incubate eggs at Speelyai and transfer 930,000 fish to the Lewis River Hatchery in April. Rear these fish to a size of 5 fish / pound and volitionally release on-station (acclimated) in March the following year.

- Keep approximately 315,000 fish at Speelyai; rear to a size of 10 fish / pound and transfer to Lewis River Hatchery in early January.

Type-S Coho

- Incubate all early coho eggs at Speelyai until eyed and then ship to Lewis River Hatchery. Rear 200,000 fish to a size of 15 fish / pound and release into Lake Merwin in June the following year.

- Rear 2,400,000 coho at Lewis River till near yearling stage. Transfer 1,000,000 in February-March to upriver acclimation / release site. Release remaining 1,400,000 in April-June.

Type-N Coho: Rear 3,552,000 fish at Lewis River Hatchery to a size 17 fish / pound; volitionally release on-station (acclimated) in April-June.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection-All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained.

Spawning Protocol-All Stocks

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Importing eggs / fish from other facilities with acceptable stocks is done to achieve production goals while maintaining regional genetic integrity in times of inadequate hatchery returns. Eggs from hatchery-returning adults are always given priority for station use. The stocks approved for release from the Lewis River and Speelyai hatcheries have been prioritized and are listed below. Stocks with the number 1 adjacent to their title are the most desirable. Stocks with higher numbers are considered to be progressively less well suited.

Spring Chinook
1 Lewis River spring chinook
2 Cowlitz River spring chinook
2 Kalama River spring chinook

Type-S Coho
1 Lewis River Type-S
2 Any Columbia River Type-S

Type-N Coho
1 Lewis River Type-N
2 Any Columbia River Type-N

Fall Chinook
1 Lewis River fall chinook

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 WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.
WDFW 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.
- Use a disease control policy 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 perform necropsies of clinically healthy 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 and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.

- 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) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Lewis/Speelyai Hatcheries

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each stock.

- 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 observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Adult spring chinook and Type-S coho are injected with antibiotics for the control of bacterial diseases.

- At spawning, eggs are water-hardened in iodophor as a disinfectant.

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

- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

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

- Different fish / egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.

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

- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. 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 parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.

- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.

- Upstream *and Downstream* Temperatures-twice per month, June through September.

- *Upstream and Downstream Dissolved Oxygen* (DO)-twice per month, June through September.

- In-hatchery Water Temperatures-maximum and minimum daily.

- In-hatchery *Dissolved* Oxygen-as required by steam flow or weather conditions.

- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent* Water Temperatures-continuous monitoring
- *Air* Temperatures-continuous monitoring
- *Influent/Effluent Dissolved* Oxygen-continuous monitoring
- *Influent pH/Conductivity*—continuous monitoring
- *S treambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

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, federal 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, Oregon Department of Fish and Wildlife, 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Eauilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS-LEWIS RIVER/SPEELYAI HATCHERIES

Objective 1

Measures	Species	Hatchery Goal	8-Year Averaae	Ranae	Constraints
Adult Capture	CHS	618	640	393-794	1
	Type-S COH	1,950	11,208	3,388-29,561	
	Type-N COH	5,205	25,655	8,719-46,220	
Adult Prespawning Survival	CHS	90%	83.4%	78.7-86.9%	2
	Type-S COH'	90%	93.1%	87.9-98.2%	
	Type-N COH	90%	97.5%	95.8-99.3%	
Egg-take	CHS	1,600,000	1,393,490	757K-1,736K	
	Type-S COH	1,950,000	1,958,300	1,407K-3,013K	3
	Type-N COH	5,205,000	11,524,120	10,407K-13,097K	
Green Egg-to-Fry Survival	CHS	90%	83.7%	80.1-91.2%	2
	Type-S COH	90%	79.6%	66.4-86.7%	2
	Type-N COH	90%	92.3%	89.1-94.3%	
Fry-to-Smolt Survival	CHS	90%	95.0%	88.3-97.2%	
	Type-S COH	90%	96.2%	87.0-99.6%	
	Type-N COH	90%	91.9%	86.6-95.1%	
Fish Releases	CHS'	1,215,000	873,512	389-1,244K	1,2,4
	Type-S COH'	1,400,000[2]	1,085,400[3]	839-1,214K	
	Type-N COH'	2,100,000[4]	3,094,780	869-4,542K	
Transfers to Co-ops (Eggs/Fish)	CHS	0	--	--	
	Type-S COH	32,000	30,650[5]	30,650	
	Type-N COH	0	5,400[6]	5,400	
Other Transfers (Eggs/Fish)	CHS	0	--	--	
	Type-S COH	1,300,000[7]	947,425[8]	687K-1,112K	
	Type-N COH	0-1,000,000	3,443,742[9]	1,766K-6,735K	

N/A=Not applicable.
[1] Combined totals for Lewis River and Speelyai hatcheries.
[2] 1992 Type-S coho planting goal reduced to 870,000.
[3] An additional average of 817,450 Type-S coho are planted into Lake Merwin from Speelyai Hatchery.
[4] 1992 Type-N coho planting goal reduced to 3,552,000.
[5] Two years data, 1989 and 1990.
[6] One year only, 1990.
[7] Transferred to Lake Met-win.
[8] From Speelyai Hatchery only.
[9] Most are egg transfers to other stations.

Objective 1 (continued)

Measures	Species	Hatchet-v Goal	B-Year Averaue	Range	Constraints
Adults Passed Upstream	CHS	0	0	0	
	Type-S COH	0	4,847	0-20,306	
	Type-N COH	0	6,800	0-25,125	
Percent Survival	CHS	2.5%	Unknown	Unknown	5
	Type-S COH	2.5%	5.0%	4.2-5.4%[1]	
	Type-N COH	2.5%	8.0%	7.1-8.8%[1]	

Objective 2

Measures	Species	Hatcherv Goal	5-Year Averaae	Ranae	Constraints
Release smolts CV<10%	CHS	Yes	15.0%	12.0-l 9.0%	6
	Type-S COH	Yes	6.8%	4.8-8.7%	6
	Type-N COH	Yes	6.9%	4.5-9.0%	6
Acclimation	CHS	Yes	Yes	--	
	Type-S COH	Yes	Yes		
	Type-N COH	Yes	Yes		
Volitional Release	CHS	Partial	Partial	--	7
	Type-S COH	Partial	Partial		
	Type-N COH	Partial	Partial		

Objective 3

Measures	Species	Hatchery Goal	S-Year Averaae	Ranae	Constraints
Collect Adults Throughout Run	CHS	Yes	Yes	Yes	1
	Type-S COH	Yes	Yes	Yes	
	Type-N COH	Yes	Yes	Yes	
Spawning Pop. >500	CHS	Yes	Yes	Yes	
	Type-S COH	Yes	Yes	Yes	
	Type-N COH	Yes	Yes	Yes	
Spawning Ratio Male:Female	CHS	1:3[2]	0.6:1	1.2:1 - .5:1	
	Type-S COH	1:3[2]	0.8:1	0.4:1 - 1.3:1	
	Type-N COH	1:3[2]	0.8:1	1:1 - 0.6:1	

[1] Data is based on two broods.
[2] Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

Objective 4

Measures	Species	Hatchery Goal	5-Year Average	Ranae	Constraints
Adhere to Disease Policy	CHS	Yes	**Yes**	--	
	Type-S COH	Yes	**Yes**	--	
	Type-N COH	Yes	**Yes**	--	

History of Reportable Pathogens—1990-1995

Species/Stock	Water Supply Inc.	Rear.	Virus	BKD	Furunc./ ERM	Other/Comments
Lewis River Hatchery	*SA*	*SA*				
CHS/Lewis R			IHN	+		IHN in yearlings
COH/Type-N				+		
COH/Type-S				+		
Speelyai Hatchery	*SR*	*SR*				
CHS/Lewis R			IHN	+		
COH/Type-S				+		
CHS/Kalama R			IHN			Adults transferred from Kalama R

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

Measures	Species	Hatchery Goal	5-Year Averaae	Ranae	Constraints
TSS Effluent	All	*5* mg/L	N/A	N/A	*8*
TSS Max Effluent	All	15 mg/L	N/A	N/A	*8*
SS Effluent	All	0.1 ml/L	N/A	N/A	*8*
TSS PA Effluent	All	100 mg/L	N/A	N/A	*8*
SS PA Effluent	All	1 .O ml/L	N/A	N/A	*8*
Downstream Temp	All	Varies	N/A	N/A	*8*
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

Measures	Species	Hatchery Goal	5-Year Averaae	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	9
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	10
Develop and Review Future Brood Doc.	All	Yes	Yes	_	9
Develop and Review Current Brood Doc.	All	Yes	Yes	_	9

Constraints/Comments-Lewis River/Speelyai Hatcheries

1. Mouth of the fish ladder needs to be dredged because shallow bar area discourages spring chinook from entering the ladder. In addition, spring chinook are not well attracted to the ladder mouth because they were reared on a different water source.

2. High water temperatures during the fall causes increased mortality of spring chinook and Type-S coho. It also increases egg mortality from adults held in warm water for long periods of time. Hauling of spring chinook to Speelyai Hatchery increases stress and mortality, but decreases subsequent adult and egg mortality.

3. Lack of sufficient brood due to poor survival years or high harvest rates in the Columbia River commercial fisheries. Higher survival of male fish can skew the sex ratio of returning adult, thus making it difficult to obtain adequate number of eggs.

4. Low flows can reduce production capability and increase loadings in Davis Creek pond.

5. Lack of continuous, current tag data.

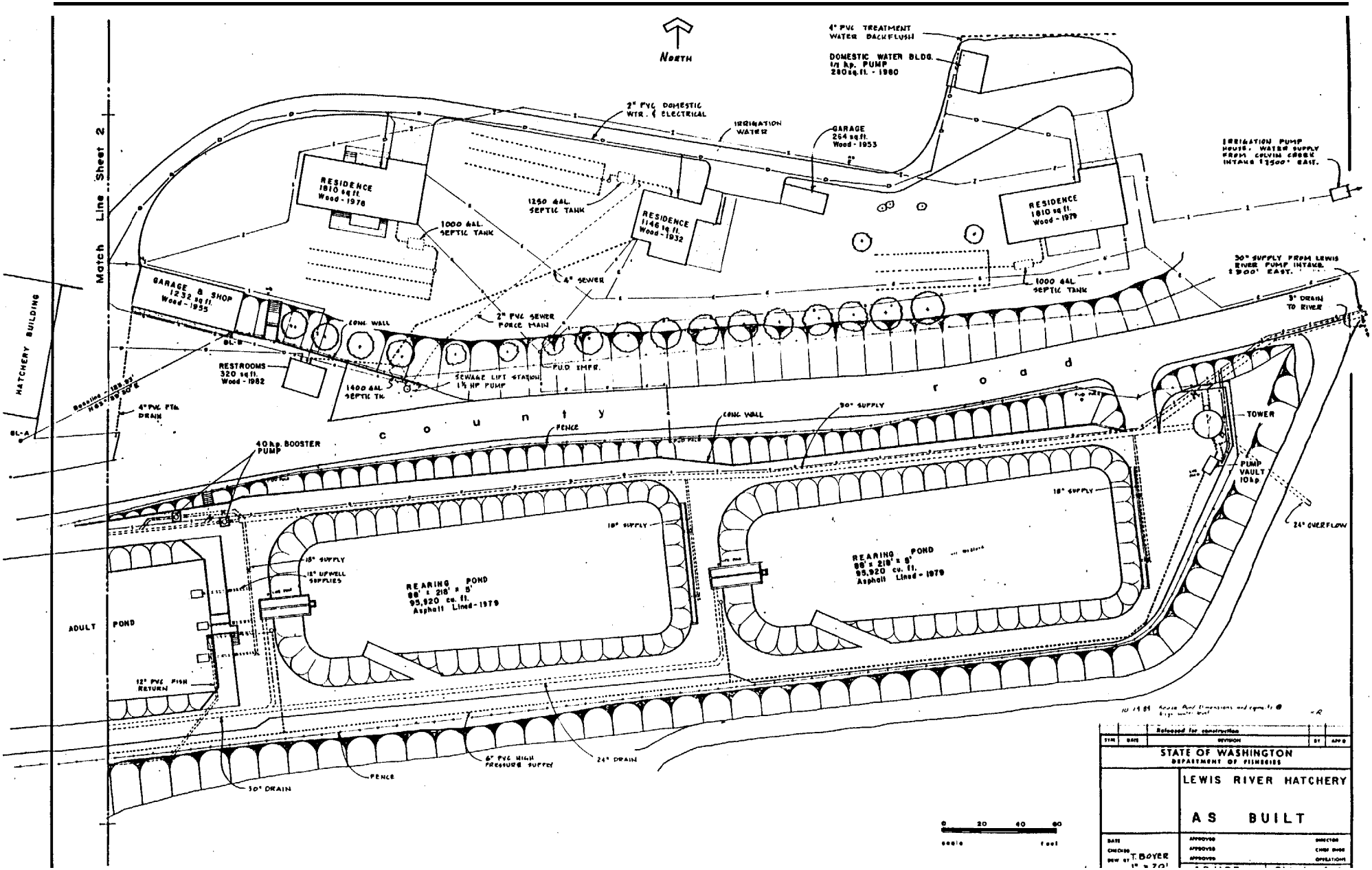
6. Combining progeny of many different egg-takes increases size variation in the large rearing ponds.

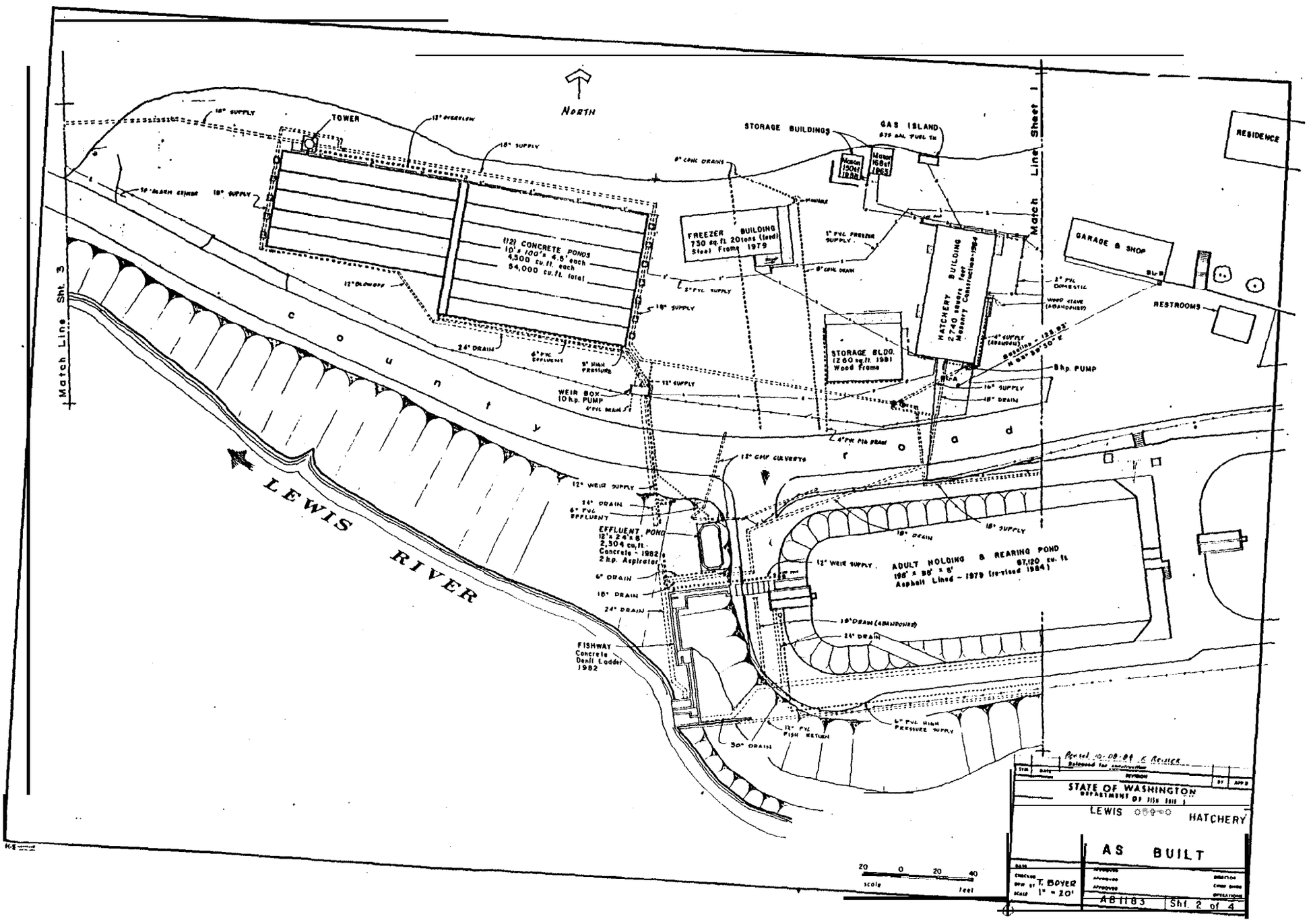
7. Location of Speelyai Hatchery precludes volitional release.

8. Pollution abatement pond is too small to accommodate the hatchery cleaning schedule, particularly for the large rearing ponds. In addition, the Davis Creek pond is not plumbed into the abatement pond. As a result, this hatchery is in frequent violation of the pollution abatement requirement. An abatement pond is in the planning stage at Speelyai Hatchery.

9. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.

