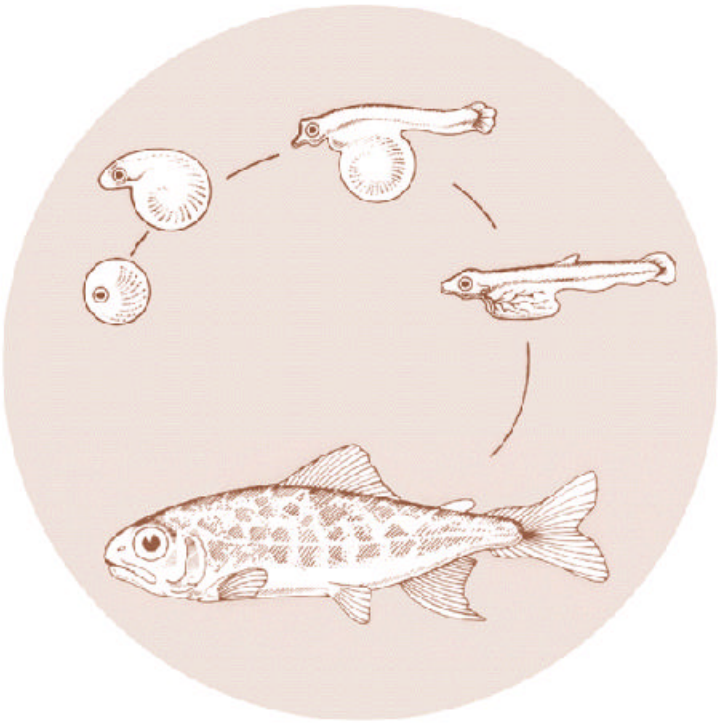
August 1993

INTEGRATED HATCHERY OPERATIONS TEAM OPERATION PLANS FOR ANADROMOUS FISH PRODUCTION FACILITIES IN THE COLUMBIA RIVER BASIN VOLUME I

Annual Report 1992



DOE/BP-60629-7

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 of this report are the author's and do not necessarily represent the views of BPA.

This document should be cited as follows:

Shelldrake, Tom, U.S. Fish and Wildlife Service Hatcheries, Integrated Hatchery Operations Team, Operation Plans for Anadromous Fish Production Facilities in the Columbia River Basin, Volume I, Annual Report 1992, Report to Bonneville Power Administration, Contract No. 1991BI60629, Project No. 199204300, 162 electronic pages (BPA Report DOE/BP-60629-7)

This report and other BPA Fish and Wildlife Publications are available on the Internet at:

http://www.efw.bpa.gov/cgi-bin/efw/FW/publications.cgi

For other information on electronic documents or other printed media, contact or write to:

Bonneville Power Administration
Environment, Fish and Wildlife Division
P.O. Box 3621
905 N.E. 11th Avenue
Portland, OR 97208-3621

Please include title, author, and DOE/BP number in the request.

INTEGRATED HATCHERY OPERATIONS TEAM:

OPERATION PLANS FOR ANADROMOUS FISH PRODUCTION FACILITIES IN THE COLUMBIA RIVER BASIN VOLUME I

ANNUAL REPORT 1992

Prepared by:

Tom Shelldrake

U.S. Fish and Wildlife Service Hatcheries
Portland, OR 97232

Prepared for:

U.S. Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife
P.O. Box 3621
Portland, OR 97283-362 1

Project Number 92-043
Contract Number DE-BI79-91BP60629

AUGUST 1993

Table of Contents

Acronyms or Abbreviations Used in this Report

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

Abernathy Salmon Culture Technology Center

INTRODUCTION

The Abernathy Salmon Culture Technology Center (Abernathy SCTC) is located along Abernathy Creek, approximately 3 miles upstream from the creek's confluence with the Columbia River. Site elevation is 187 feet above sea level.

Juvenile rearing facilities are in fair condition and consist of 12 standard raceways. The adult holding pond is in poor condition and is also used for rearing juvenile fish. Staffing for the fish culture program totals 3.0 FTE's. Additional staff is also assigned to the station to fulfill other duties.

Water rights total 20,600 gpm from Abernathy Creek and one well. Actual water use averages about 6,000 gpm from Abernathy Creek and 300 gpm from the well. The well water has a high iron content and the amount currently utilized is limited by the capacity of the iron filter. A new well was recently drilled and the USFWS has applied for a water right of 3,000 gpm. A pump and piping system have not yet been installed.

PURPOSE

The facility was originally established as a National Fish Hatchery under provisions of the Mitchell Act-a program to provide for the conservation of Columbia River fishery resources. The facility was constructed in 1959 and fish culture operations began the following year. In 1961, research activities at the Salmon Culture Laboratory in Entiat, Washington were transferred to Abernathy to expand the laboratory's research program to include fall chinook. Lower river tule fall chinook are the only fish currently reared on a production basis at Abernathy. Adult collection, egg incubation and rearing are all conducted at this facility.