10. A comprehensive basin-wide production plan has not been completed at this time.


NORTH
Match Line Sheet 2
4" PVC TREATMENT WATER BACKFLUSH
DOMESTIC WATER BLDG. 1/2 hp. PUMP 280 sq.ft. - 1980
2" PVC DOMESTIC WTR. & ELECTRICAL
IRRIGATION WATER
GARAGE 264 sq.ft. Wood - 1953
IRRIGATION PUMP HOUSE - WATER SUPPLY FROM COLVIN CREEK INTAKE 13500' EAST.
RESIDENCE 1810 sq.ft. Wood - 1978
1250 GAL. SEPTIC TANK
RESIDENCE 1148 sq.ft. Wood - 1932
1000 GAL. SEPTIC TANK
RESIDENCE 1810 sq.ft. Wood - 1979
30" SUPPLY FROM LEWIS RIVER PUMP INTAKE 1900' EAST.
4" SEWER
1000 GAL. SEPTIC TANK
GARAGE & SHOP 1232 sq.ft. Wood - 1955
CONC. WALL
2" PVC SEWER FORCE MAIN
8" DRAIN TO RIVER
HATCHERY BUILDING
RESTROOMS 320 sq.ft. Wood - 1982
SEWAGE LIFT STATION 1½ HP PUMP
P.U.D. IMPR.
1400 GAL. SEPTIC TK.
4" PVC FTN. DRAIN
county road
CONC. WALL
30" SUPPLY
TOWER
FENCE
40 hp. BOOSTER PUMP
PUMP VAULT 10 hp
18" SUPPLY
24" OVERFLOW
18" SUPPLY
18" UPWELL SUPPLIES
REARING POND 88' x 218' x 5' 95,920 cu. ft. Asphalt Lined - 1979
REARING POND 88' x 218' x 5' 95,920 cu. ft. Asphalt Lined - 1979
ADULT POND
12" PVC FISH RETURN
6" PVC HIGH PRESSURE SUPPLY
24" DRAIN
30" DRAIN
FENCE
0 20 40 60
scale feet
Released for construction
STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
LEWIS RIVER HATCHERY
AS BUILT
DRAWN T. BOYER
DATE
CHECKED
APPROVED DIRECTOR
APPROVED CHIEF ENGR
APPROVED OPERATIONS

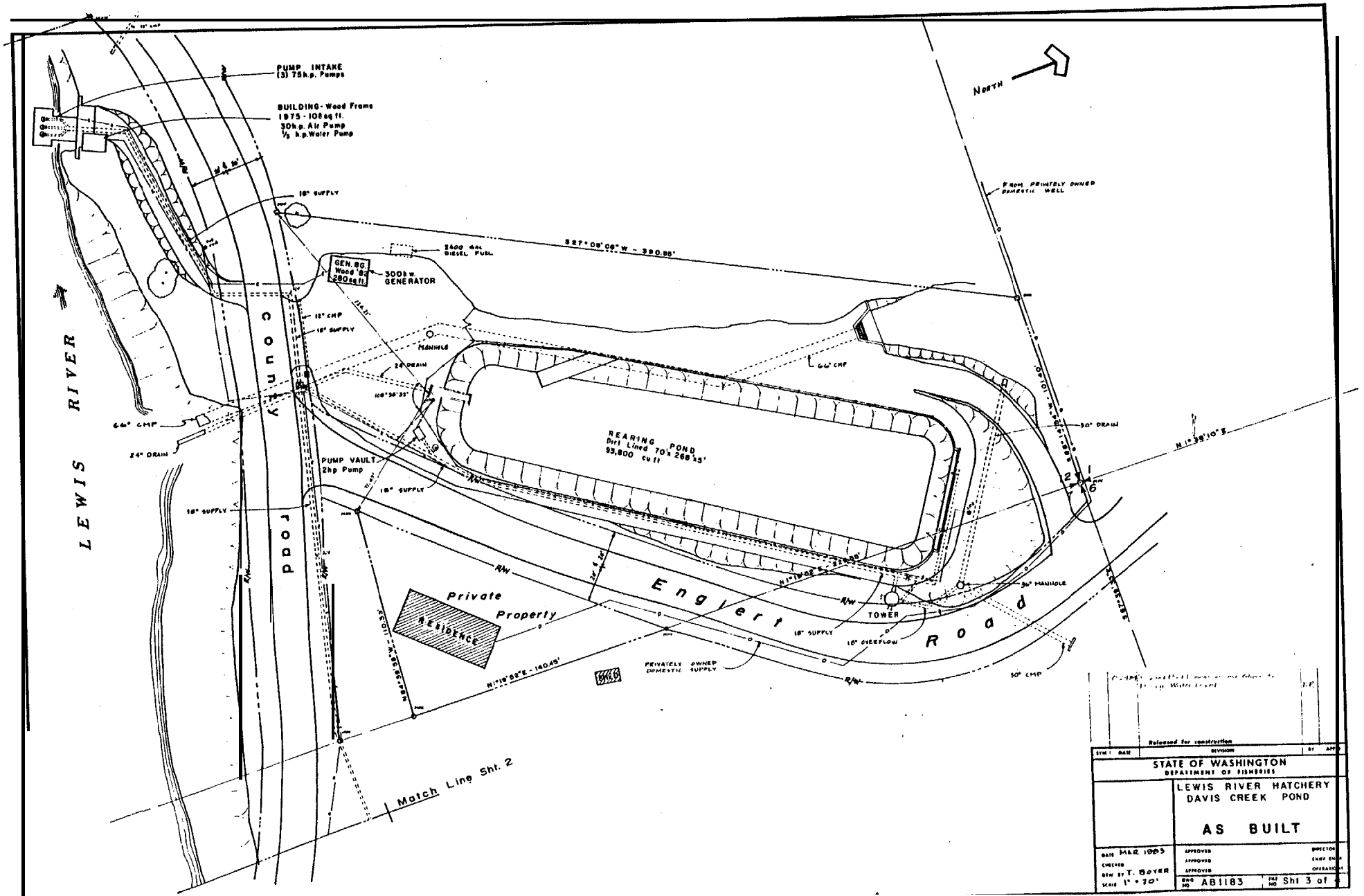


Revised 10-08-84 As Revised
Released for Construction

STATE OF WASHINGTON
DEPARTMENT OF FISH AND GAME
LEWIS HATCHERY

AS BUILT

DRAWN T. BOYER
SCALE 1" = 20'
A81183 Shl. 2 of 4



Released for construction

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES

LEWIS RIVER HATCHERY
DAVIS CREEK POND

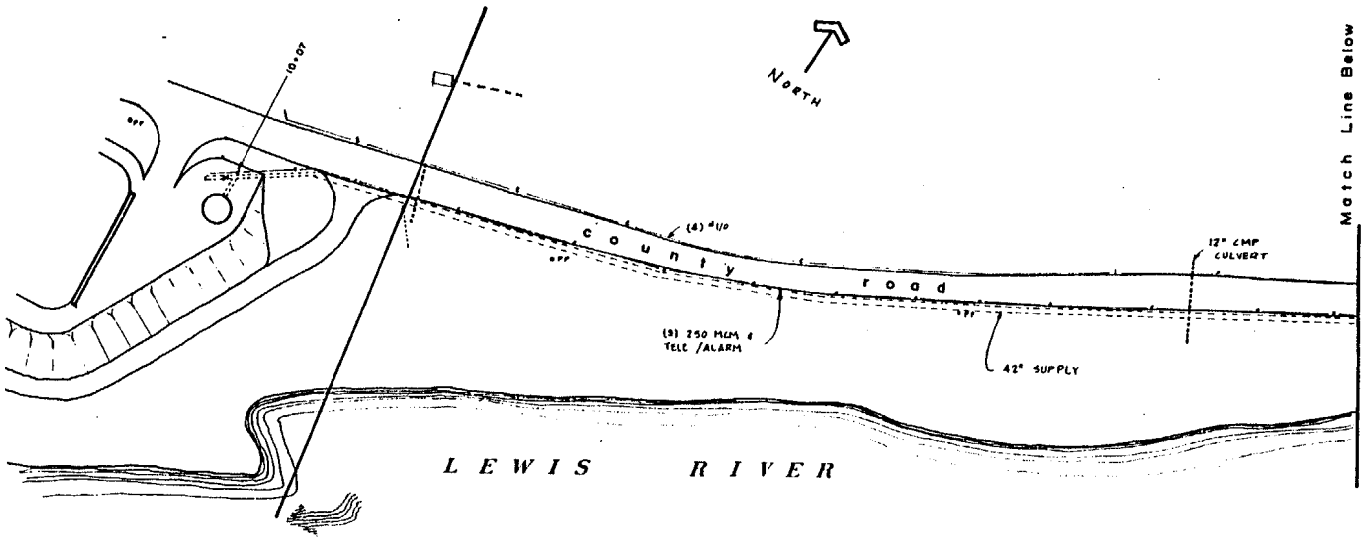
AS BUILT

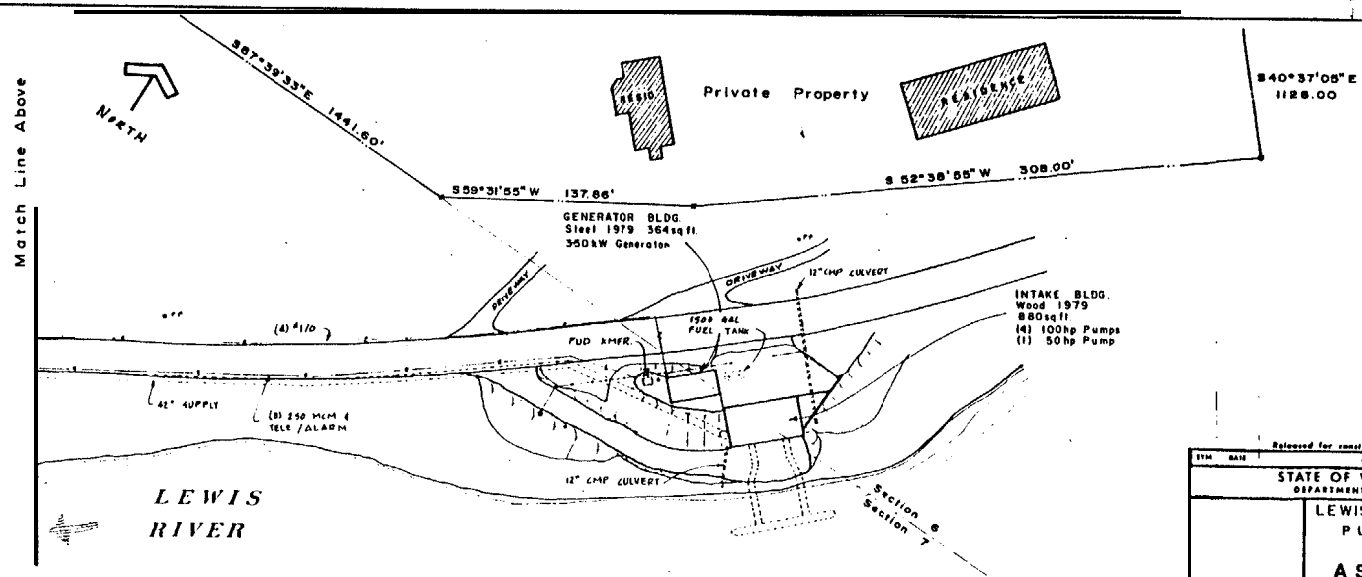
DATE MAR. 1983
CHECKED
DRN BY T. BOYER
SCALE 1" = 20'

APPROVED DIRECTOR
APPROVED CHIEF ENGR.
APPROVED OPERATIONS

DNR NO. AB1183
SHT NO. Sht 3 of 5

Details Sheet 1





Released for construction

BY	DATE	Revisions	BY	APP'D

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES

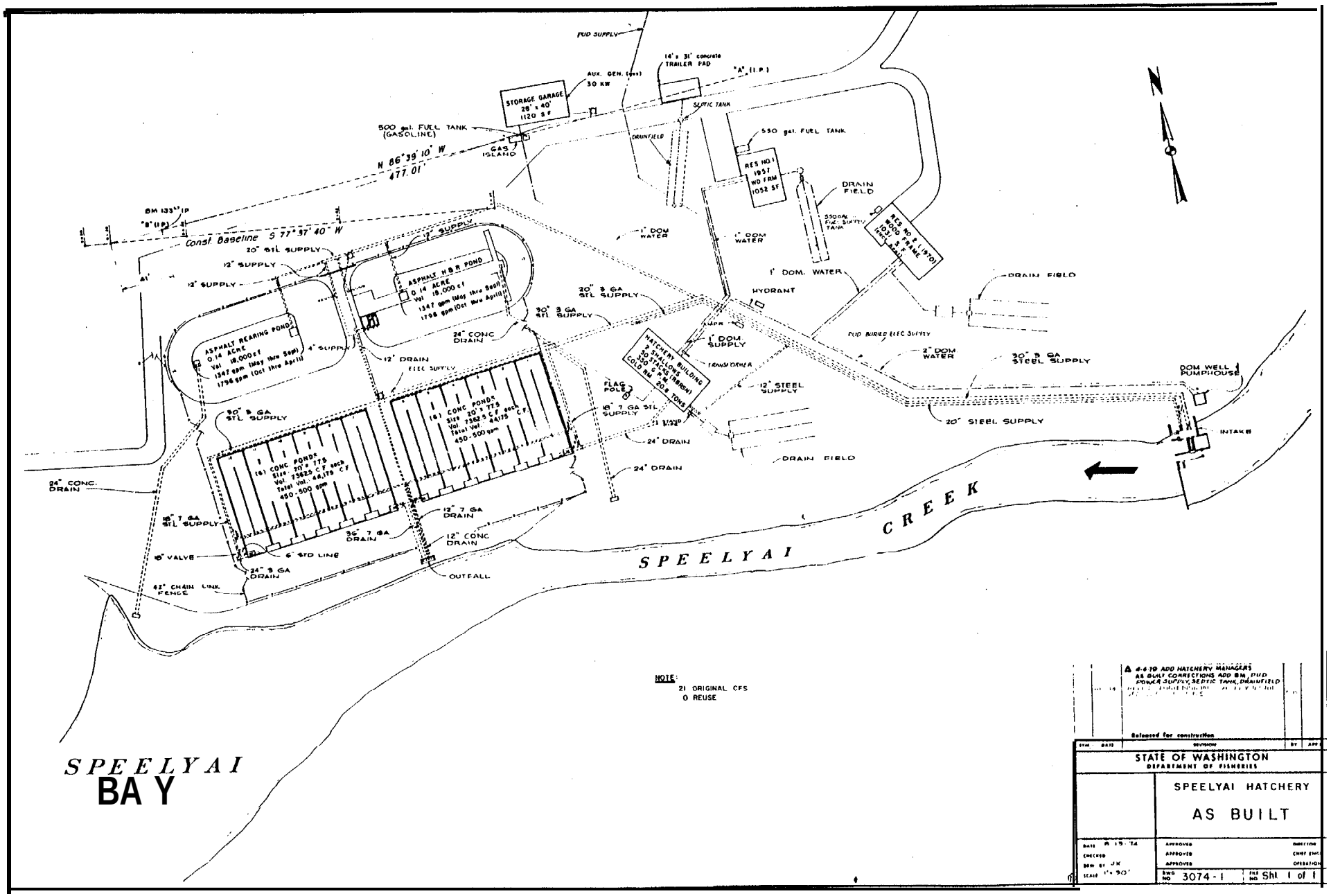
LEWIS RIVER HATCHERY
PUMP INTAKE

AS BUILT

DATE MAR 1985
CHK'D

APPROVED
APPROVED

DIRECTOR
CHIEF ENGR



NOTE:
21 ORIGINAL CFS
0 REUSE

	4-6-79 ADD HATCHERY MANAGERS AS BUILT CORRECTIONS ADD BM, PUD POWER SUPPLY, SEPTIC TANK, DRAINFIELD		
	Released for construction		
DATE	DATE	BY	APP'D

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES

SPEELYAI HATCHERY

AS BUILT

DATE 8-15-74	APPROVED	DIRECTOR
CHECKED	APPROVED	CHIEF ENG.
DRW BY J.K.	APPROVED	OPERATION
SCALE 1" = 50'	DWG NO 3074-1	SHT NO Sht 1 of 1

Lower Kalama Salmon Hatchery

INTRODUCTION

Lower Kalama Hatchery is located along the Kalama River, 5 miles north of Kalama, Washington. The facility is 53 feet above sea level and is located in relatively steep terrain. It is staffed with 3.25 FTE's.

The rearing units consist of 8 raceways, 1 asphalt rearing pond (also used for adult holding), and 1 gravel rearing pond. Total rearing area is 161,200 cubic feet.

Facility water rights total 15,112 gpm from two sources: Kalama River and Fallert Creek. The hatchery water supply comes from the Kalama River by pumping and from Fallert Creek by gravity flow.

Water from Fallert Creek is used for incubation and some fish rearing. This creek is not used during summer months because of low water flows.

Rearing Facilities at Lower Kalama Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Deep Troughs					4		Concrete	46	Good	
Vertical Incubators					304		Fiberglass	10	Good	FAL
Vertical Incubators					144		Fiberglass	26	Fair	Heath
Gravel Pond				55,000	1	55,000	Dirt		Poor	
Raceways	80	20	4	6,400	8	51,.200	Concrete	35	Good	
Rearing/ Adult Pond				55,000	1	55,000	Asphalt	35	Fair	
Shallow Troughs					16		Concrete	46	Good	

PURPOSE

Lower Kalama Hatchery began operation in 1895 and is one of the oldest hatcheries in the Columbia River Basin. Facility operations are funded as part of the Mitchell Act-a program to mitigate for fishery losses caused by hydroelectric system development. Funds for this program are administered by the National Marine Fisheries Service.

This facility is used for spawning, egg incubation, and rearing of tule fall chinook and early (Type-S) coho. It is also used for final rearing and release of yearling spring chinook transferred in from the Kalama Falls Hatchery. The hatchery is

currently operating at maximum production. Tule fall chinook and Type-N coho stocks produced from Mitchell Act hatcheries are managed as species aggregates; therefore, adequate escapement of appropriate species/stocks for each hatchery's egg-take needs is not critical. Mitchell Act hatcheries with insufficient broodstock can receive eggs of appropriate species/stocks from any other Mitchell Act facility with surplus eggs (see Kalama Falls Hatchery Plan).

GOALS

Produce lower river fall chinook, spring chinook and 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

Spring Chinook

Produce 500,000 yearlings for on-station release.

Fall Chinook

Produce 2,000,000 subyearlings for on-station release.

Provide eggs/fish (surplus to on-station needs) to other facilities.

Type-S Coho

Produce 525,000 yearlings for on-station release.

Provide eggs/fish (surplus to on-station needs) to other facilities.

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 salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Lower Kalama Hatchery is to collect as many adults as possible to maintain the hatchery production program.

Spring Chinook: There is no adult spring chinook collection program at this hatchery. Spring chinook are transferred from the Kalama Falls Hatchery as fingerlings.

Tule Fall Chinook: Entry of adults into the subbasin occurs from August to November. Spawning occurs from September to November with a peak in October. Adults are captured at Modrow Trap in the lower Kalama River and trucked to Kalarna Falls Hatchery. When the holding ponds at Kalama Falls are full, Lower Kalama Hatchery becomes the alternate location for holding adults. Adults also return to Fallert Creek, which supplies additional eggs for the hatchery.

Type-S Coho: Type-S coho begin entering the Kalama River in September. Spawning occurs from October to November with a peak in late October to early November. Adults are captured at the hatchery site as they migrate up Fallert Creek.

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 retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water 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 the 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 7 fish / pound and release on-station (acclimated) in April.

Fall Chinook: Rear 2 million fish to a size of 50-80 fish / pound and release on-station (acclimated) in June.

Type-S Coho: Rear 525,000 fish to a size of 18 fish / pound and release on-station (acclimated) in May.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection-All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained.

Spawning Protocol-All Stocks

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Importing eggs / fish from other facilities with acceptable stocks is done to achieve production goals while maintaining regional genetic integrity in times of inadequate hatchery returns. Eggs from hatchery-returning adults are always given priority for station use. The stocks approved for release from the Lower Kalama Hatchery are listed below. Stocks with the number 1 adjacent to their title are the most desirable. Stocks with higher numbers are considered to be progressively less well suited.

Sprine Chinook
1 Kalama Falls spring chinook

Fall Chinook
1 Kalama River fall chinook

Twe-S Coho
1 Grays River Type-S
2 Toutle River Type-S

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 WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW 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.
- Use a disease control policy 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 perform necropsies of clinically healthy 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 and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.

- 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) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Lower Kalama Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each stock.

- 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 observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.

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

- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

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

- Different fish / egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.

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

- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. 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 parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.

- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.

- *Upstream and* Downstream Temperatures-twice per month, June through September.

- *Upstream and Downstream Dissolved Oxygen (DO)*—twice per month, June through September.

- *In-hatchery Water Temperatures-maximum* and minimum daily.

- *In-hatchery Dissolved* Oxygen-as required by steam flow or weather conditions.

- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water* Temperatures-continuous monitoring
- *Air* Temperatures-continuous monitoring
- *Influent/Effluent Dissolved* Oxygen-continuous monitoring
- *Influent pH/Conductivity*—continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

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.

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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, federal 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, Oregon Department of Fish and Wildlife, 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Eauilibrium Brood Document for the Columbia River and / or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS-LOWER KALAMA HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Averaae	Ranae	Constraints
Adult Capture	CHF	1,425	1,394	887-l ,899	1
	Type-S COH	880	1,869	474-4,262	
Adult Prespawning Survival	CHF	90%	84.3%	71.9-89.2%	2
	Type-S COH	90%	98.1%	95.8-l 00%	
Egg-take	CHF	2,360,000	2,897,860	827K-4,231K	
	Type-S COH	1,200,000	1,858,800	252K-3,834K	
Green Egg-to-Fry Survival	CHF	90%	92.9%	89.9-94.6%	
	Type-S COH	90%	89.6%	79.4-96.6%	2
Fry-to-Smelt Survival	CHF	90%	99.5%	99.2-99.7%	
	Type-S COH	90%	95.4%	92.3-98.0%	
Fish Releases	CHF	2,000,000	2,149,981	2,040K-2,242K	1
	CHS	500,000	491,050	282K-572K	
	Type-S COH	525,000	475,346	209-554K	
Transfers to Co-ops (Eggs/Fish)	CHF	0	700,000'	--	
	CHS	0	--	--	
	Type-S COH	0	550,000[2]	--	
Other Transfers (Eggs/Fish)	CHF	0-1,500,000	1,025,000[3]	--	
	CHS	0	435,694[4]	--	
	Type-S COH	550,000[5]	--	270K-1,200K	
Adults Passed Upstream	CHF	0	0	0	
	CHS	0	0	0	
	Type-S COH	0	89	0-21 1	1
Percent Survival	CHF	1.0%	Unknown	Unknown	3
	CHS	5.0%	Unknown	Unknown	3
	Type-S COH	3.0%	Unknown	Unknown	3

N/A=Not applicable.
[1] One year only, 1987.
[2] One year only (1990, egg transfer).
[3] Two years only (egg transfers).
[4] Three years of egg transfers and two years of fish transfers.
[5] Rocky Reach program.

Objective 2

Measures	Species	Hatchery Goal	5-Year Averaae	Range	Constraints
Release smolts	CHF	Yes	N/A	N/A	3
CV<10%	CHS	Yes	N/A	N/A	3
	Type-S COH	Yes	N/A	N/A	3
Acclimation	CHF	Yes	Yes	--	
	CHS	Yes	Yes	--	
	Type-S COH	Yes	Yes	--	
Volitional Release	CHF	Yes	No	--	
	CHS	Yes	No	--	
	Type-S COH	Yes	No	--	

Objective 3

Measures	Species	Hatcherv Goal	&Year Average	Ranae	Constraints
Collect Adults	CHF	Yes	No	--	1
Throughout Run	Type-S COH	Yes	Yes	—	
Spawning Pop.	CHF	Yes	Yes	600-2,400	
>500	Type-S COH	*Yes*	*Yes*	15-4,000	
Spawning Ratio	CHF	1:1	1.3:1	0.5:1 - 3.6:1	
Male:Female	Type-S COH	1:3[1]	1.1:1	0.7:1 - 1.4:1	

Objective 4

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Adhere to	CHF	Yes	Yes	- -	
Disease Policy	Type-S COH	Yes	Yes	—	

[1] Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

History of Reportable Pathogens—1990-1995

Species/Stock	Water Supply Inc.	Rear.	Virus	-a-- BKD	Furunc./ ERM	Other/Comments
Fallert Creek Hatchery	*SA*	*SA*				
CHS/Kalama R				+		
CHF/Kalama R				+		
COH/Type-S				+		

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Ranae	Constraints
TSS Effluent	All	5 mg/L	N/A	N/A	5
TSS Max Effluent	All	15 mg/L	N/A	N/A	5
SS Effluent	All	0.1 ml/L	N/A	N/A	5
TSS PA Effluent	All	100 mg/L	N/A	N/A	5
SS PA Effluent	All	1 .O ml/L	N/A	N/A	5
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

Measures	Species	Hatchery Goal S-Year Averane		Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	--	6
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	—	7
Develop and Review Future Brood Doc.	All	Yes	Yes	--	6
Develop and Review Current Brood Doc.	All	Yes	Yes	--	6

Constrain&/Comments-Lower Kalama Hatchery

1. Kalama River tule fall chinook are managed to provide adequate escapement to the Kalama hatcheries because these hatcheries provide eggs to other lower Columbia River hatcheries with shortfalls. Type-S coho are not managed to provide adequate escapement to the hatchery. Because of the lower river trap at Modrow, this facility does not receive tule fall chinook from all segments of the run.

2. Hauling fish increases prespawning mortality, particularly during years when high water temperatures are present. High water temperatures during holding increases the egg-to-fry mortality, particularly with Type-S coho.

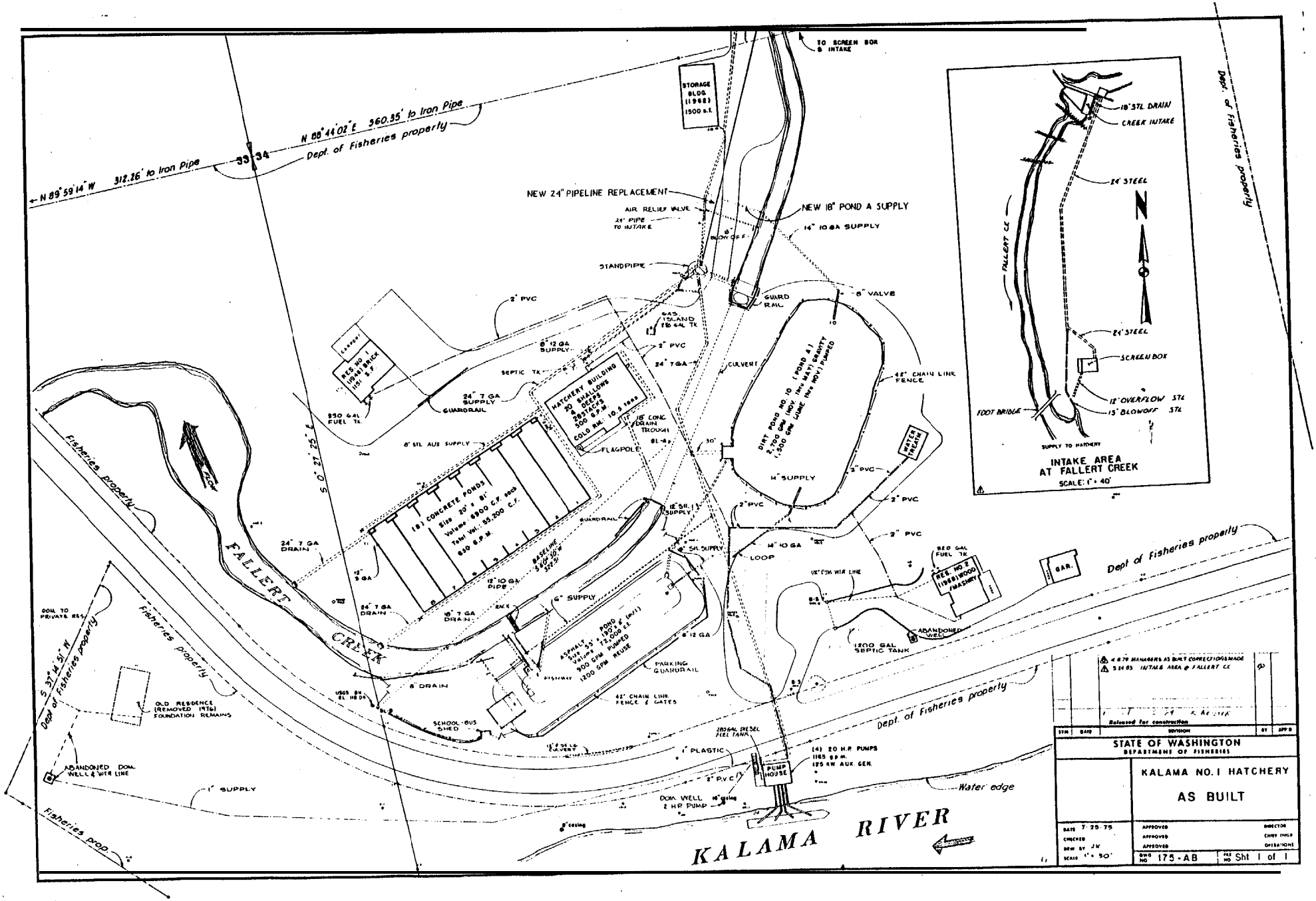
3. Lack of current, continuous tag data. Only marked fish are measured to determine mean length and coefficient of variation (CV).

4. Outlet structures on rearing ponds are not designed to allow volitional release.

5. There is no pollution abatement pond; effluent discharges into Fallert Creek. The hatchery has been in violation of water quality standards during pond drawdowns. Funds are not currently available for construction of an abatement pond.

6. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.

7. A comprehensive basin-wide production plan has not been completed at this time.


← N 89°59'14" W 312.26' to Iron Pipe
33 34
N 88°44'02" E 360.35' to Iron Pipe
Dept. of Fisheries property
TO SCREEN BOX & INTAKE
STORAGE BLDG (1968) 1500 s.f.
NEW 24" PIPELINE REPLACEMENT
AIR RELIEF VALVE
24' PIPE TO INTAKE
8" BLOW OFF
NEW 18" POND A SUPPLY
14" 10 GA SUPPLY
STANDPIPE
GUARD RAIL
6" VALVE
2" PVC
6" 12 GA SUPPLY
GAS ISLAND 750 GAL TK
2" PVC
24" 7 GA
CULVERT
48" CHAIN LINK FENCE
CARPORT
RES NO 1 (1948) BRICK 1151 s.f.
SEPTIC TK
24" 7 GA SUPPLY
GUARDRAIL
HATCHERY BUILDING 20 SHALLOWS 4 DEEPS 300 G.P.M. COLD RM. 10 x 10 ft
18" CONC DRAIN TROUGH
8L-4
FLAGPOLE
DIRT POND NO. 10 (POND A) 2,720 GPM INCW (NPW MAIN) GRAVITY (1,500 GPM LUMIE INCW PUMP) PUMPED
WATER HEATER
14" SUPPLY
2" PVC
2" PVC
2" PVC
8" STL AUX SUPPLY
(8) CONCRETE PONDS Size 20' x 81' Volume 6900 C.F. each Total Vol.: 55,200 C.F. 850 G.P.M.
24" 7 GA DRAIN
12" 9 GA
12" 10 GA PIPE
BASELINE S 0° 27' 25" E 349.91'
18" STL SUPPLY
GUARDRAIL
8" SUPPLY
14" 10 GA
LOOP
950 GAL FUEL TK
RES NO 2 (1968) WOOD MASONRY
GAR.
Dept of Fisheries property
DOM TO PRIVATE RES
S 37°44'51" W
Fisheries property
24" 7 GA DRAIN
18" 7 GA DRAIN
RACK
6" SUPPLY
ASPHALT 35' x 190' Sub Volume 175,000 C.F. 900 GPM PUMPED 1200 GPM REUSE
PARKING GUARDRAIL
8" 12 GA
FISHWAY
42" CHAIN LINK FENCE & GATES
OLD RESIDENCE (REMOVED 1976) FOUNDATION REMAINS
SCHOOL BUS SHED
1200 GAL SEPTIC TANK
ABANDONED WELL
Dept of Fisheries property
ABANDONED DOM. WELL & WIR LINE
1" SUPPLY
Fisheries prop.
1" PLASTIC
2" P.V.C.
PUMP HOUSE
(4) 20 H.P. PUMPS 1185 g.p.m. 175 kW AUX GEN
DOM. WELL 16" casing 2 H.P. PUMP
6" casing
Water edge
KALAMA RIVER
FALLERT CREEK
FLOW
Fisheries property
Dept. of Fisheries property
18" STL DRAIN
CREEK INTAKE
24' STEEL
N
FALLERT CK
24' STEEL
SCREEN BOX
12" OVERFLOW STL
15" BLOWOFF STL
FOOT BRIDGE
SUPPLY TO HATCHERY
INTAKE AREA AT FALLERT CREEK
SCALE: 1" = 40'
4-6-79 MANAGERS AS BUILT CORRECTIONS MADE
5-24-85 INTAKE AREA @ FALLERT CK
Released for construction
STATE OF WASHINGTON
DEPARTMENT OF FISHERIES
KALAMA NO. 1 HATCHERY
AS BUILT
DATE 7-25-75
CHECKED
DRW BY JK
SCALE 1" = 50'
APPROVED
APPROVED
APPROVED
DIRECTOR
CHIEF ENGR OPERATIONS
DWG NO 175-AB
SHT NO Sht 1 of 1

Lyons Ferry Hatchery and Satellites

(Tucannon Hatchery and Curl Lake, Cottonwood, and Dayton Rearing Ponds)

INTRODUCTION

Lyons Ferry Hatchery is located on the Snake River above Lower Monumental Dam near Starbuck, Washington. Site elevation is 526 feet above sea level. The WDFW hatchery is staffed with 6.5 FTE's. Rearing facilities at Lyons Ferry Hatchery include 19 raceways, 3 earthen rearing ponds, adult holding ponds, and a hatchery building with 60 troughs. Water rights total 53,200 gpm from wells. A constant 22,100 gpm is available for use at the WDFW hatchery.

Four satellite facilities are operated as part of the Lyons Ferry Hatchery complex: Tucannon Hatchery, Curl Lake Rearing Pond, Cottonwood Rearing Pond and Dayton Rearing Pond. Tucannon Hatchery is located on the Tucannon River, 2 miles east of Dayton, Washington. This hatchery rears resident rainbow trout.

Cottonwood Rearing Pond is located at river mile 28 on the Grande Ronde River. This 1.25-acre pond was constructed in 1984. Water rights total 2,693 gpm from Cottonwood Creek and ranges from 2,693 gpm in March to 1,795 gpm in May.

Curl Lake Rearing Pond is located on the Tucannon River. This 2.8-acre pond was constructed in 1984. Water rights total 2,693 gpm from the Tucannon River, but up to 4,488 gpm have been used.

Dayton Rearing Pond is located on the Touchet River (Walla Walla River tributary) in Dayton, Washington. This O.&acre pond began operation 1987. Water rights total 2,693 gpm from the Touchet River, which is the amount used.