GOALS

The fish production goal at Abernathy SCTC is to produce lower river fall chinook to help compensate for fish losses in the Columbia River Basin caused by mainstem dams. Additional goals of this facility are to 1) develop or improve practical methods for use in artificial propagation of salmon and steelhead, 2) identify techniques for improving smolt quality and survival ability following hatchery releases, and 3) provide technical assistance regarding salmon diet and nutritional needs.

OBJECTIVES

Objective 1: Hatchery Production

Produce 1.6 million subyearling tule fall chinook 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

Tule fall chinook adults enter Abernathy Creek from early September to October. Fish swim directly into the hatchery holding pond and are spawned from mid-September through the first week in October.

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

Rearing and Release Strategies

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. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Fall Chinook: Rear 1.6 million fish to a smolt size of 20-90 fish / pound and release on-station (acclimated) in March, April and May. There are no fry releases from this station.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

All adults that enter the hatchery are used for broodstock to ensure that genetic diversity is maintained. Any fish identified as non-Abernathy origin are not used as broodstock.

Spawning Protocol

Fish are randomly selected and spawned at a 1:l male to female ratio. When excess eggs are taken, culling is accomplished by removing the eggs of individual females from each egg-take until the required number of eggs is obtained. Selection of the female

whose eggs are to be removed is determined using a random number generating system.

Acceptable Stocks

If broodstock numbers are insufficient to meet the hatchery production objectives (i.e., numbers of fish), the hatchery will rear fewer fish to a larger size. In extreme cases, Spring Creek stock are acceptable for use at this facility.

Objective 4: Maximize survival at ail 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 USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. 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.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions 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.

- Follow USFWS Fish Health Policy and Implementation Guidelines on 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 Abernathy SCTC

Health Monitoring

- The fish disease monitoring plan for Abernathy NFH requires the monitoring of juveniles from January through May. The disease inspection includes a sample size of at least 60 fish per lot.

- 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. This sample consists of a minimum of 60 fish per lot.

- 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 specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

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

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 the control of fungus on eggs and the control of parasites on 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 or those under Investive New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.

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

- Different fish/egg lots are physically distinct and kept in separate ponds or incubation units.

- Tank trucks or tagging trailers are disinfected when brought onto the station.

- 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 USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit. 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:

- *Suspended Solids (TSS)*—Once per month on composite effluent from all outfalls. Once per month from creek ponds effluent and twice per month from abatement pond effluent.

- Settleable *Solids*—Once per month from creek ponds effluent and twice per month from abatement pond effluent.

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

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

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

Coordination/Communication within USFWS

The USFWS holds an internal production meeting each year. At this meeting, hatchery project leaders report on the year's accomplishments and receive any changes in production requested by the fishery managers. This meeting also serves as a forum for the hatchery project leaders to share technical information.

The hatchery also holds two coordination meetings each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the following six months, and present management programs that might affect, or be affected by hatchery operations.

Interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional "Fishery Resource Offices," and a basin-wide "Office of the Columbia River Coordinator" that participates in the following forums:

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 (PNFHPQ 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

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

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-ABERNATHY SALMON CULTURE CENTER

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	Fall Chinook	1,000	1,382	1,040-1,772	1
Adult Prespawning Survival	Fall Chinook	98%	98.5%	98-99%	
Egg-take	Fall Chinook	1.75M	2.8M	2.4M-35M	
Green Egg-to-Fry Survival	Fall Chinook	93%	93%	82-95%	
Fry- to-Smolt Survival	Fall Chinook	95%	96.1%	95.3-96.9%	
Fish Releases	Fall Chinook	1.6M	2M	1.5M-3.1M	
Egg Transfers	Fall Chinook	0	1M	0.6M-1.7M	
Fish Transfers	Fall Chinook	0	0	0	
Adults Passed Upstream	Fall Chinook	0	0	0	
Percent Survival	Fall Chinook	1%	1%	0.5-1.3%	

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Fall Chinook	20	19.6	--[1]	
		36	36.8	--[1]	
		60	59.5	--[1]	
		450	450	--[1]	
Acclimation	Fall Chinook	Yes	Yes	--	
Volitional Release	Fall Chinook	No	No	--	

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Fall Chinook	Yes	Yes	--	
Spawning Pop. >500	Fall Chinook	Yes	Yes	--	
Spawning Ratio Male:Female	Fall Chinook	1:1	1:1.32	1:0.87-1:1.92	

Objective 4

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

1 **Not estimated for this report.**

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Meet Requirements of NPDE Permit	All	Yes	Yes	--	

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	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments-Abernathy SCTC

1. The adult capture goal is not always met because low stream flows in September can hinder adult migration upstream in Abernathy Creek. This could be alleviated by construction of a weir, trap, and adult holding facility near the mouth of Abernathy Creek.

2. The Equilibrium Brood Document has not been completed at this time.

Carson National Fish Hatchery

INTRODUCTION

Carson NFH is located 13 miles northwest of Carson in Skamania County, Washington. It lies in a heavily forested valley within the Gifford Pinchot National Forest at the confluence of Tyee Creek and Wind River. Elevation of the site is 1,180 feet above sea level. Authorized staff totals 7 FTE's.