Rearing Facilities at Lyons Ferry Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
P-acre Ponds	1,100	78	7.2	618,000	3	1,854,000	Earth/Concrete	13	Good	
Adult Raceways	84.4	10	5	4,221	3	12,663	Concrete	13	Good	
Buckets					192		Plastic	13	Good	
intermediate Rwys	27.6	3.8	2	211	4	844	Concrete	13	Good	
Production Rwys	88.5	9.7	3.3	2,873	19	54,587	Concrete	13	Good	
Troughs	14.4	1	.5	7	88	634	Concrete	13	Good	

PURPOSE

Lyons Ferry Hatchery was built by the U.S. Army Corps of Engineers in 1982 as part of the Lower Snake River Compensation Program-a program to mitigate for fishery losses caused by the four dams constructed on the lower Snake River. The USFWS provides operating funds to the hatchery, while WDFW operates the facility. Lyons Ferry is used for rearing rainbow trout and for adult collection, egg incubation and rearing of summer steelhead. The satellite facilities are used to acclimate pre-smolts to the parent river water for several weeks prior to their release.

GOALS

Surnmer Steelhead: Produce fish for sport and tribal fisheries while providing adequate escapement for hatchery production.

Rainbow Trout: Produce fish for sport fisheries.

OBJECTIVES

Objective 1: Hatchery Production

Surnmer Steelhead
Produce 875,000 summer steelhead smolts for on-station release and for release from satellite facilities.

Rainbow Trout
Produce 253,000 legal-sized fish and 200,000 sub-legal fish for release into numerous lakes, ponds and streams.

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 steelhead producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the current hatchery practices used at this facility. Only practices associated with anadromous fish production are summarized in this portion of the report.

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Lyons Ferry Hatchery is to collect enough adults to maintain the hatchery production program. Hatchery steelhead enter the hatchery trap from August through mid-December with a peak in late September. Fish are spawned from late January through mid-March with over 90 percent of the spawning completed by early March.

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

Rearing and Release Strategies-Overview

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions.

Size at Release: One important strategy for minimizing interactions is to ensure that all fish are released so they will promptly migrate from the subbasin. To accomplish this, fish should be released at a size and condition factor to indicate a smolt condition. For steelhead, a release size of 4.0-8.0 fish per pound with a condition factor of less than 1.0 is considered appropriate. For cutthroat, the release size should be between 3.5 and 5 fish/pound with a condition factor of less than 1.0.

Time of Release: Smolts should be released between April 15 and May 15, the time period that research has indicated that optimum returns be expected.

Acclimation: Acclimating smolts to the parent stream water prior to their release can help reduce straying when they return as adults as well as increase survival to adulthood. Acclimation periods from 4 to 6 weeks are required to get maximum benefits from this technique. Current investigations are underway to more closely define these requirements.

Volitional Release: The use of volitional release ensures that only actively migrating fish are released from the hatchery pond. The removal of the migrating fish also benefits the remaining population by allowing them more time to feed, reducing the stress on the remaining population by reducing loadings, and may decrease the likelihood of disease occurrence during final rearing.

Marking Programs: All hatchery smolts stocked in systems where they will co-mingle as adults with an under-escaped wild run are marked with an adipose clip to allow for selective fishery regulations.

Rearing and Release Strategies-Lyons Ferry Hatchery

The specific fish rearing and release strategies currently used at this hatchery are detailed below.

Summer Steelhead: The current strategy is to rear 70,000 summer steelhead smolts to a size of 4-8 fish/pound and release on-station between April 15 and May 15. The remaining fish are released off-station at the following sites:

Tucannon River	80,000
Walla Walla River	200,000
Mill Creek	30,000
Wildcat Creek	50,000

In addition, satellite facilities are used to acclimate smolts for a period of two months prior to release. The fish releases from these acclimation sites are as follows:

Curl Lake Rearing Pond	120,000
Dayton Pond	150,000
Cottonwood Pond	175,000

All fish are marked prior to release.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

Adult summer steelhead are collected from August through mid-November and spawned between February and early March. Two and sometimes three stocks are used-Lyons Ferry, Wallowa and Oxbow. Lyons Ferry broodstock is collected at the hatchery while Wallowa is collected on the Grande Ronde. Oxbow fish originate from the Touchet/Walla Walla system. Progeny from the above are returned to the system of origin.

Spawning Protocol

The intent is to utilize a spawning population of at least 200 adults and spawn fish at a 1:1 male-to-female ratio. Most egg-takes are used in hatchery production.

Acceptable Stocks

Importing eggs from other facilities with acceptable stocks is occasionally done in emergencies when disease epizootics occur. Other stocks used include Pahsimeroi and Wells. Although these latter stocks are less desirable than Lyons Ferry and Wallowa, they are upper Columbia River and Snake River stocks.

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-AN Stocks

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will survive well and contribute to the sport fishery. The fish health programs also seek to prevent the introduction, amplification or spread of certain fish pathogens detrimental to hatchery or wild fish.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. The standard elements of these programs are outlined below.

Disease Control

- Necropsies of diseased and dead fish are conducted to diagnose the cause of loss.

- Appropriate treatments are prescribed.

- A disease control policy is used to determine how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention

- Disease preventative strategies have been implemented, including the use of quality feeds and rearing fish in environmental conditions appropriate to avoid disease events. In addition, antibiotics may be used prophylactically to avoid disease problems.

- A disease prevention policy has been implemented which restricts the introduction of stocks into a facility which may result in the introduction of a new pathogen.

- Sanitation procedures are used which prevent introduction of pathogens into or within a facility.

- Applied research is conducted on new and existing disease prevention techniques.

Fish Health Activities at Lyons Ferry Hatchery

Health Monitoring

- At spawning, a minimum of 60 ovarian fluids, 60 milts and 60 kidney/spleens are examined for viral pathogens from each fish lot.

- Prior to transfer or release, fish are given a health exam.

- Whenever abnormal behavior or mortality is observed, the fish health specialist examines the affected fish, makes a diagnosis and recommends the appropriate treatment.

- Reporting and control of selected fish pathogens are done in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Fish and eggs are moved in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor (100 ppm for 60 minutes) as a bacterial and viral disinfectant.

- Juvenile fish are administered antibiotics orally when needed to control bacterial infections.

- Formalin (37% formaldehyde) is dispensed into water for control of ecto-parasites on juvenile fish and for fungus control on eggs.

- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

- All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish / egg lots.

- Different fish / egg lots are physically isolated from each other by separate ponds or incubation units. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.

- Tank trucks are disinfected between the hauling of adult and juvenile fish.

- Foot baths containing disinfectant are strategically located on the hatchery grounds to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Environmental monitoring is conducted at WDFW facilities to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples.
- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples.
- *In-hatchery* Wafer Temperatures-daily maximum and minimum readings.

Objective 6: Communicate effectively with other steelhead producers and managers.

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): 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, federal 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,

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Eauilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS-LYONS FERRY HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Averaue	Ranae	Constraints
Adult Capture	STS	2,000	2,107	1,081-2,527	
Adult Prespawning Survival	STS	--	89.9%	84-96%	
Egg-take	STS	2,400,000	1,389,500	1.3-1.5 million	
Green Egg-to-Fly Survival	STS	90%	75.3%	57.4-87.8%	1
Fry-to-Smelt Survival	STS	90%	91.8%	86.5-95.1%	2
Fish Releases	STS	875,000	837,782	61 OK-970K	
Egg Transfers	STS	0	--[1]	--[1]	
Fish Transfers	STS	0	--[1]	--[1]	
Adults Back to River	STS	--	978	500-l ,400	
Percent Survival	STS	--	0.5%	0.05-l .03%	3

Objective 2

Measures	Species	Hatchery Goal	5-Year Averaae	Ranae	Constraints
Volitional Release	STS	Yes	Yes	--	
Proper Release Size	STS	Yes	Yes	--	
Proper Release Time	STS	*Yes*	*Yes*	--	

N/A=Not applicable.
[1] Not estimated for this report.

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	STS	Yes	Yes	–	
Spawning Pop. >200	STS	Yes	Yes	--	
Spawning Ratio Male:Female	STS	1:1	2.1:1	2.03:1 - 2.18:1	4
Acceptable Stocks	STS	Yes	Yes	–	

Objective 4

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

History of Reportable Pathogens-1990-1995

Species/Stock	Water Supply Inc.	Rear.	Virus	BKD	Furunc./ ERM	Other/Comments
Lyons Ferry Hatchery	G	G				
STS/ Lyons Ferry			IHN			
Cottonwood RP	N/A	SA				
STS/Cottonwood Cr			IHN			
Davton RP	N/A	SA				
STS/Lyons Ferry						
Tucannon Hatchery	G	G,SA				
STS/Tucannon R			IHN			
Curt Lake RP	N/A	SA				
STS/Lyons Ferry						

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Ranae	Constraints
TSS Effluent	All	5 mg/L	N/A	N/A	
Settleable Solids	All	0.1 ml/L	N/A	N/A	
In-hatchery Water Temperatures	All	50-56°F	N/A	N/A	

Objective 6

Measures	Species	Hatchery Goal	5-Year Average	Ranae	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	Yes		
Develop and Review Equil. Brood Doc.	All	Yes	No	--	
Develop and Review Future Brood Doc.	All	Yes	No		
Develop and Review Current Brood Doc.	All	Yes	No		

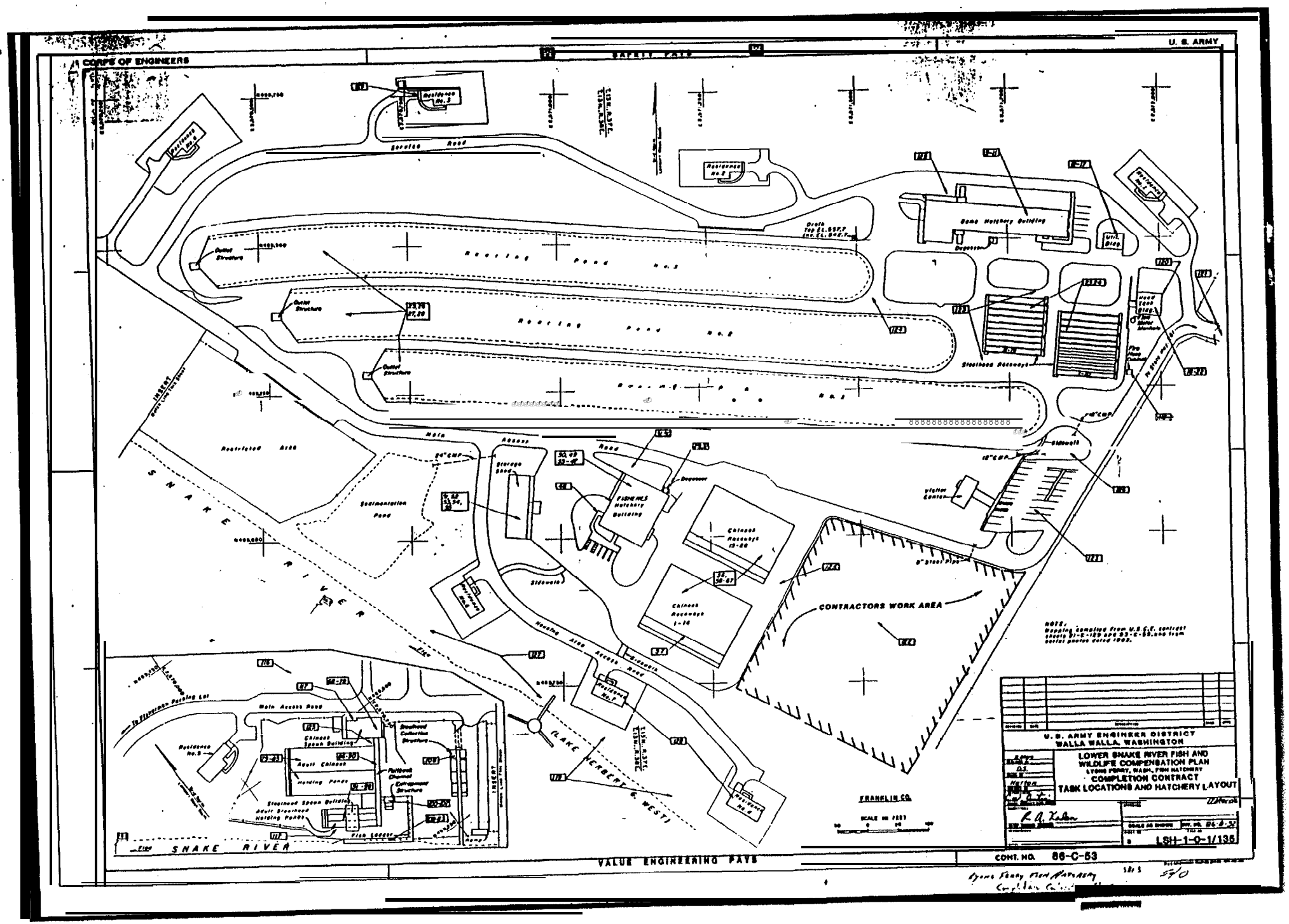
Constraints/Comments-Lyons Ferry Hatchery

1. The IHN virus is sometimes found in the broodstock, resulting in the destruction of eggs.

2. The IHN virus is sometimes found in fingerlings, resulting in the destruction of fish. This makes the fingerling-to-smolt survival difficult to estimate.

3. The percent survival estimate does not include naturally spawning fish.

4. Many males produce inadequate sperm so additional males are used.


CORPS OF ENGINEERS
U. S. ARMY
SAFETY PATH
Service Road
Residence No. 3
Residence No. 2
Residence No. 1
Boat Hatchery Building
Unit. Bldg.
Outlet Structure
Rearing Pond No. 2
Rearing Pond No. 3
Stockpond Raceways
Main Access
Restricted Area
Sedimentation Pond
Storage Shed
FISHERIES Hatchery Building
Chinook Raceways 13-20
Chinook Raceways 1-12
Visitor Center
Sidewalk
CONTRACTORS WORK AREA
Housing Area Access Road
Residence No. 5
Residence No. 4
SNAKE RIVER
LAKE HERBERT G. WEST
To Hatchery Parking Lot
Main Access Road
Chinook Spawn Building
Adult Chinook
Holding Ponds
Steelhead Collection Structure
Fishway Channel
Entrapment Structure
Steelhead Spawn Building
Adult Steelhead Holding Ponds
Fish Ladder
Intake
Ponds
FRANKLIN CO.
SCALE IN FEET
U.S. ARMY ENGINEER DISTRICT
WALLA WALLA, WASHINGTON
LOWER SNAKE RIVER FISH AND WILDLIFE COMPENSATION PLAN
LYONS FERRY, WASH., FISH HATCHERY
COMPLETION CONTRACT
TASK LOCATIONS AND HATCHERY LAYOUT
LSH-1-0-1/136
CONT. NO. 86-C-53
VALUE ENGINEERING PAYS

Lyons Ferry Salmon Hatchery

INTRODUCTION

Lyons Ferry Salmon Hatchery is located downstream of the confluence of the Palouse and Snake rivers, about 7 miles west of Starbuck, Washington. This facility is part of a complex which rears trout and steelhead in one portion of the hatchery complex. The spring chinook acclimation pond and adult trap at Tucannon Hatchery is operated as a satellite facility. The hatchery is staffed with 6.5 FTE's.

Rearing units at the salmon hatchery consist of 28 raceways and 4 rearing ponds. The raceways were not designed to allow direct release of fish into the Snake River. Therefore, smolts must be pumped to either the river or barges which transport them downriver.

Water rights total 53,200 gpm from wells. Water temperatures range from 52°-54°F. No river water is currently being utilized.

On June 27, 1991 the National Marine Fisheries Service proposed a determination that Snake River spring and summer chinook salmon be included as a threatened species under the Endangered Species Act (ESA).

Rearing Facilities at Lyons Ferry Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Vertical Incubators					1,792		Fiberglass	12	Good	
Raceways	100	10	3	3,000	28	64,000	Concrete	12	Good	
Rearing Pond	150	40	5	30,000	2	60,000	Concrete	12	Good	

PURPOSE

The hatchery began operation in 1984. It was constructed under the Lower Snake River Compensation Program as partial mitigation for federal dams constructed on the lower Snake River. The facility is used for adult collection, egg incubation and rearing of fall chinook and spring chinook salmon.

GOALS

The original mitigation goal for the hatchery was 1,152 adult Tucannon spring chinook and 18,300 adult Snake River fall chinook salmon. Additional hatchery

goals are to 1) maintain genetic integrity of these stocks, 2) manage the hatchery operations in accordance with the listing of both stocks as "threatened" under the Endangered Species Act, 3) gather information on short- and long-term effects of hatchery supplementation on an indigenous wild salmon stock, and 4) minimize impacts on other fish stocks.

OBJECTIVES

Objective 1: Hatchery Production

Produce 800,000 yearling fall chinook for on-station release or transfer to and release from upriver acclimation facilities.

Produce 154,000 spring chinook (5,133 pounds) to be transferred to the Tucannon Hatchery for final rearing, acclimation and release.

(Note: Hatchery production objectives are subject to change under ESA considerations.)

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 salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Lyons Ferry Hatchery is to collect enough adults of the appropriate stock to maintain the hatchery production program while minimizing adverse impacts on wild or native populations. These stocks are listed as "threatened" under the Endangered Species Act.

Spring Chinook: Spring chinook from the Tucannon River are trapped at the Tucannon Hatchery throughout the run (mid-April to October). A maximum of 50 hatchery and 50 wild fish are used. The objectives are to 1) allow as many wild fish upstream for natural spawning as possible, and 2) ensure proportional genetic contribution from both wild and hatchery fish. Adults are transferred to Lyons Ferry Hatchery for holding and spawning.

Fall Chinook: Fall chinook adults either return to the hatchery or are trapped at Ice Harbor and Lower Granite dams. Only marked hatchery fish are trapped at the dams.

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 retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water 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 the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Spring Chinook: Rear 90,000 fish to a size of 30 fish / pound; transfer back to Tucannon Hatchery in November for final rearing and acclimation; volitionally release from the Tucannon acclimation pond in April at a size of 15 fish / pound. These activities are done in conformance with the ESA Salmon Recovery Plan and tribal agreements.

Fall Chinook: Rear 900,000 fish to a size of 10 fish / pound and release at the hatchery in April the following year. Fall chinook are reared on well water;

therefore, they are not acclimated to parent river water prior to release. Additional efforts are underway to provide acclimation facilities upstream of Lower Granite Dam for a portion of the production. These activities are done in conformance with the ESA Salmon Recovery Plan and tribal agreements.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection-All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained and appropriate stocks are utilized in the hatchery. Adults and "jacks" are collected in proportion to their prevalence in the run.

Spawning Protocol-Al Stocks

The intent of the spawning protocols used for fall and spring chinook is to maintain genetic diversity of these stocks. Male to female spawning ratios will always be 1:1 for each spawning. In cases where sex ratios on a given spawning day are unequal, gametes will be split into subsets for cross-matings. The use of live-spawned males is a viable alternative as well. Prior to spawning, coded-wire tags are read to ensure that only parent stocks are used in matings. Eggs originating from non-Lyons Ferry fall chinook are shipped off-station for use in other Columbia River upriver bright fall chinook programs.

Acceptable Stocks

The stocks approved for release from Lyons Ferry and Tucannon hatcheries are listed below.

Fall Chinook
Snake River fall chinook (confirmed by CWT analysis)

Spring Chinook
Tucannon River spring chinook (confirmed by CWT analysis)

Monitoring

Tucannon River spring chinook salmon are a discrete, genetically isolated population within the Snake River Basin that has received limited, historical hatchery enhancement. Maintenance of the genetic integrity of wild spring chinook salmon stocks is a priority in the Tucannon River. Approximately 80 gene loci in the Tucannon River spring chinook salmon are currently being monitored through electrophoretic analysis. In addition, a four-year study was initiated in 1990 to determine if measurable genetic differences occur in incubation and rearing performance, and smolt-to-adult survival rates as a result of one generation of hatchery rearing.

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 WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW 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.
- Use a disease control policy 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 perform necropsies of clinically healthy 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 and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.

- 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) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Lyons Ferry Salmon Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each fish stock.

- At spawning, an Enzyme Link Immunosorbent Assay (ELISA) is conducted on kidney tissue samples from all spawned females. ELISA is used to detect the bacterium which causes kidney disease (*Renibacterium salmoninarum*). Progeny from females with similar ELISA levels are grouped and reared together to reduce the horizontal transmission of this disease.

- 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 observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

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

- At spawning, eggs are water-hardened in iodophor as a disinfectant.

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

- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

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

- Different fish / egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.

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

- Foot baths containing ivory soap are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. 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 parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.

- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.

- *Upstream and Downstream* Temperatures-twice per month, June through September.

- *Upstream and Downstream Dissolved Oxygen (DO)*—twice per month, June through September.

- *In-hatchery Wafer* Temperatures-maximum and minimum daily.

- *In-hatchery Dissolved* Oxygen-as required by steam flow or weather conditions.

- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water Temperatures*—continuous monitoring
- *Air* Temperatures-continuous monitoring
- *Influent/Effluent Dissolved* Oxygen-continuous monitoring
- *Influent pH/Conductivity*—continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

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 (MOT): 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, federal 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, Oregon Department of Fish and Wildlife, 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Equilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—LYONS FERRY SALMON HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	CHF	4,000	1,443	996-1,880	1
	CHS	100	105'	182-510	1
Adult Prespawning Survival	CHF	90%	84.8%	74.2-92.2%	1,2
	CHS	90%	88.5%	78.3-98.2%	1,2
Egg-take	CHF	3,530,000	2,896,854	2,182-3,522K	1
	CHS	136,000	139,653	91 K-168K	
Green Egg-to-Fry Survival	CHF	90%	91.9%	89.9-95.3%	
	CHS	90%	80.6%	60.6-97.0%	3
Fry-to-Smolt Survival	CHF	90%	91.0%[2]	81.8-95.2%	
	CHS	90%	95.0%[2]	92.4-96.4%	
Fish Releases	CHF	3,400,000	2,397,216	760-3,044K	1,3
	CHS	88,000	108.957	74-145K	1,3
Transfers to Co-ops (Eggs/Fish)	CHF	0	--	--	
	CHS	0	--	--	
Other Transfers (Eggs/Fish)	CHF	0	2,028,377[3]	--	
	CHS	0	--	--	
Adults Passed Upstream	CHF	0	0	0	
	CHS	--[4]	276	90-439	
Percent Survival	CHF	1.0%	0.23%	--	1
	CHS	2.5%	0.29%[5]	--	1

N/A=Not applicable.
[1] On average, an additional 276 adults are passed upstream every year.
[2] Average of four broods, 1987-1990. Fall chinook include both yearling and subyearling releases.
[3] Average of three broods. Includes eggs of non-Lyons Ferry origin adults and fry reared for other programs.
[4] By agreement, a minimum of 60% of the wild-origin fish will be passed upstream, or 1,052 total fish.
[5] 1986 brood year.

Objective 2

Measures	Species	Hatchery Goal 5-Year Averaae		Range	Constraints
Release smolts	CHF	**Yes**	9.8%	**7.3-12.0%**	4
CV<1 0%	CHS	Yes	11.1%	**6.5-I 3.6%**	4
Acclimation	CHF	Yes	No	–	5
	CHS	Yes	Yes	--	
Volitional Release	CHF	No	No	--	5
	CHS	Yes	Yes	--	5

Objective 3

Measures	Species	Hatcherv Goal 5-Year Averaae		Ranae	Constraints
Collect Adults	CHF	**Yes**	**Yes**	**Yes**	
Throughout Run	CHS	**Yes**	**Yes**	**Yes**	
Spawning Population	CHF	**Yes**	1,599	1,082-2,798	1,2
>500	CHS	Yes	78	180-327	
Spawning Ratio	CHF	1:1	0.70:1	0.4:1 - 0.9:1	3
Male:Female	CHS	1:1	0.90:1	0.7:1 - 1.2:1	3

Objective 4

Measures	Species	Hatcherv Goal S-Year Averaae		Ranse	Constraints
Adhere to	CHF	*Yes*	*Yes*	--	
Disease Policy	CHS	*Yes*	*Yes*	--	

History of Reportable Pathogens-1990-1995

Species/Stock	Water Supply Inc.	Rear.	Virus	BKD	Furunc./ ERM	Other/Comments
Lvons Ferrv Hatchery	*G*	*G*				
CHS/Tucannon R			IHN	+		BKD by ELISA of broodstock
CHF/Snake R			IHN	+		BKD by ELISA of broodstock
Tucannon Hatcherv	*G*	G,SA				
CHS/Tucannon R			IHN	+		BKD by ELISA of broodstock

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1 .O ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

Measures	Species	Hatchet-v Goal	5-Year Average	Ranae	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	_	6
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	7
Develop and Review Future Brood Doc.	All	Yes	Yes	_	6
Develop and Review Current Brood Doc.	All	Yes	Yes	--	6

Constraints/Comments-Lyons Ferry Salmon Hatchery

1. Low survival due to dam passage or water flow constraints. Higher mortality due to high water temperatures in the reservoirs or in the Tucannon River during adult migration period. High predation losses in the reservoirs. High harvest rate of Lyons Ferry fall chinook. Section 10 of the Endangered Species Act requires a permit to trap spring chinook, which constrains trapping these fish for broodstock.

2. High river temperatures during adult return increase both egg and adult mortalities. Hauling adults to the hatchery also increases stress-related mortalities.

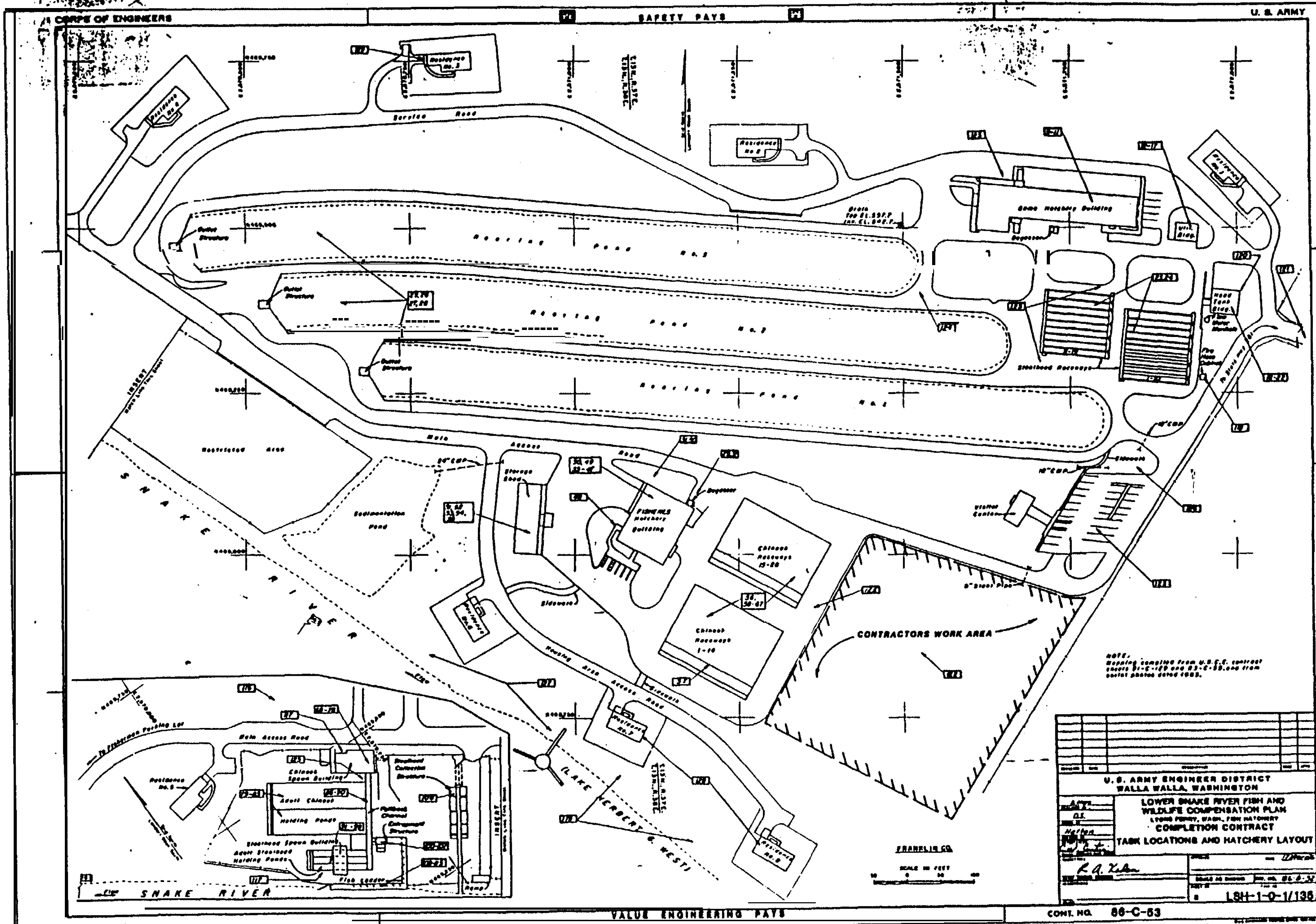
3. The spawning protocol requires that the origin of each fish be determined before eggs are fertilized. As a result, eggs are not fertilized immediately, which in warm temperature conditions can reduce egg and sperm viability. In addition, some egg lots are shipped to the hatchery prior to fertilization. Softshell disease causes higher mortalities. Warm temperatures during incubation accelerate development requiring fish to be held back during rearing. This can increase the susceptibility to some pathogens. Spawning protocol may eliminate candidate males for spawning (i.e., improper stock) and thus skew the sex ratio from 1:1.

4. Combining progeny of different egg-takes into single ponds increases size variation as does feeding fish at low rations.

5. At Lyons Ferry, the pond design does not allow for direct river release or the use of river water for acclimation. Volitional release may be truncated to coordinate fish outmigration with timing of water spills.

6. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.

7. A comprehensive basin-wide production plan has not been completed at this time.


CORPS OF ENGINEERS
SAFETY PAYS
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Game Hatchery Building
Rearing Pond No. 1
Rearing Pond No. 2
Rearing Pond No. 3
Outlet Structure
Steelhead Raceways
Restricted Area
Sedimentation Pond
Storage Shed
FISHERIES Hatchery Building
Chinook Raceways 15-28
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Visitor Center
Main Access Road
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COMPLETION CONTRACT
TASK LOCATIONS AND HATCHERY LAYOUT
LSH-1-0-1/136
VALUE ENGINEERING PAYS
CONT. NO. 86-C-53

Merwin Dam Hatchery

INTRODUCTION

Merwin Dam Hatchery is located on the North Fork Lewis River downstream of Merwin Dam near Ariel, Washington. The staffing level is 4.0 FTE's.

The facility consists of 10 standard raceways, 4 adult holding ponds, 4 rearing ponds and 2 smolt ponds for volitional outmigration to collection raceways, then trucking for release. The hatchery building contains 4 fry troughs, 6 intermediate raceways and 30 eight-tray-stack vertical flow incubators.

Water is supplied to the hatchery from Lake Merwin using a 5,000-gpm pump station on the dam face. Two intakes are used at depths of 15 and 110 feet. The intake used varies depending upon the time of year and water temperature needs of the hatchery. Water entering the adult holding ponds, incubators, fry troughs and intermediate raceways is disinfected with an ozone system. In addition, ozone disinfection of all water to the fingerling raceways and rearing ponds is available from June 1 through the end of September.

Rearing Facilities at Merwin Dam Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Deep Troughs				21	4	84	Concrete	5	Good	
Raceways				1,871	10	18,710	Concrete	5	Good	
Raceways				353	8	2,118	Concrete	5	Good	
Rearing Ponds				1,364	2	2,728	Concrete	5	Good	
Rearing Ponds				46,918	4	187,672	Concrete	5	Good	
Holding Ponds				1,011	4	4,044	Concrete	5	Good	

PURPOSE

Merwin Dam Hatchery began operating in 1993. It was constructed by PacifiCorp to mitigate for losses of resident and anadromous trout resulting from construction and operation of the Merwin Project on the North Fork Lewis River. The facility is also used for rearing resident and anadromous trout. Steelhead and sea-run cutthroat are released in the Lewis River. Rainbow trout are used for lake management programs. PacifiCorp funds the hatchery operation and maintenance.

GOALS

Produce winter and summer steelhead, sea-run cutthroat trout and rainbow trout for harvest by sport anglers while providing adequate escapement for hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Winter Steelhead
Produce 125,000 smolts for release in the Lewis River.

Summer Steelhead
Produce 125,000 smolts for release in the Lewis River.

Sea-Run Cutthroat
Produce 25,000 smolts for release in the Lewis River.

Rainbow Trout
Produce 1,000,000 fingerlings for release into area lakes. (This number is subject to review and change.)

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 steelhead producers and managers in the Columbia River Basin.

PLANNED PRACTICES TO ACHIEVE OBJECTIVES

The sections that follow describe the hatchery practices used at this facility. Only practices associated with anadromous fish production are summarized in this portion of the report.

Objective 1: Hatchery Production

Adult Collection

Adult steelhead and sea-run cutthroat trout (if available) broodstock are collected at Merwm Dam, Merwin Hatchery and at the Lewis River Salmon Hatchery located 4 miles downstream. Fish are held at Merwin Hatchery for spawning.

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

Rearing and Release Strategies-Overview

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions.

Size at Release: One important strategy for minimizing interactions is to ensure that all fish are released so they will promptly migrate from the subbasin. To accomplish this, fish should be released at a size and condition factor to indicate a smolt condition. For steelhead, a release size of 4.0-8.0 fish per pound with a condition factor of less than 1.0 is considered appropriate. For cutthroat, the release size should be between 3.5 and 5 fish/pound with a condition factor of less than 1.0.

Time of Release: Smolts should be released between April 15 and May 15, the time period that research has indicated that optimum returns be expected.

Acclimation: Acclimating smolts to the parent stream water prior to their release can help reduce straying when they return as adults as well as increase survival to adulthood. Acclimation periods from 4 to 6 weeks are required to get maximum benefits from this technique. Current investigations are underway to more closely define these requirements.

Volitional Release: The use of volitional release ensures that only actively migrating fish are released from the hatchery pond. The removal of the migrating fish also benefits the remaining population by allowing them more time to feed, reducing the stress on the remaining population by reducing loadings, and may decrease the likelihood of disease occurrence during final rearing.

Marking Programs: All hatchery smolts stocked in systems where they will co-mingle as adults with an under-escaped wild run are marked with an adipose clip to allow for selective fishery regulations.

Rearing and Release Strategies—Merwin Hatchery

The specific fish rearing and release strategies used at this hatchery are detailed below.

Winter Steelhead: Rear 125,000 smolts to a size of 6 fish / pound and release in the Lewis River between April 15 and May 15.

Summer Steelhead: Rear 125,000 smolts to a size of 6 fish / pound and release in the Lewis River between April 15 and May 15.

Sea-Run Cutthroat: Rear 25,000 smolts to a size of 4 fish / pound and release in the Lewis River between April 15 and May 15.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

Adults are collected at Merwin Dam and Lewis River Hatchery throughout the duration of the run. Fish are held at Merwin Hatchery for spawning.

Adult hatchery winter steelhead are collected and spawned from December through February. Early spawning fish are selected for hatchery broodstock so that spawning time of returning hatchery fish precedes wild fish. Approximately 80 percent of the winter steelhead spawning is completed by February 1, while a majority of wild fish spawn in April and May.

Sea-run cutthroat broodstock are also selected for early spawning fish, which will inhibit returning hatchery fish from crossbreeding with wild fish. However, in years of low return, nearly all fish are spawned.

Summer steelhead adults are collected at the Lewis River Hatchery trap and the fish trap located in Merwin Dam.

Spawning Protocol

Each of the three anadromous stocks is held in separate facilities at Merwin Hatchery. The intent is to utilize a spawning population of at least 200 adults. Eggs are held in the smallest possible lots until they have tested negative for IHN and other diseases.