The facilities include 46 raceways, 2 rearing ponds and 2 adult holding ponds. Water rights total 42,639 gpm from three sources: Tyee Creek, Tyee Spring and the Wind River. The main water source for the hatchery is Tyee Creek; the Wind River is used as a secondary supply. Incubation and domestic water is provided by Tyee Spring. All water is supplied by gravity flow and all rearing units receive single-pass water.

PURPOSE

Carson NFH was placed into operation in 1938 to rear and release fall chinook salmon and trout. The hatchery was remodeled in 1956 under the Mitchell Act in an attempt to establish a spring chinook run in the Wind River. The hatchery is currently used for adult collection, egg incubation and rearing of spring chinook. It also provides spring chinook eggs for re-establishing spring chinook runs in some mid-Columbia River tributaries.

GOALS

Restore and maintain upriver Columbia River chinook salmon stocks. The hatchery has successfully maintained a self-sustaining run of mature fish to the fishery and hatchery.

OBJECTIVES

Objective 1: Hatchery Production

Produce 2 million spring chinook smolts for on-station release.

Produce 100,000 spring chinook smolts for off-station release.

Provide 2 million spring chinook eggs to Big White Ponds and state agencies.

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

Adult spring chinook enter the hatchery holding pond from May to August. Spawning occurs in August.

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

Rearing and Release Strategies

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. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Spring Chinook: Rear 2 million fish to a yearling smolt size of 18 fish / pound and release on-station (acclimated) in April. Rear 100,000 yearling smolts and release from acclimation sites in the Umatilla River. There are no fry releases from this station.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

More fish enter the hatchery than are used for broodstock. The fish trap and ladder are operated so that a representative portion of the run remains available to the sport and tribal fisheries in the Wind River or are collected at the hatchery for tribal food bank programs.

Spawning Protocol

Fish are randomly selected and spawned at **a** 1:l male to female ratio. When culling excess eggs or when removing eggs for off-station transfers, a portion of eggs from each female in that day's egg-take is used.

Acceptable Stocks

If broodstock numbers are insufficient to meet the hatchery production objectives (i.e., numbers of fish), the hatchery will rear fewer fish to a larger size. In extreme cases of a natural disaster, any mid-Columbia River spring chinook stock would be acceptable for use at this facility.

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 USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. 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.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions 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.

- Follow USFWS Fish Health Policy and Implementation Guidelines on 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 Carson NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish throughout the rearing year.

- At spawning, a minimum of 150 ovarian fluids and 60 kidney/spleens from each species 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. This sample consists of a minimum of 60 fish per lot.

- 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 specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

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

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 the control of fungus on eggs and the control of parasites on 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 or those under Investive New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.
- All equipment (nets, tanks, rain gear) is disinfected with iodophor between different fish/egg lots.
- Different fish/egg lots are physically distinct and kept in separate ponds or incubation units.
- Tank trucks or tagging trailers are disinfected when brought onto the station.
- 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 USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit. 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 month 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.

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

Coordination/Communication within USFWS

The USFWS holds an internal production meeting each year. At this meeting, hatchery project leaders report on the year's accomplishments and receive any changes in production requested by the fishery managers. This meeting also serves as a forum for the hatchery project leaders to share technical information.

The hatchery also holds two coordination meetings each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the following six months, and present management programs that might affect, or be affected by hatchery operations.

The Carson NFH Quality Control and Improvement team meets twice each year. This team is a comprehensive effort to improve fish production, including physical changes in water supply and facility structures. The team includes representatives of Carson NFH, Lower Columbia River Fish Health and Lower Columbia River Fishery Resource Office.

Interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional "Fishery Resource Offices," and a basin-wide "Office of the Columbia River Coordinator" that participates in the following forums:

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 (PNPHPC): 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

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

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-CARSON NATIONAL FISH HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	Spr. Chinook	2,400	4,754	2,110-10,656	
Adult Prespawning Survival	Spr. Chinook	95%	97%	95-99%	4
Egg-take	Spr. Chinook	5M	5,850K	4,184K-7,518K	
Green Egg-to-Fry Survival	Spr. Chinook	90%	91%	87-93%	
Fry-to-Smolt Survival	Spr. Chinook	95%	96.8%	92.0-98.6%	3
Fish Releases	Spr. Chinook	2.1M	2,305K	1,989K-2,459K	2
Egg Transfers	Spr. Chinook	2h4	2,371K	600K-3,500K	
Fish Transfers	Spr. Chinook	600K	300K	0-800K	
Adults Passed Upstream	Spr. Chinook	0	0	0	
Percent Survival	Spr. Chinook	0.2%	0.4%	0.17-0.62%	1

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constrain&
Smolt Size at Release (fish/lb)	Spr. Chinook	18	19.8	15-22	
Acclimation	Spr. Chinook	Yes	Yes	--	
Volitional Release	Spr. Chinook	Partial (20%)	Partial (20%)	--	2

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Spr. Chinook	Yes	Yes	--	
Spawning Pop. >500	Spr. Chinook	Yes	Yes	--	
Spawning Ratio Male:Female	Spr. Chinook	1:1	1:0.88	1:0.69-0.92:l	

Objective 4

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

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Meet Requirements of NPDE Permit	All	Yes	Yes	--	

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	--	5
Develop and Review Future Brood Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Cons train ts/Commen ts-Carson National *Fish Hatchery*

1. Fish survival and quality could be enhanced by placing a cover over the upper and middle banks of raceways. This would help exclude predators, provide cover and safety for employees, and provide better environmental conditions for the fish.