Acceptable Stocks

Steelhead and sea-run cutthroat trout eggs are obtained from adults returning to the Lewis River at Merwin Dam and the Lewis River Hatchery. However, if adequate numbers of adults are not available, other lower Columbia River hatchery stocks of similar genetic lineage may be used.

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 WDFW hatcheries is to produce healthy smolts that will survive well and contribute to the sport fishery. The fish health programs also seek to prevent the introduction, amplification or spread of certain fish pathogens detrimental to hatchery or wild fish.

WDFW has implemented both disease control and disease prevention programs at all of its facilities to try and achieve these objectives. The standard elements of these programs are outlined below.

Disease Control

- Necropsies of diseased and dead fish are conducted to diagnose the cause of loss.
- Appropriate treatments are prescribed.
- A disease control policy is used to determine how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.

Disease Prevention

- Disease preventative strategies have been implemented, including the use of quality feeds and rearing fish in environmental conditions appropriate to avoid disease events. In addition, antibiotics may be used prophylactically to avoid disease problems.

- A disease prevention policy has been implemented which restricts the introduction of stocks into a facility which may result in the introduction of a new pathogen.

- Sanitation procedures are used which prevent introduction of pathogens into or within a facility.

- Applied research is conducted on new and existing disease prevention techniques.

Fish Health Activities at Merwin Hatchery

Under an agreement, disease control measures are being developed to 1) reduce fish disease outbreaks at Merwin Hatchery, and 2) minimize the discharge of pathogens into the Lewis River above the Lewis River Salmon Hatchery. The control measures include the following elements:

- A year-round supply of disinfected water will be available to the hatchery by disinfecting incoming reservoir waters. The hatchery design will provide disinfected water for all fish from June through December, and for eggs and fry from November through May.

- A system for treating all hatchery effluent water will be installed for use during an occurrence of an emergency or certifiable disease.

- The water supply to the broodstock holding ponds and egg incubation system will be isolated, and the effluent from these facilities will be treated continuously.

Health Monitoring

- Prior to release, fish are given a health exam.

- Whenever abnormal behavior or mortality is observed, the fish health specialist examines the affected fish, makes a diagnosis and recommends the appropriate treatment.

- Reporting and control of selected fish pathogens are done in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Fish are moved in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- Juvenile fish are administered antibiotics orally when needed to control bacterial infections.

- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All equipment (nets, tanks, boots, etc.) is disinfected with iodophor between different fish / egg lots.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Environmental monitoring is conducted at WDFW facilities to ensure that these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. Discharges from the cleaning treatment system are monitored as follows:

- *Total Suspended* Solids *(TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples when hatchery production exceeds 20,000 pounds of fish.

- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples.

Objective 6: Communicate effectively with other steelhead producers and managers.

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 Advisor-v 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 (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, federal 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Eauilibrium Brood Document for the Columbia River and / or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS-MERWIN HATCHERY

Objective 1

Measures	Species	Hatcher-v Goal	S-Year Average	Ranae	Constraints
Adult Capture	STW	200	N/A	N/A	
	STS	300	N/A	N/A	
	SCT	200	N/A	N/A	1
Adult Prespawning Survival	STW	75%	N/A	N/A	
	STS	75%	N/A	N/A	
	SCT	75%	N/A	N/A	
Egg-take	STW	165,000	N/A	N/A	
	STS	250,000	N/A	N/A	
	SCT	42,000	N/A	N/A	
Green Egg-to-Fry Survival	STW	72%	N/A	N/A	
	STS	72%	N/A	N/A	
	SCT	72%	N/A	N/A	
Fry-to-Smolt Survival	STW	83%	N/A	N/A	
	STS	03%	N/A	N/A	
	SCT	83%	N/A	N/A	
Fish Releases	STW	125,000	N/A	N/A	
	STS	125,000	N/A	N/A	
	SCT	25,000	N/A	N/A	
Egg Transfers	STW	0	N/A	N/A	
	STS	0	N/A	N/A	
	SCT	0	N/A	N/A	
Fish Transfers	STW	0	N/A	N/A	
	STS	0	N/A	N/A	
	SCT	0	N/A	N/A	
Adults Back to River	STW	--	N/A	N/A	
	STS	--	N/A	N/A	
	SCT	--	N/A	N/A	
Percent Survival	STW	--	N/A	N/A	
	STS	--	N/A	N/A	
	SCT	--	N/A	N/A	

N/A=Not applicable.

Objective 2

Measures	Species	Hatchet-v Goal	5-Year Average	Range	Constraints
Volitional Release	All	Yes	N/A	N/A	
Proper Release Size	All	Yes	N/A	N/A	
Proper Release Time	All	Yes	N/A	N/A	

Objective 3

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	STW	*Yes*	N/A	N/A	
	STS	*Yes*	N/A	N/A	
	SCT	*Yes*	N/A	N/A	
Spawning Pop. >200	STW	No	N/A	N/A	
	STS	No	N/A	N/A	
	SCT	No	N/A	N/A	
Spawning Ratio Male:Female	STW	1:1	N/A	N/A	
	STS	1:1	N/A	N/A	
	SCT	1:1	N/A	N/A	
Acceptable Stocks	STW	*Yes*	N/A	N/A	
	STS	*Yes*	N/A	N/A	
	SCT	*Yes*	N/A	N/A	

Objective 4

Measures	Species	Hatcherv Goal	5-Year Averaae	Range	Constraints
Adhere to Disease Policy	STW	Yes	N/A	N/A	
	STS	Yes	N/A	N/A	
	SCT	Yes	N/A	N/A	

History of Reportable Pathogens-7990-1995

Species/Stock	Water Supply Inc.	Rear.	Virus	BKD	Furunc./ ERM	Other/Comments
Merwin Hatchery	CS	CS,SA				
SCT/Cowlitz						
STS/Washougal R						
STW/Washougal/ELO			IHN			Returns to Merwin H.

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

Measures	Species	Hatchet-v Goal	5-Year Average	Range	Constraints
TSS Effluent	All	5 mg/L	N/A	N/A	
Settleable Solids	All	0.1 ml/L	N/A	N/A	
In-hatchery Water Temperatures	All	50-56°F	N/A	N/A	

Objective 6

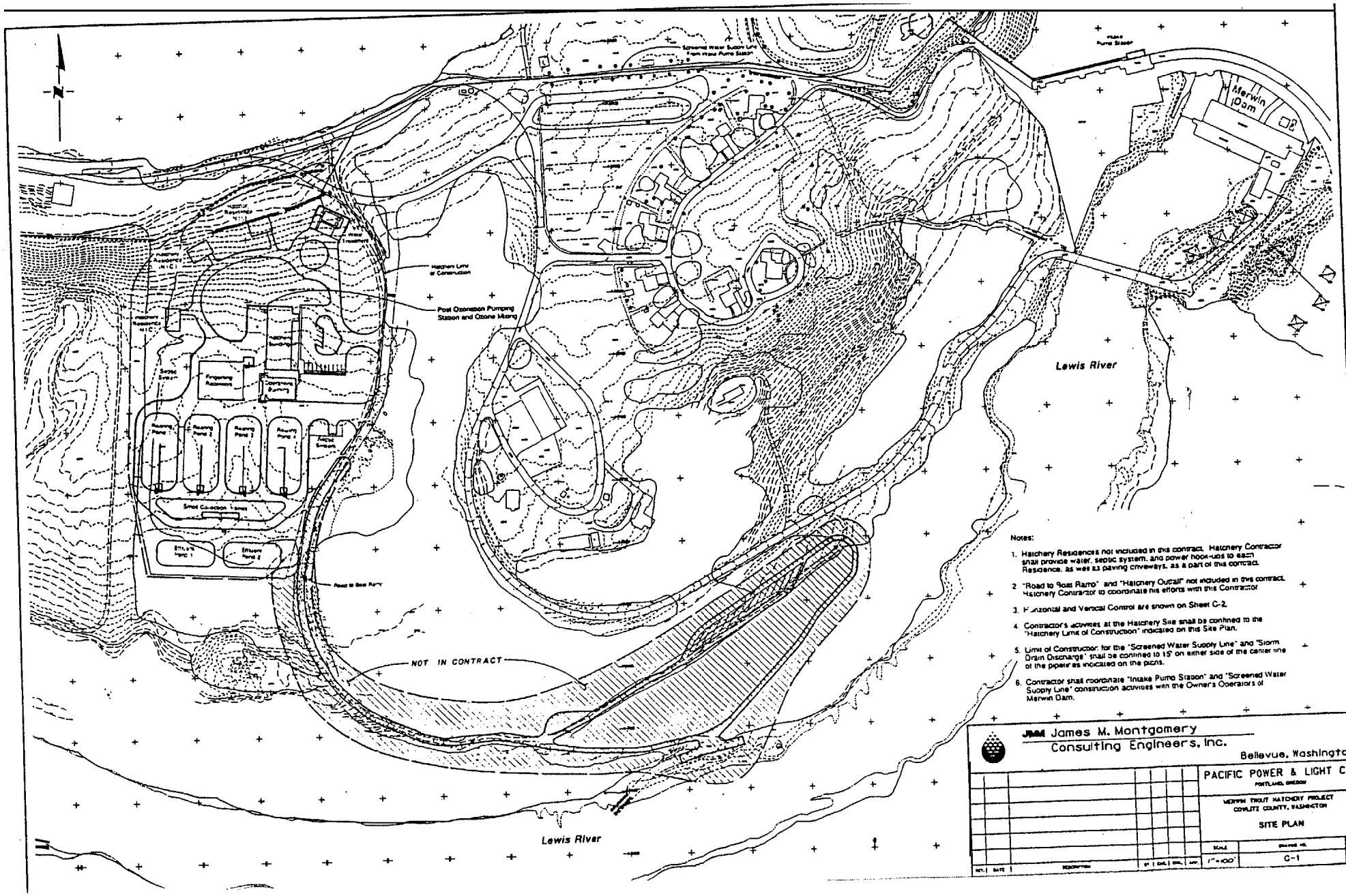
Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	N/A	N/A	
Develop and Review Equil. Brood Doc.	All	Yes	N/A	N/A	
Develop and Review Future Brood Doc.	All	Yes	N/A	N/A	
Develop and Review Current Brood Doc.	All	Yes	N/A	N/A	

Constraints/Comments-Merwin Hatchery

Constraints to reaching the hatchery goals will not be apparent until the hatchery is operated for at least five years.

1. None available.

2. Eggs are shipped in.



Notes:

1. Hatchery Residences not included in this contract. Hatchery Contractor shall provide water, septic system, and power hook-ups to each Residence, as well as paving driveways, as a part of this contract.
2. "Road to Boat Ramp" and "Hatchery Outfall" not included in this contract. Hatchery Contractor to coordinate his efforts with this Contractor.
3. Horizontal and Vertical Control are shown on Sheet C-2.
4. Contractor's activities at the Hatchery Site shall be confined to the "Hatchery Limit of Construction" indicated on this Site Plan.
5. Limit of Construction for the "Screened Water Supply Line" and "Storm Drain Discharge" shall be confined to 15' on either side of the center line of the pipelines indicated on the plans.
6. Contractor shall coordinate "Intake Pump Station" and "Screened Water Supply Line" construction activities with the Owner's Operators of Merwin Dam.

JMM James M. Montgomery
Consulting Engineers, Inc.
Bellevue, Washington

PACIFIC POWER & LIGHT CO.
PORTLAND, OREGON

MERWIN TROUT HATCHERY PROJECT
COWLITZ COUNTY, WASHINGTON

SITE PLAN

REV.	DATE	DESCRIPTION	BY	CHK.	APP.

SCALE	DRAWING NO.	REV.
1" = 100'	C-1	

Methow Salmon Hatchery and Satellites
(Twisp River and Chewuch River Acclimation Ponds)

INTRODUCTION

Methow Hatchery is located on the Methow River, 1 mile upstream from the confluence with the Chewuch River in Winthrop, Washington. It is also approximately 1 mile upstream of Winthrop National Fish Hatchery. Site elevation is 1,770 feet above sea level.

The facility is funded by Douglas County PUD and is staffed with 3.5 FTE's. The hatchery has satellite acclimation ponds and upstream migrant traps on the Twisp and Chewuch rivers.

Rearing units include 12 rearing ponds, 24 starter troughs, 3 adult ponds and 3 lined release ponds. The hatchery uses well water to incubate eggs, and well and river water for fish rearing.

Rearing Facilities at Methow Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Deep Trough				111	24	2,664	Concrete	5	Good	
Raceway				2,560	3	7,660	Concrete	5	Good	
Raceway				22,000	12	264,000	Concrete	5	Good	
Rearing Pond				24,750	1	24,750	Concrete	5	Good	
Rearing Pond				22,000	1	22,000	Asphalt	5	Good	Chewack Pond
Rearing Pond				27,000	1	27,000	Asphalt	5	Good	Twisp Pond

PURPOSE

Methow Hatchery began operating in 1992 to replace the fish killed by the Wells Project. The mitigation agreement requires that the hatchery production be consistent with guidelines and procedures developed under the Northwest Power Planning Council's Fish and Wildlife Program.

The central hatchery is used for adult holding, incubation, and rearing of three separate populations of spring chinook salmon. Each population is treated as a separate stock. Two of these stocks are eventually released via the off-station acclimation ponds. Adult fish are collected from the Twisp and Chewuch rivers, and transported to Methow where they are held and spawned. Following egg incubation

and early rearing, juvenile fish are transported to acclimation ponds at the parent river for final rearing and release.

GOALS

Increase the number of naturally spawning spring chinook salmon adults in the Methow, Twisp and Chewuch rivers.

OBJECTIVES

Objective 1: Hatchery Production

Produce up to 246,000 yearling spring chinook smolts for on-station release into the Methow River.

Produce up to 246,000 yearling spring chinook smolts for release into the Twisp River from the Twisp River acclimation pond.

Produce up to 246,000 yearling spring chinook smolts for release into the Chewuch River from the Chewuch River 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 salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production ---

Adult Collection

Methow Snrine Chinook: Adults return from May to August and spawn from August to September. Fish will be trapped at the Foghorn Diversion Dam.

Twisp Snrine Chinook: Adults return from May to August and spawn from August to September. Adults are collected via a Japanese-style weir. Adult collection protocols will be developed each year.

Chewuch Spring Chinook: Adults return from May to August and spawn from August to September. Adults will be collected at the Fulton Irrigation Diversion Dam ladder. Adult collection protocols will be developed each year.

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

Rearing and Release Strategies

The release strategies established for this hatchery are intended to acclimate and imprint the hatchery fish so that returning hatchery adults do not stray into the spawning areas of other distinct stocks. The release procedures are also intended to 1) imprint the fish so that returning hatchery adults spawn with the donor stock, and 2) minimize adverse interactions (i.e., competition for food and habitat) between hatchery releases and naturally produced fish. The specific rearing and release strategies are outlined below.

Methow Snrine Chinook: Rear fish to a size of 15 fish / pound; acclimate to the Methow River water for minimum of six week; volitionally release on-station in April-May.

Twisp Snrine Chinook: Incubate and provide early rearing at Methow Hatchery; transport to Twisp acclimation pond for final rearing; volitionally release into the Twisp River in April-May at a size of 15 fish / pound.

Chewuch Snrine Chinook: Incubate and provide early rearing at Methow Hatchery; transport to Chewuch acclimation pond for final rearing; volitionally release into the Chewuch River in April-May at a size of 15 fish / pound.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection *and Spawning*

Adults will be collected throughout the duration of the run, in as much as possible, to ensure representation from the entire population. For both the Twisp and Chewuch facilities, no more than 30 percent of salmon trapped should be retained for broodstock. This percentage may be adjusted in subsequent years, depending upon hatchery performance, estimates of run strength and broodstock collection efficiency.

The guidelines for mating Methow Complex spring chinook are as follows:

1. Matings will be single-pair, with individual family incubation and rearing for each population.

2. Live-spawn the males and mark them after their use.

3. Cryopreserve milt for successive years. Priority will be placed upon freezing gametes from age-5 males (identified by size).

These methods are used regardless of the number of fish collected for broodstock. A genetic monitoring program is underway to test whether the broodstock and mating procedures are conserving the genetic diversity of the donor stocks.

All salmon released from the Methow Fish Hatchery Complex will be marked (coded-wire tag and adipose clip). This mark is required for assessing survival rates, straying rates and for broodstock management. The tentative plan in ensuing years is to allow all marked salmon to pass upstream and spawn naturally. An external mark may be required to distinguish Methow Complex fish from those released from Winthrop NFH.

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 WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW 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.
- Use a disease control policy 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 perform necropsies of clinically healthy 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 and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.
- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
- 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) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Methow Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each fish lot.

- At spawning, an Enzyme Link Immunosorbent Assay (ELISA) is conducted on kidney tissue samples from each spawned female (Methow, Twisp and Chewuch spring chinook). ELISA is used to detect the bacterium which causes kidney disease (*Renibacterium salmoninarum*). Progeny from females with similar ELISA levels are grouped and reared together to reduce the horizontal transmission of this disease.

- 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 observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy. Fish and egg movements outside the subbasin are not appropriate for these facilities.

Therapeutic and Pronhylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.

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

- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

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

- Different fish / egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by separate rooms. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.

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

- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. 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 parameters are currently monitored at all WDFW hatcheries:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.

- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.

- *Upstream and* Downstream Temperatures-twice per month, June through September.

- *Upstream and Downstream Dissolved Oxygen (DO)*—twice per month, June through September.

- *In-hatchery* Water Temperatures-maximum and minimum daily.

- *In-hatchery Dissolved Oxygen*- a s required by steam flow or weather conditions.

- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent Water* Temperatures-continuous monitoring
- *Air* Temperatures-continuous monitoring
- *Influent/Effluent Dissolved* Oxygen-continuous monitoring
- *Influent pH/Conductivity*—continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

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 Advisor-y 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 Onerations 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, federal 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, Oregon Department of Fish and Wildlife, 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Eauilibrium Brood Document for the Columbia River and / or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—METHOW HATCHERY AND SATELLITES

Objective 1

Measures	Species	Hatchery Goal	B-Year Average	Range	Constraints
Adult Capture	Methow CHS	*238*	N/A	N/A	
	Twisp CHS	*238*	N/A	N/A	
	Chewuch CHS	*238*	N/A	N/A	
Adult Prespawning Survival'	Methow CHS	*80%*	N/A	N/A	
	Twisp CHS	*80%*	N/A	N/A	
	Chewuch CHS	*80%*	N/A	N/A	
Egg-take	Methow CHS	*350,000*	N/A	N/A	
	Twisp CHS	*350,000*	N/A	N/A	
	Chewuch CHS	*350,000*	N/A	N/A	
Green Egg-to-Fry Survival	Methow CHS	*85%*	N/A	N/A	
	Twisp CHS	*85%*	N/A	N/A	
	Chewuch CHS	*85%*	N/A	N/A	
Fry-to-Smolt Survival[1]	Methow CHS	*70%*	N/A	N/A	
	Twisp CHS	*70%*	N/A	N/A	
	Chewuch CHS	*70%*	N/A	N/A	
Fish Releases	Methow CHS	*246,000*	N/A	N/A	
	Twisp CHS	*246,000*	N/A	N/A	
	Chewuch CHS	*246,000*	N/A	N/A	
Transfers to Co-ops (Eggs/Fish)	Methow CHS	*0*	N/A	N/A	
	Twisp CHS	*0*	N/A	N/A	
	Chewuch CHS	*0*	N/A	N/A	
Other Transfers (Eggs/Fish)	Methow CHS	*0*	N/A	N/A	
	Twisp CHS	*0*	N/A	N/A	
	Chewuch CHS	*0*	N/A	N/A	
Adults Passed Upstream	Methow CHS	2/3 of run	N/A	N/A	
	Twisp CHS	2/3 of run	N/A	N/A	
	Chewuch CHS	2/3 of run	N/A	N/A	
Percent Survival	Methow CHS	1.0%	Unknown	Unknown	
	Twisp CHS	1.0%	Unknown	Unknown	
	Chewuch CHS	1.0%	Unknown	Unknown	

N/A=Not applicable.

[1] Goals are assigned by FERC agreement and do not reflect hatchery expectations.

Objective 2

Measures	Species	Hatchery Goal	8-Year Average	Range	Constraints
Release smolts CV<10%	Methow CHS	*Yes*	N/A	N/A	
	Twisp CHS	*Yes*	N/A	N/A	
	Chewuch CHS	*Yes*	N/A	N/A	
Acclimation	Methow CHS	Yes	N/A	N/A	
	Twisp CHS	Yes	N/A	N/A	
	Chewuch CHS	Yes	N/A	N/A	
Volitional Release	Methow CHS	Yes	N/A	N/A	
	Twisp CHS	Yes	N/A	N/A	
	Chewuch CHS	Yes	N/A	N/A	

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Methow CHS	Yes	N/A	N/A	
	Twisp CHS	Yes	N/A	N/A	
	Chewuch CHS	Yes	N/A	N/A	
Spawning Pop. >500	Methow CHS	Yes	N/A	N/A	
	Twisp CHS	Yes	N/A	N/A	
	Chewuch CHS	Yes	N/A	N/A	
Spawning Ratio Male:Female	Methow CHS	1:3[1]	N/A	N/A	
	Twisp CHS	1:3[1]	N/A	N/A	
	Chewuch CHS	1:3[1]	N/A	N/A	

Objective 4

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adhere to Disease Policy	Methow CHS	Yes	N/A	N/A	
	Twisp CHS	Yes	N/A	N/A	
	Chewuch CHS	Yes	N/A	N/A	

[1] Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

History of Reportable Pathogens-79904995

Species/Stock	Water Supply Inc.	Rear.	Virus	BKD	Furunc./ ERM	Other/Comments
Methow Hatchery	*G*	*SA*				
CHS/Methow R				+		
CHR/Wells						
CHS/Chewuch R				+		
CHS/Twisp R				+		
CHS/Leavenworth						
SOC/Okanogan				+		BKD by ELISA of broodstock

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

Objective 5

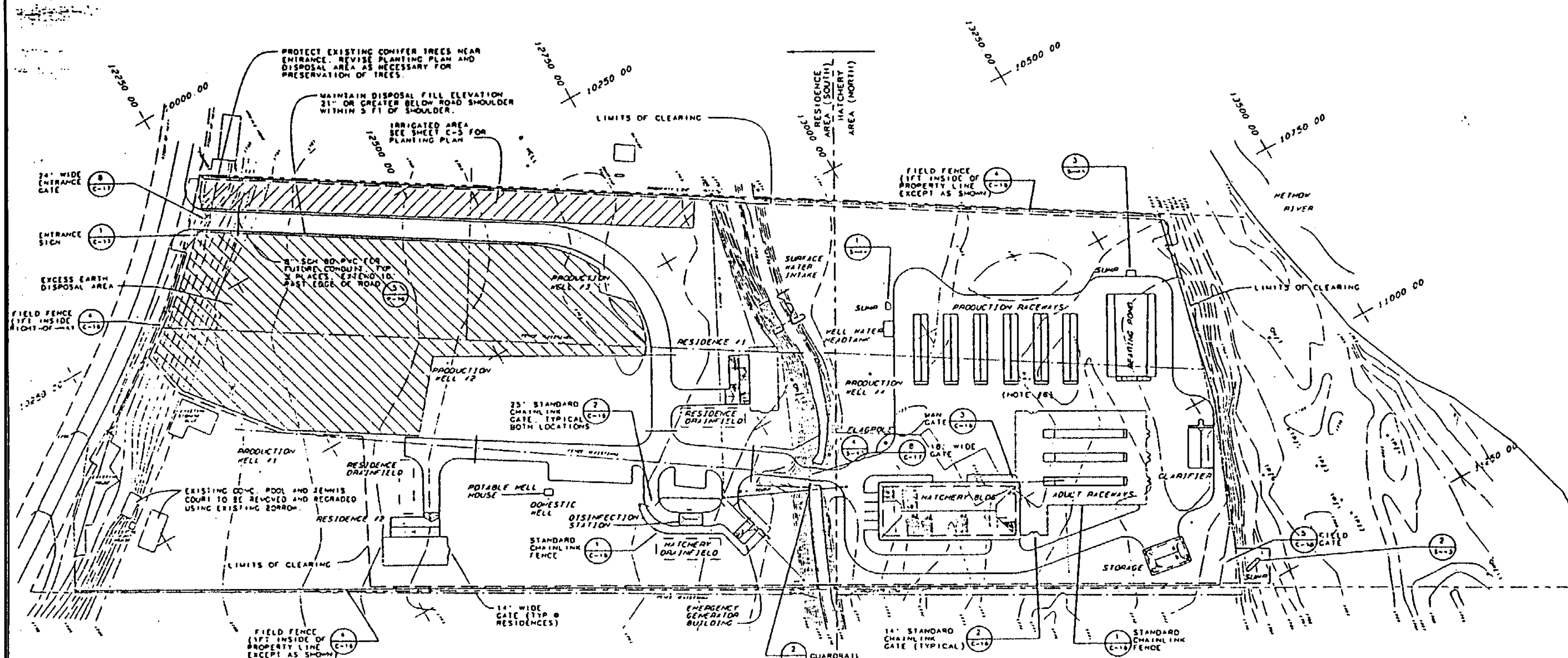
Measures	Species	Hatchery Goal	5-Year Averaae	Ranae	Constraints
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1 .O ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

Measures	Species	Hatchery Goal	5-Year Averase	Range	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	N/A	N/A	
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	N/A	N/A	
Develop and Review Future Brood Doc.	All	Yes	N/A	N/A	
Develop and Review Current Brood Doc.	All	Yes	N/A	N/A	

Constraints/Comments—Methow Hatchery and Satellites

1. A comprehensive basin-wide production plan has not been completed at this time.



SITE PLAN

SCALE: 1" = 60'

NOTES:

1. ALL OVERHEAD POWER POLES & LINES TO BE REMOVED.
2. CONTRACTOR IS RESPONSIBLE FOR ALL PERMITS FOR CONSTRUCTION NOT OBTAINED BY OWNER.
3. ALL DISTURBED AREAS SHALL BE REGRADED TO UNIFORM CONTOURS AS INDICATED AND SEEDED IN ACCORDANCE WITH THE SPECIFICATIONS.
4. REMOVE ALL COTTONWOOD TREES ON PROPERTY.
5. REMOVE ALL EXISTING WOODEN POSTS, FENCING, AND DEBRIS AND DISPOSE OF IN ACCORDANCE WITH THE SPECIFICATIONS.
6. ABANDON AND REMOVE OW #9 MINIMUM 10 FEET BELOW FINISHED GRADE.
7. EXCESS EARTH DISPOSAL AREA SHALL BE DEPOSITED AS A CONTROLLED FILL STARTING AT ROAD RIGHT OF WAY AND CONTINUING NORTH AS DIRECTED BY THE DISTRICT. DISPOSAL AREA SHALL BE MINIMIZED BY MAXIMIZING THE FILL PLACED ADJACENT TO THE ROAD EMBANKMENT. THE AREA SHALL BE GRADED TO ESTABLISH A NATURAL APPEARING AREA, SLOPING GRADUALLY NORTH, AVOIDING STEEP DROPS AND BLENDING IN WITH EXISTING SURFACES.

GENERAL NOTES:

1. Shown coordinates and existing contour information are based on boundary and topographic data provided by Douglas County PUD as prepared by Erlandsen & Associates, Brewster, Washington.
2. All geotechnical related design considerations are based on information contained in "Report, Geotechnical Engineering Services, Proposed Methow Basin Spring Chinook Enhancement Facilities, Winthrop, Washington" as prepared by GeoEngineers dated September 25, 1990.
3. The Contractor shall minimize his earthwork operations to no more than that required to meet the requirements of the Contract Documents.
4. No existing underground utilities are shown on the Drawings. It is the Contractor's responsibility to determine and verify the location of underground utilities and to protect all utilities not designated for removal. Any damage shall be repaired to the satisfaction of the District.
5. The Contractor is responsible for accepting and controlling all storm runoff and runoff from both on-site and off-site sources for the duration of the Contract.
6. The Contractor is responsible for furnishing, installing and maintaining all necessary measures to control erosion in full accordance with the Contract Documents and applicable local, state, and Federal regulations.
7. The Contractor shall develop and provide all measures required to safely control pedestrian and vehicular traffic in and around the project sites during the duration of the Contract.
8. The discharge of storm runoff, excess water from construction operations, and water from dewatering operations to irrigation ditches is not allowed. All discharges from the project sites shall be in full accordance with the Contract Documents and all local, state, and Federal regulations.

0 —— 1" — BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

PUBLIC UTILITY DISTRICT NO. 1
Douglas County, Washington

METHOW RIVER SPRING CHINOOK HATCHERY

HATCHERY SITE PLAN

FISHPRO, INC.

SHEET NO. C-1

North Toutle Salmon Hatchery

INTRODUCTION

The Toutle Hatchery site is located along the Green River about 23 miles east of Castle Rock, Washington. It is situated in a hilly location approximately 770 feet above sea level. The hatchery began operating in 1951 but was destroyed in the 1980 eruption of Mount St. Helens. Hatchery operations were reestablished in 1985.

Two large rearing ponds (Beaver Slough Rearing Ponds) near the hatchery site were only slightly damaged by the eruption. These ponds were cleaned and have been operating since 1985. Twenty-four raceways have been dredged out and placed into operation for rearing. The facility is currently staffed with 4.67 FTE's. Water rights for the Toutle Hatchery total 26,031 gpm from the Green River.

Rearing Facilities at North Toutle Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Raceways				3,650	14	51,100	Concrete		Good	
Rearing Pond				143,740	2	267,480	Asphalt	16	Good	
Rearing Pond				18,525	1	18,525	Dirt	16	Good	Adult Pond
Deep Troughs				31	31	961	Concrete		Fair	

PURPOSE

The hatchery was authorized under the Mitchell Act and began operation as part of the Columbia River Fisheries Development Program-a program to mitigate for fishery losses caused by hydroelectric system development. Funds for the program are administered by the National Marine Fisheries Service.

The facility is used for adult collection, limited incubation and rearing of tule fall chinook and early (Type-S) coho. The hatchery is currently operating at maximum production. Tule fall chinook stocks produced from Mitchell Act hatcheries are managed as species aggregates; therefore, adequate escapement of appropriate species / stocks for each hatchery's egg-take needs is not critical. Mitchell Act hatcheries with insufficient broodstock can receive eggs of appropriate species / stocks from any other Mitchell Act facility with surplus eggs

GOALS

Produce adult 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.

OBJECTIVES

Objective 1: Hatchery Production

Produce 2,500,000 subyearling tule fall chinook for on-station release.

Produce 1,100,000 yearling Type-S coho for on-station release.

Produce up to 500,000 spring chinook yearlings for on-station release

Produce up to 50,000 summer run steelhead yearlings 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 salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Toutle Hatchery is to collect as many adults as possible to maintain the hatchery program. Because tule stocks are not managed to provide adequate escapement to individual hatcheries, shortfalls are made up with imports from other facilities which have surplus eggs.

Tule Fall Chinook: Entry of adults into the subbasin occurs from late August to November. Spawning occurs from late September to November with a peak in October. Adults are captured at a temporary weir which diverts fish into the holding pond. Eggs are incubated on-site.

Type-S Coho: Entry of adults in the subbasin begins in early September and runs through November. Spawning peaks in October. Adults are diverted into the holding pond by a temporary weir. All incubation and rearing are performed on site.

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 retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water 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 the least amount of interaction with native populations. The specific rearing and release strategies used at this hatchery are outlined below.

Tule Fall Chinook: Rear 2,500,000 fish to a size of at least 80 fish / pound; release on-station (acclimated) in June.

Type-S Coho: Transfer 1,100,000 fingerlings, if necessary, from Grays River, Elokomin and Lewis River hatcheries in January; rear to a size of 17 fish / pound; release on-station (acclimated) in May.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection-All Stocks

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained.

Spawning Protocol-Ail Stocks

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. When spawning more than 1 million eggs in a day, the ratio will not be less than 1 male to 3 females, A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

The stocks approved for release from the Toutle Hatchery are listed below.

Tule Fall Chinook
Any tule stock

Type-S (Early) Coho
Toutle River Type-S

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 WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW 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.

- Use a disease control policy 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 perform necropsies of clinically healthy 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 and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.

- 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) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Tout/e Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens from each fish 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 observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.

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

- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon as needed. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

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

- Different fish/egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic

curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.

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

- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e, entrance to hatchery building) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. 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 parameters are currently monitored at this hatchery:

- Total Suspended *Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.

- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.

- *Upstream* and *Downstream* Temperatures-twice per month, June through September.

- *Upstream and Downsfream Dissolved Oxygen* (DO&-twice per month, June through September.

- *In-hatchery Wafer* Temperatures-maximum and minimum daily.

- *In-hatchery Dissolved* Oxygen-as required by steam flow or weather conditions.

- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent* Wafer *Temperatures*—continuous monitoring
- *Air* Temperatures-continuous monitoring
- *Influent/Effluent Dissolved* Oxygen-continuous monitoring
- *Influent pH/Conductivity*—continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

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, federal 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, Oregon Department of Fish and Wildlife, 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Eauilibrium Brood Document for the Columbia River and/or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS—TOUTLE HATCHERY

Objective 1

Measures	Species	Hatcherv Goal	5-Year Averaae	Ranae	Constraints
Adult Capture	CHF	1,524	297'	105-396	1
	Type-S COH	1,350	5,256'	2,745-9,874	1
Adult Prespawning Survival	CHF	90%	93.5%'	91.5-95.6%	
	Type-S COH	90%	99.3%'	99.0-99.5%	
Egg-take	CHF	2,875,000	433,325	184-712K	1
	Type-S COH	1,300,000	2,296,250	1,029-3,356K	1
Green Egg-to-Fry Survival	CHF	90%	N/A	N/A	2
	Type-S COH	90%	N/A	N/A	2
Fry-to-Smolt Su rvival	CHF	90%	98.8%	98.3-99.6%	
	Type-S COH	90%	99.2%	99.0-99.7%	
Fish Releases	CHF	2,500,000	3,364,800	2,387K-4,714K	
	Type-S COH	1,100,000	760,775'	740K-1,293K	1
Transfers to Co-ops (Eggs/Fry)	CHF	0	--	--	
	Type-S COH	0	--	--	
Other Transfers (Eggs/Fry)	CHF	0	--	--	
	Type-S COH	0	--	--	
Adults Passed Upstream	CHF	150	23'	8-43	1
	Type-S COH	1,300	4,117'	691-9,283	
Percent Survival	CHF	1.0%	Unknown	Unknown	3
	Type-S COH	2.5%	4.3%[3]	Unknown	3

N/A=Not applicable.
[1] Average of four broods, 1990-l 993.
[2] Based on average of four broods, 1987-1990.
[3] Average of three broods, 1986-l 988.

Objective 2

Measures	Species	Hatcherv Goal	5-Year Average	Range	Constraints
Release smolts	CHF	Yes	Unknown	Unknown	3
CV<10%	Type-S COH	Yes	Unknown	Unknown	3
Acclimation	CHF	Yes	Yes	–	
	Type-S COH	Yes	Yes	--	
Volitional Release	CHF	Yes	No	–	4
	Type-S COH	Yes	Partial	--	4

Objective 3

Measures	Species	Hatcher-v Goal	5-Year Averaae	Ranae	Constraints
Collect Adults	CHF	Yes	Yes	Yes	1
Throughout Run	Type-S COH	Yes	Yes	Yes	1
Spawning Pop.	CHF	Yes	No	No	1
>500	Type-S COH	Yes	Yes	Yes	
Spawning Ratio	CHF	1:3[1]	0.9:1[2]	0.8:1-1.0:1	
Male:Female	Type-S COH	1:3[1]	1.0:1[2]	0.8:1-1.2:1	1

Objective 4

Measures	Species	Hatcherv Goal	B-Year Average	Ranae	Constraints
Adhere to	CHF	Yes	Yes	--	
Disease Policy	Type-S COH	Yes	Yes	–	

[1] Spawning guidelines require a 1:1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.
[2] Average of four broods, 1990-93.