2. Current research indicates that reduced numbers of smolts released may be conducive to larger adult returns.

3. Carson NFH utilizes Tyee Spring water during critical rearing periods. This spring contains resident fish, which have tested positive for bacterial kidney disease. These fish are electroshocked from the spring on an annual basis. Having feral fish in the hatchery water supply means that there will always be the potential for those resident fish to be shedding pathogens into the water supply. Potential for further protection and spring improvement is limited because the USFWS holds no ownership. Dependency on surface water supplies (including Tyee Creek and Wind River) also means that the facility is vulnerable during low water years and there is limited protection against water quality degradation.

4. Adult holding ponds need renovation to accommodate current disease prevention protocols (i.e., erythromycin injection of adults). The current ponds do not allow for the separation of injected and non-injected groups. Pond improvements would also facilitate better handling of adults throughout the spawning cycle.

5. The Equilibrium Brood Document has not been completed at this time.

Dworshak National Fish Hatchery

INTRODUCTION

Dworshak NFH is located at the confluence of the North Fork Clearwater River and the main stem Clearwater River near the unincorporated town of Ahsahka, in north-central Idaho. The site is 1,000 feet above sea level and is situated 3 miles west of Orofino, on the north bank of the Clearwater River and 1 mile downstream from the Dworshak Dam. The facility is authorized a staff level of 23 FTE's.

The facility consists of 84 Burrows ponds, 42 raceways, 4 adult holding ponds, 128 deep troughs and 78 stacks of vertical incubators. Water use ranges from 27,000 gpm to 83,000 gpm from the North Fork Clearwater River below Dworshak Dam.

PURPOSE

Dworshak NFH began operations in 1969 rearing summer steelhead and resident trout. Additional construction was completed in 1982 under the Lower Snake River Compensation Program (LSRCP) which expanded facilities to rear spring chinook salmon. The hatchery is to mitigate for loss of summer steelhead and resident trout habitat after the construction of Dworshak Dam on the North Fork Clearwater River. Spring chinook production is to mitigate for dams constructed on the lower Snake River.

GOALS

Produce adult summer steelhead and spring chinook salmon to the upper Clearwater River to compensate for fish losses caused by construction of Dworshak Darn and dams on the lower Snake River.

OBJECTIVES

Objective 1: Hatchery Production

Summer Steelhead (B-Strain)
Produce 1.2 million yearling smolts for on-station release.

Produce 1.1 million yearling smolts for off-station release.

Collect broodstock for the Clearwater Anadromous Fish Hatchery.

Spring Chinook
Produce 1.1 million yearlings 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 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 Dworshak NFH is to collect the adults necessary to maintain the hatchery production program and provide eggs to meet the needs of the LSRCP hatcheries in Idaho.

Summer Steelhead (B-Strain): Adult steelhead return to the hatchery rack from late October to May. Spawning occurs from late January to early May with a peak usually in March. Adults are captured at the hatchery weir.

Spring Chinook: Adult spring chinook return to the hatchery rack from early June to late August. Spawning occurs from late August to early September. Adults are captured at the hatchery weir.

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

Rearing and Release Strategies

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. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Summer Steelhead: Rear 2.3 million fish to a size of 6 fish/pound; release 1.2 million fish on-station in May. Release 1.1 million smolts off-station into Clearwater River tributaries in April.

Spring Chinook: Rear 1.1 million fish to a size of 18 fish/pound and release on-station into the North Fork Clearwater River in mid-April.

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. Fish identified as non-Clearwater origin are not used for spawning.

Spawning Protocol-All Stocks

The intent is to utilize a spawning population of at least 500 adults. Fish are randomly selected and spawned at I:1 male to female ratio.

Acceptable Stocks

If numbers of returning broodstock are insufficient to meet the hatchery production goals, Rapid River stock has been used. However, no other broodstock is used and the hatchery production goals fall short.

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 USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. 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.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions 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.

- Follow USFWS Fish Health Policy and Implementation Guidelines on 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 Dworshak NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish per lot.

- 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. This sample consists of a minimum of 60 fish per lot.

- 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 specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

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

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 the control of fungus on eggs and the control of parasites on 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 or those under Investive New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.

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

- Different fish/egg lots are physically distinct and kept in separate ponds or incubation units.

- Tank trucks or tagging trailers are disinfected when brought onto the station.

- 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 USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit. 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 month 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.

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

Coordination/Communication wlthin USFWS

The USFWS holds an internal production meeting each year. At this meeting, hatchery project leaders report on the year's accomplishments and receive any changes in production requested by the fishery managers. This meeting also serves as a forum for the hatchery project leaders to share technical information.