History of Reportable Pathogens-7990-1995

Species/Stock	Water Supply Inc.	Rear.	Virus	BKD	Furunc./ ERM	Other/Comments
N. Toutle Hatchery	SA	SA				
CHS/Cowlitz R			IHN	+		
CHF/Toutle R						
COH/Type-S				+		

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish-and Wildlife.)

Objective 5

Measures	Species	Hatchery Goal B-Year Averaae		Range	Constraints
TSS Effluent	All	5 mg/L	N/A	N/A	
TSS Max Effluent	All	15 mg/L	N/A	N/A	
SS Effluent	All	0.1 ml/L	N/A	N/A	
TSS PA Effluent	All	100 mg/L	N/A	N/A	
SS PA Effluent	All	1 .O ml/L	N/A	N/A	
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

Measures	Species	Hatchery Goal	5-Year Averaae	Ranae	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	_	5
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	_	6
Develop and Review Future Brood Doc.	All	**Yes**	**Yes**	**--**	
Develop and Review Current Brood Doc.	All	**Yes**	**Yes**	**--**	

Constraints/Comments-Tout/e Hatchery

1. Tule fall chinook and Type-S coho stocks are not managed for escapement to individual hatcheries. Lack of adequate broodstock is made up by importing eggs or fingerlings from other facilities which have a surplus. Low river flows during the spawning migration prevent the hatchery from obtaining sufficient broodstock during years when adequate fish numbers are present. Coho returning during high flow periods may be able to bypass the weir. The eruption of Mt. St. Helens severely damaged the river environment which may affect the survival of outmigrating juvenile fish. Harvest levels and migration obstacles may affect sex ratio of returning adults.

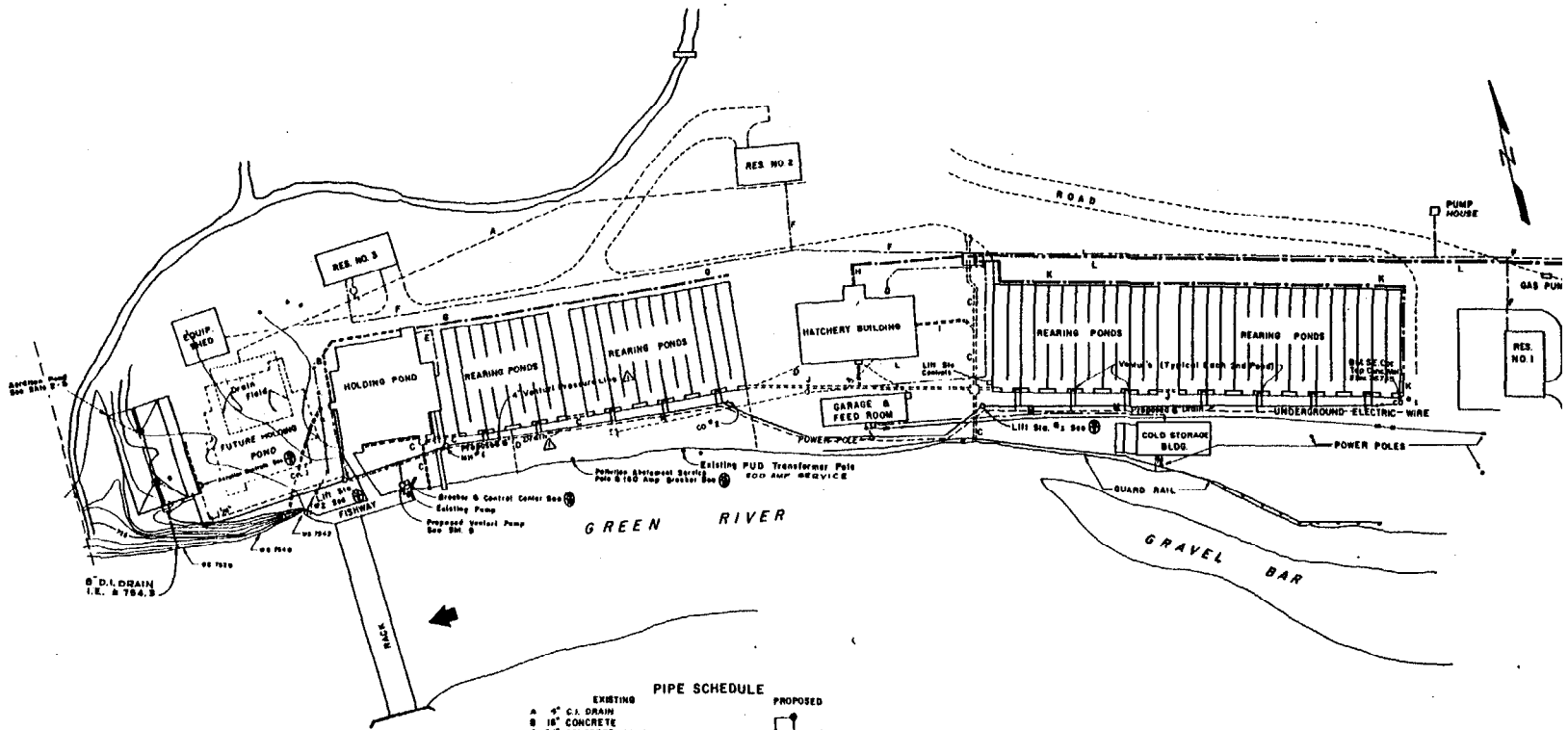
2. This facility has no electricity.

3. Lack of current, continuous tag data. Only marked fish are sampled for mean length and coefficient of variation (CV).

4. The time available to volitionally release coho is shorter than desired. Because river flows decline in June, chinook must be forced out of the pond to take advantage of the available flow.

5. Current hatchery system lacks the necessary infrastructure and mechanisms to ensure adequate monitoring and evaluation needed for efficient and effective hatchery rearing programs.

6. A comprehensive basin-wide production plan has not been completed at this time.



PIPE SCHEDULE

	EXISTING
A	4" C.I. DRAIN
B	18" CONCRETE
C	24" CONCRETE DRAIN
D	8" DRAIN
E	6" STEEL
F	3" DOMESTIC WATER SUPPLY
G	16" STEEL SUPPLY
H	10" STEEL SUPPLY
I	18" CONCRETE DRAIN
J	21" CONCRETE DRAIN
K	SUPPLY
L	26 5/8" STEEL SUPPLY
M	1 1/2" CL 160 PVC SUPPLY
N	DRAIN

PROPOSED

VENTURI LOCATIONS

REVISION

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES

TOUTLE HATCHERY
GENERAL PLAN
POLLUTION ABATEMEN
FACILITIES

DATE 9/15/71
CHECKED
DRW BY ABE-SS
SCALE 1"=40'
APPROVED
APPROVED
APPROVED
DWG NO 2077-1
SHT NO Sht 1 of 11

Priest Rapids Salmon Hatchery

INTRODUCTION

Priest Rapids Hatchery is located just below Priest Rapids Dam along the Columbia River. Elevation of the facility is 445 feet above sea level. It is funded by the Grant County PUD and is staffed with 5.25 FTE's.

The hatchery began operation in 1963 and was originally designed and constructed as a 1 mile-long spawning channel. The upper portion has since been converted into five large rearing ponds. The remainder of the channel is currently unused except for volunteer broodstock trapping and collection.

The facility rears only fall chinook. The rearing units consist of 6 rearing ponds and 12 vinyl raceways. Five of the rearing ponds are used only for smolt production. Two of the ponds are used for adult holding or fry rearing.

Water is supplied to the hatchery from the Columbia River and wells. The majority of the water is supplied by gravity flow from the Columbia River (44,883 gpm) with the wells supplying 8,000 gpm. Both river water and well water are used for adult holding, incubation and rearing.

Rearing Facilities at Priest Rapids Salmon Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (cu ft)	Number Units	Total Volume (cu ft)	Construction Material	Age	Condition	Comment
Vertical Incubators					1,280		Fiberglass	32	Fair	
Raceways	80	8	2.5	1,600	12	19,200	Steel/Vinyl	9	Good	
Rearing Ponds	250	30	3.5	26,250	6	157,500	Concrete	32	Good	Rearing/Adult Holding

PURPOSE

Priest Rapids Hatchery is operated as mitigation facility for fishery impacts caused by the Priest Rapids Project (i.e., Priest Rapids and Wanapum dams). It is used for adult collection, egg incubation, rearing and release of upriver bright (URB) fall chinook. The hatchery also supplies eggs to other hatcheries within the basin, and is therefore managed to allow for adequate escapement.

GOALS

The mitigation agreement with Grant County PUD requires an annual production level of 100,000 pounds of URB chinook, this is equal to the release of 5 million smolts at 50 fish / pound. An additional 1.7 million smolts are produced as part of John Day Mitigation.

OBJECTIVES

Objective 1: Hatchery Production

Produce 100,000 pounds of subyearling URB fall chinook for on-station release.

Provide URB chinook eggs (surplus to on-station needs) to other facilities which rear this 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 salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

The intent of the adult collection procedures at Priest Rapids Hatchery is to collect enough adults to maintain the hatchery production program. Surplus eggs are supplied to other hatcheries when available.

Adult URB fall chinook return to the hatchery from September 1 through November and are collected as volunteers to the channel. Adults are also collected from a trap at the dam ladder but these fish are usually surplus to the hatchery's on-station production needs. There is usually a sufficient number of eggs taken to meet the hatchery production goals and supply 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 retention time in downstream migration. Rearing on parent river water, or acclimation for several weeks to parent river water 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 the least amount of interaction with native populations.

Fall chinook is the only species reared at this facility. The goal is to rear fish to a size of 50 fish/pound, acclimate to parent river and release on-station in mid-June.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

Adults are collected throughout the entire run to ensure that the run timing for these stocks is maintained.

Spawning Protocol

The intent is to utilize a spawning population of at least 500 adults. When spawning fewer than 1 million eggs in a day, the male-to-female ratio will be 1:1 for all stocks. When spawning more than 1 million eggs in a day, the ratio will not be less than 1

male to 3 females. A portion of each day's egg-take is used for on-site hatchery production.

Acceptable Stocks

Importing eggs / fish from other facilities with acceptable stocks is done to achieve production goals while maintaining regional genetic integrity in times of inadequate hatchery returns. Eggs from hatchery-returning adults are always given priority for station use.

The stocks approved for release from the Priest Rapids Hatchery have been prioritized and are listed below. Stocks with the number 1 adjacent to their title are the most desirable. Stocks with higher numbers are considered to be progressively less well suited.

Fall Chinook
1 Priest Rapids fall chinook
2 Mainstem Columbia River upriver brights

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 WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

WDFW 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.
- Use a disease control policy 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 perform necropsies of clinically healthy 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 and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid a disease problem.

- Use a disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.

- 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) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. For example, the Density Index is used to estimate the maximum number of fish (of a given length) that can occupy a rearing unit based on the rearing unit's size. The Flow Index is used to estimate the rearing unit's carrying capacity based on water flows.

Fish Health Activities at Priest Rapids Hatchery

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot at the hatchery are given a health exam. The sample includes a minimum of ten fish per lot. Findings are reported on WDFW Form FH01.

- At spawning, a minimum of 60 ovarian fluids and 60 kidney/spleens are examined for viral pathogens.

- 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 observed, the fish health specialist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.

- Reporting and control of selected fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Co-Managers Fish Disease Control Policy.

Therapeutic and Prophylactic Treatments

- At spawning, eggs are water-hardened in iodophor as a disinfectant.

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

- Formalin (37% formaldehyde) is dispensed into water for control of parasites and fungus on eggs, juveniles and adult salmon. Treatment dosage and time of exposure varies with species, life-stage and condition being treated.

- Only therapeutants approved by the U.S. Food and Drug Administration are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor (as per disease policy).

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

- Different fish / egg lots are physically isolated from each other by separate ponds or incubation units. Incubation units are further isolated by plastic curtains. The intent of these activities is to prevent the horizontal spread of pathogens by splashing water.

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

- Foot baths containing iodophor are strategically located on the hatchery grounds (i.e., entrance to “clean” or isolated areas of the incubation room) to prevent spread of pathogens.

Objective 5: Conduct environmental monitoring.

Environmental Monitoring

Primarily, environmental monitoring is conducted at WDFW facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System Permit administered by the Washington Department of Ecology. 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 parameters are currently monitored at this hatchery:

- *Total Suspended Solids (TSS)*—1 to 2 times per month on composite effluent, maximum effluent and influent samples. Once per month on pollution abatement pond influent and effluent samples.

- *Settleable Solids (SS)*—1 to 2 times per week on effluent and influent samples. Once per week on pollution abatement pond influent and effluent samples.

- *Upstream and Downstream Dissolved Oxygen (DO)*—twice per month, June through September.

- In-hatchery *Water Temperatures*—maximum and minimum daily.

- *In-hatchery Dissolved* Oxygen-as required by steam flow or weather conditions.

- Some facilities monitor rainfall and air temperature on a daily basis.

The following are additional parameters which should be monitored at WDFW hatcheries:

- *Influent* Water Temperatures-continuous monitoring
- *Air* Temperatures-continuous monitoring
- *Influent/Effluent Dissolved* Oxygen--continuous monitoring
- *Influent pH/Conductivity*—continuous monitoring
- *Streambed Movement*
- *In-stream Flow/Current*
- *Daily Rainfall*

Objective 6: Communicate effectively with other salmon producers and managers.

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 Onerations 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, federal 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, Oregon Department of Fish and Wildlife, 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.

Record Keeping

Records are kept in a consistent manner employing standard formats to allow for documentation and monitoring. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. 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.

Development and Review of Brood Documents

The three brood documents are reviewed and agreed to annually. The Eauilibrium Brood Document for the Columbia River and / or major tributaries has not yet been developed. It would document existing baseline production and current management. The Future Brood Document is a detailed listing of annual production goals. This is reviewed and updated each spring, and is finalized by July. The Current Brood Document reflects actual production relative to the annual production goals. It is developed in the spring after eggs are taken. It is usually finalized by March.

PERFORMANCE STANDARDS-PRIEST RAPIDS HATCHERY

Objective *1*

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	CHF	6,102	5,534	2,636-8,963	1
Adult Prespawning Survival	CHF	90%	95.5%	93.8-97.7%	
Egg-take	CHF	7,890,000	11,148,180	6.3-14.8 million	
Green Egg-to-Fry Survival	CHF	90%	92.6%	90.9-94.2%	2
Fry-to-Smolt Survival	CHF	90%	96.9%	94.9-98.4%	
Fish Releases	CHF	6,700,000	5,537,010	5,159K-6,431K	2
Transfers to Co-ops (Eggs/Fish)	CHF	0	548,300	0-2,741K	
Other Transfers (Eggs/Fish)	CHF	100K-17,500K[1]	4,388,800	705K-7,165K	
Adults Passed Upstream	CHF	195	0	0	
Percent Survival	CHF	1.0%	1.17%	0.29-2.44%	1

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Release smolts CV<10%	CHF	Yes	7.2%'	4.8-9.5%	3
Acclimation	CHF	Yes	Yes	--	
Volitional Release	CHF	Yes	No	--	1,4

N/A=Not applicable.
[1] Klickitat, Rocky Reach and other URB programs.
[2] Average of four broods, 1984-1987.

Objective 3

Measures	Species	Hatchet-v Goal	5-Year Averaae	Ranae	Constraints
Collect Adults Throughout Run	CHF	Yes	Yes	Yes	
Spawning Pop. >500	CHF	Yes	Yes	Yes	
Spawning Ratio Male:Female	CHF	1:3[1]	0.5:1	0.4:1 - 0.7:1	

Objective 4

Measures	Species	Hatcherv Goal	5-Year Averane	Range	Constraints
Adhere to Disease Policy	CHF	Yes	Yes	–	

History of Reportable Pathogens—1990-1995

Species/Stock	Water Inc.	Supply Rear.	Virus	BKD	Furunc J ERM	Other/Comments
Priest Rapids Hatchery	G,SA	G,SA				
CHF/Priest Rapids			IHN			Paramyxovirus
CHF/Little White				+		May have progeny from IHN+ adults

(Note: This is only a summary of reportable pathogens at this facility. More detailed information is available from the Washington Department of Fish and Wildlife.)

[1] Spawning guidelines require a 1 :1 male-to-female spawning ratio if less than 1 million eggs are spawned in a single day.

:tive 5

ures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Effluent	All	*5* mg/L	N/A	N/A	*5*
3 Max Effluent	All	15 mg/L	N/A	N/A	*5*
; Effluent	All	0.1 ml/L	N/A	N/A	*5*
SS PA Effluent	All	100 mg/L	N/A	N/A	*5*
SS PA Effluent	All	1 .O ml/L	N/A	N/A	*5*
Downstream Temp	All	Varies	N/A	N/A	
Downstream DO	All	Varies	N/A	N/A	
Continuous Monitoring of Other Parameters	All	Yes	N/A	N/A	

Objective 6

Measures	Species	Hatchet-v Goal	5-Year Averaae	Ranae	Constraints
Check Hatchery Records for Accuracy and Completeness	All	Yes	No	_	*6*
Develop and Review Comp. Basin-Wide Production Plan	All	Yes	No	--	*7*
Develop and Review Future Brood Doc.	All	Yes	Yes	--	6
Develop and Review Current Brood Doc.	All	Yes	Yes	--	6