The hatchery also holds two coordination meetings each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the following six months, and present management programs that might affect, or be affected by hatchery operations.

Interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional "Fishery Resource Offices," and a basin-wide "Office of the Columbia River Coordinator" that participates in the following forums:

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

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

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-DWORSHAK NATIONAL FISH HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	S. Steelhead	3,000	6,400	3,700-10,613	
	Spr. Chinook	1,000	1,249	165-2,042	
Adult Prespawning Survival	S. Steelhead	95%	95%	94-96%	
	Spr. Chinook	90%	85%	80-90%	
Egg-take	S. Steelhead	8.5M	9.2M	9M-12M	
	Spr. Chinook	1.6M	460K	276K-1.4M	
Green Egg-to-Fry Survival	S. Steelhead	78%	70%	68-74%	
	Spr. Chinook	85%	85%	83-902	
Fry-to-Smolt Survival	S. Steelhead	81%	65%	--[1]	
	Spr. Chinook	85%	80%	--[1]	
Fish Releases	S. Steelhead	2.3M	2.4M	--[1]	
	Spr. Chinook	l.lM	1.4M	--[1]	
Egg Transfers	S. Steelhead	2M	--[1]	--[1]	
	Spr. Chinook	0	--[1]	--[1]	
Fish Transfers	S. Steelhead	0	--[1]	--[1]	
	Spr. Chinook	0	--[1]	--[1]	
Adults Passed Upstream	S. Steelhead	0	0	0	
	Spr. Chinook	0	0	0	
Percent Survival	S. Steelhead	1.2%	--[1]	--[1]	
	Spr. Chinook	0.3%	--[1]	--[1]	

1 **Not estimated for this report.**

Objective 2

Measures	Specues	Hatchery Goal	5-Year Average	Range	Constraints
Smolts Size at Release (fish/lb)	S. Steelhead	5.7	6	5.2-7.5	1
	Spr. Chinook	20	17	16-19	
Acclimation	S. Steelhead	Yes	Yes	--	
	Spr. Chinook	Yes	Yes	--	
Volitional Release	S. Steelhead	No	No	--	
	Spr. Chinook	No	No	--	

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	S. Steelhead	Yes	Yes	--	
	Spr. Chinook	Yes	Yes	--	
Spawning Pop. >500	S. Steelhead	Yes	Yes	--	
	Spr. Chinook	Yes	3 of 5	--	
Spawning Ratio Male:Female	S. Steelhead	1:l	--1	l:l-1:4	2
	Spr Chinook	1:l	-- 1	--1	

Objective 4

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

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Meet Requirements of NPDE Permit	All	Yes	Yes	--	

1 **Not estimated for this report.**

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	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments-Dworshak National Fish Hatchery

1. Temperature of water released from Dworshak Reservoir sometimes restricts smolt size.

2. Brood collection in some years has resulted in spawning populations that are comprised of 75 percent females.

3. The Equilibrium Brood Document has not been completed at this time.

Eagle Creek National Fish Hatchery

INTRODUCTION

Eagle Creek NFH is located 40 miles east of Portland, Oregon along Eagle Creek, a tributary of the Clackamas River. The hatchery is situated on about 25 acres of bottomland in a deep canyon. Site elevation is 950 feet above sea level.

The hatchery currently consists of 75 standard raceways divided into upper and lower sections, 1 adult holding pond and 10 starter tanks. The adult holding pond is used for rearing from March 15-April 30. A small hydropower plant has been constructed at the intake on Eagle Creek. Power can only be generated when flows exceed hatchery production requirements. Revenue is used to offset electrical costs.

Water rights total 116,730 gpm (260 cfs), almost all from Eagle Creek. A spring is used for egg incubation and a well for domestic water use. Approximately 67,325 gpm (150 cfs) of the water right is for power generation and is not used for fish culture. There is not enough water during low flow periods to provide the entire water right so power generation only occurs during high flows. Flow from Eagle Creek available for hatchery use ranges from 6,000 gpm to 25,146 gpm. All rearing units are supplied with serial re-use water. The hatchery is staffed with 8 FTE's.

PURPOSE

Eagle Creek NFH was authorized under the Mitchell Act and currently operates as part of the Columbia River Fisheries Development Program-a program to provide for the conservation of Columbia River fishery resources. Facilities were first constructed in 1956 and expanded in 1964 and 1975. The hatchery is currently used for adult collection, egg incubation and rearing of coho and winter steelhead for on-station release. It has also produced coho salmon for use in Oregon's Youngs Bay Net Pen Program.

GOALS

Produce coho and winter steelhead to help compensate for fish losses in the Columbia River Basin caused by mainstem dams.

OBJECTIVES

Objective 1: Hatchery Production

Coho
Produce 1 million smolts for on-station release.

Produce 1 million smolts for transfer to net pens in Youngs Bay.

Winter Steelhead
Produce 200,000 smolts for on-station release.

Produce 40,000 yearlings for transfer to net pens at Oregon City.

Produce 70,000 fry for transfer to Clackamas Hatchery.

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

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

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

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

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

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Coho: Adults return to Eagle Creek from September to November. Fish returning directly to the hatchery holding pond are spawned in October and November.

Winter Steelhead: Adults return to Eagle Creek from November to April. Fish returning directly to the hatchery holding pond are spawned from December to mid-March.

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

Rearing and Release Strategies

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. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Coho: Rear 1 million fish to a yearling smolt size of 15 fish / pound and volitionally release directly into Eagle Creek in April. Rear 1 million fish to a yearling smolt size of 15 fish / pound and transfer to net pens in Youngs Bay. There are no fry releases from this station.

Winter Steelhead: Rear 160,000 fish to a yearling smolt size of 6 fish / pound and 40,000 to size of 8 fish / pound for release directly into Eagle Creek in April-May. Transfer 14 month-old yearlings (40,000) to net pens in Oregon City. There are no fry releases from this station.

Objective 3: Maintain stock integrity and genetic diversity.

Broods tock Selection-All Stocks

More fish return to the hatchery than are needed for broodstock. Excess fish are randomly selected throughout the run for use in food bank programs.

Spawning Protocol-All Stocks

Fish are randomly selected and spawned at a 1:l male to female ratio. Excess eggs are taken and a portion of eggs from each female is kept for on-station rearing. The remaining eggs are either destroyed or transferred for use in other programs where acceptable,

Acceptable Stocks

If numbers of returning broodstock are insufficient to meet the hatchery production goals, the coho production may be achieved using Sandy River, Klaskanine, Big Creek or Willard stocks, in that order of preference. Steelhead production can be met using Clackamas River 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 USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. 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.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions 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.

- Follow USFWS Fish Health Policy and Implementation Guidelines on 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 Eagle Creek NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish per lot.

- 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. This sample consists of a minimum of 60 fish per lot.

- 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 specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

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

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 the control of fungus on eggs and the control of parasites on 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 or those under Investive New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.

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

- Different fish lots are physically distinct and kept in separate ponds or incubation units.

- Tank trucks or tagging trailers are disinfected when brought onto the station.

- 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 USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit. 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 month 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.

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

Coordination/Communication within USFWS

The USFWS holds an internal production meeting each year. At this meeting, hatchery project leaders report on the year's accomplishments and receive any changes in production requested by the fishery managers. This meeting also serves as a forum for the hatchery project leaders to share technical information.

The hatchery also holds two coordination meetings each year. Cooperators **and** other interested parties are invited to hear reports on the accomplishments, review plans for the following six months, and present management programs that might affect, or be affected by hatchery operations.

interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional "Fishery Resource Offices," and a basin-wide "Office of the Columbia River Coordinator" that participates in the following forums:

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

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

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-EAGLE CREEK NATIONAL FISH HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	Coho	1350	--[1]	1,400-4,300	
	W. Steelhead	300	--[1]	287-920	
Adult Prespawning Survival	Coho	95%	**95%**	93-96%	
	W. Steelhead	95%	**94%**	94-95%	
Egg-take	Coho	2.1M	3.4M	2.OM-4.6M	
	W. Steelhead	500K	371K	308K-2.2M	2
Green Egg-to-Fry Survival	Coho	95%	95%	94-98%	
	W. Steelhead	95%	95%	94-95%	
Fry-to-Smolt Survival	Coho	90%	90%	89-91%	
	W. Steelhead	95%	93%	86-962	
Fish Releases	Coho	1.OM	2.OM	1.8M-3.4M	
	W. Steelhead	200K	200K	200K	
Egg Transfers	Coho	0	--[1]	--[1]	
	W. Steelhead	0	--[1]	--[1]	
Fish Transfers	Coho	1.0	--[1]	--[1]	
	W. Steelhead	110,000	--[1]	--[1]	
Adults Passed Upstream	Coho	0	**0**	**0**	
	W. Steelhead	0	**0**	**0**	
Percent Survival	Coho	NA	Unknown	Unknown	3
	W. Steelhead	NA	Unknown	Unknown	3

NA=Not applicable.

1 **Not estimated for this report.**

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Coho	15	14.6	10-15	
	W. Steelhead	6	6.7	5.4-7.8	
Acclimation	Coho	Yes	Yes	--	
	W. Steelhead	Yes	Yes	--	
Volitional Release	Coho	Partial (50%)	No	--	
	W. Steelhead	No	No	--	

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Coho	yes	Yes	--	
	W. Steelhead	Yes	Yes	--	
Spawning Pop. >500	Coho	Yes	Yes	--	
	W. Steelhead	Yes	Yes	--	
Spawning Ratio Male:Female	Coho	1:1	1:1	1:l	
	W. Steelhead	1:1	1:1	1:l	

Objective 4

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

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Meet Requirements of NPDE Permit	All	Yes	Yes	--	

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	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments-Eagle Creek National Fish Hatchery

1. Poor water quality in some years has decreased fish survival.
2. The amount of incubation water and number of incubators prohibit individual incubation.
3. No tag data available for this period.
4. The Equilibrium Brood Document has not been completed at this time.

Entiat National Fish Hatchery

INTRODUCTION

Entiat NFH is located along the Entiat River, east of Entiat, Washington. Site elevation is 980 feet above sea level. The facility is operated as a satellite of Leavenworth NFH and is staffed with 3.0 FTE's.

Rearing units are in good condition and consist of 42 starter tanks, 30 raceways and 2 adult holding ponds. The adult holding pond is used for overwintering smolts for release in the spring.

Water rights total 15,340 gpm from three sources: the Entiat River, Packwood Spring and wells. Approximately 7,786 gpm is available for hatchery use. The Entiat River and wells provide most of this water flow.

PURPOSE

Entiat NFH was originally authorized by the Grand Coulee Fish Maintenance Project in 1937 and re-authorized by the Mitchell Act in 1938. Hatchery construction began in 1940 and limited operations began one year later. The original hatchery purpose was to mitigate for the loss of salmon spawning grounds caused by Grand Coulee Dam. The hatchery is currently used for adult collection, egg incubation and rearing of spring chinook.

GOALS

Produce spring chinook to help compensate for fish losses in the upper Columbia River drainage caused by construction of Grand Coulee Dam.

OBJECTIVES

Objective 1: Hatchery Production

Produce 400,000 yearling spring chinook smolts for on-station release.

Produce 400,000 subyearling spring chinook 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 salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Adult spring chinook return to the Entiat River from mid-May to August. Fish swim directly into the hatchery broodstock pond and are spawned from mid-August to early September.

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

Rearing and Release Strategies

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. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Spring Chinook: Rear 400,000 fish to yearling smolt size of 16-18 fish / pound and release on-station into the Entiat River (acclimated) in April.

Rear 400,000 fish to a subyearling size of 30 fish / pound and release into the Entiat River in May. There are no fry releases at this facility.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

All fish that enter the hatchery are used as broodstock.

Spawning Protocol

Fish are randomly selected and spawned at a I:1 male to female spawning ratio. If excess eggs are taken, a portion of eggs from each female is kept for on-station rearing and the rest destroyed.

Acceptable Stocks

If numbers of returning broodstock are insufficient to meet the hatchery production goals, the production may be achieved using wild Entiat River fish or Leavenworth stock, in that order of preference.

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

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. 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.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions 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.

- Follow USFWS Fish Health Policy and Implementation Guidelines on 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 Entiat NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam.

- 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. This sample consists of a minimum of 60 fish per lot.

- 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 specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

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

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 the control of fungus on eggs and the control of parasites on 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 or those under Investive New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.

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

- Different fish/egg lots are physically distinct and kept in separate ponds or incubation units.

- Tank trucks or tagging trailers are disinfected when brought onto the station.

- 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 USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit. 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* (TSSJ-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 month 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.

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

Coordination/Communication within USFWS

The USFWS holds an internal production meeting each year. At this meeting, hatchery project leaders report on the year's accomplishments and receive any changes in production requested by the fishery managers. This meeting also serves as a forum for the hatchery project leaders to share technical information.

The hatchery holds a coordination meeting each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the next year, and present management programs that might affect, or be affected by hatchery operations.

Interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional "Fishery Resource Offices," and a basin-wide "Office of the Columbia River Coordinator" that participates in the following forums:

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

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

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-ENTIAT NATIONAL FISH HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	Spr. Chinook	650	593	437-687	
Adult Prespawning Survival	Spr. Chinook	95%	75%	67-97%	
Egg-take	Spr. Chinook	850K	775K	612K-878K	
Green Egg-to-Fry Survival	Spr. Chinook	95%	90%	89-91%	
Fry-to-Smolt Survival	Spr. Chinook	95%	88.8%	82.6-93.9%	1
Fish Releases	Spr. Chinook	800K	791K	628K-887K	1
Egg Transfers	Spr. Chinook	0	--1	--1	
Fish Transfers	Spr. Chinook	0	--1	--1	
Adults Passed Upstream	Spr. Chinook	0	0	0	
Percent Survival	Spr. Chinook	0.5%	Unknown	Unknown	2

1 **Not estimated for this report.**

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constrain&
Smolt Size at Release (fish/lb)	Spr. Chinook	18	18	14.6-19.7	3
Acclimation	Spr. Chinook	Yes	Yes	--	
Volitional Release	Spr. Chinook	No	No	--	

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Spr. Chinook	Yes	Yes	--	4
Spawning Pop. >500	Spr. Chinook	Yes	No	--	
Spawning Ratio Male:Female	Spr. Chinook	1:l	--	--	5

Objective 4

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

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Meet Requirements of NPDE Permit	All	Yes	Yes	--	

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	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments-Entiat National Fish Hatchery

1. Fish production is limited by pathogen loads in Entiat River water which have rendered this source virtually unusable during parts of the year. Inadequate groundwater production further limits production.

2. No tag data available for this period.

3. The optimal size at release for spring chinook at this facility has not been defined through rigorous controlled experimentation. This subject needs to be fully evaluated before size at release is other than a best guess.

4. The size and configuration of the broodstock holding pond makes separation of fish according to the time of arrival extremely difficult. This impairs the ability to insure that adults are collected from throughout the run in representative proportions.

5. Sufficient numbers of males are not always available to permit a 1:l spawning ratio.

6. The Equilibrium Brood Document has not been completed at this time.

Hagerman National Fish Hatchery

INTRODUCTION

The Hagerman NFH is located next to the Snake River in southern Idaho, approximately 5 miles southeast of the town of Hagerman. The facility is authorized a staff of 9.5 FTE's.

The facility consists of 102 raceways, 66 starter tanks and a display pond. Water temperature is a constant 59°F. Raceways are organized into two systems, each system with three tiers for serial re-use of water. Water rights are currently going through the Snake River Basin Water Rights Adjudication process. The amount claimed is 92.5 cfs from six major collecting structures.

PURPOSE

The hatchery was authorized in 1930 and began operating in 1933. Historically, production consisted of rearing rainbow trout for stocking waters in Idaho, Oregon and Nevada. In the late 197Os, trout production was reduced and the steelhead program started. The hatchery was remodeled and expanded from 1982 to 1984 as part of the Lower Snake River Compensation Program (LSRCP)-a program to mitigate for fishery losses caused by the four federal dams constructed on the lower Snake River.

Hagerman NFH is currently used for egg incubation and rearing of summer steelhead for LSRCP mitigation. It is also still used for rearing rainbow trout. No adults are collected or spawned at this facility. Eggs are transferred in from various Idaho Fish and Game facilities.

GOALS

Produce summer steelhead that will partially mitigate for summer steelhead losses incurred because of the construction of dams on the lower Snake River. The annual goal is 1,530,000 smolts averaging 4.5 fish per pound. The adult return goal is 13,600 fish to the Snake River Basin.

OBJECTIVES

Objective 1: Hatchery Production

Summer Steelhead
Produce 1.53 million smolts for off-station release into the Salmon and Snake rivers.

Rainbow Trout
Produce trout as needed for management of federal lands. Currently, 100,000 trout are released into Duck Valley Reservation reservoirs.

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

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

No adults are collected or spawned at this facility because there is no fish passage at dams in the Hells Canyon reach of the Snake River. Summer steelhead eggs are transferred in from various Idaho Fish and Game facilities.

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

Rearing and Release Strategies

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. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Summer Steelhead: Rear 1.53 million fish to a size of 4.5 fish / pound and release into the Salmon and Snake rivers in March and April.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

No adults are collected or spawned at this facility. All hatchery production is the result of eggs transferred in from other facilities.

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

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. 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.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions 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.
- Follow USFWS Fish Health Policy and Implementation Guidelines on 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 Hagerman NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish per lot.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit. This sample consists of a minimum of 60 fish per lot.

- 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 specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

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

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 the control of fungus on eggs and the control of parasites on 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 or those under Investive New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health 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 incubation units.

- Tank trucks or **tagging trailers are disinfected when brought onto the station.**

- 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 USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit. 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)-once per month on raceway effluent, settling pond influent, and settling pond effluent.

- Settleable Solids (SS)-twice per month on raceway effluent and once per month on settling pond influent and effluent.

- Water Flows-once per month on raceway and settling pond effluent flows.

- In-hatchery Water Temperafures-occasionally as spring water temperatures change very little.

- *In-hatchery* Dissolved Oxygen-as required based on numbers and size of fish in the raceways.

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

Coordination/Communication within USFWS

The USFWS holds an internal production meeting each year. At this meeting, hatchery project leaders report on the year's accomplishments and receive any changes in production requested by the fishery managers. This meeting also serves as a forum for the hatchery project leaders to share technical information.

The hatchery also holds two coordination meetings each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the following six months, and present management programs that might affect, or be affected by hatchery operations.

Interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional "Fishery Resource Offices," and a basin-wide "Office of the Columbia River Coordinator" that participates in the following forums:

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

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

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-HAGERMAN NATIONAL FISH HATCHERY

Objective 1

Measures	Species	Hatchery Goal 5-Year Average[1]		Range	Constraints
Adult Capture	S. Steelhead	NA	NA	NA	
Adult Prespawning Survival	S. Steelhead	NA	NA	NA	
Egg-take	S. Steelhead	NA	NA	NA	
Green Egg-to-Fry Survival	S. Steelhead	NA	NA	NA	
Fry-to-Smolt Survival	S. Steelhead	90%	81.1%	72.1-86.32	1
Smolt Releases	S. Steelhead	*1,530,000*	1,459,000	l,437K-1,487K	1
Egg Transfers	S. Steelhead	*0*	0	0	
Fish Transfers	S. Steelhead	*As* Needed	811,000	210K-1,958K	*2*
Adults Passed Upstream	S. Steelhead	*0*	0	*0*	
Percent Survival	S. Steelhead	NA	Unknown	Unknown	

NA=Not applicable.
l F&al Years 1988-1992.

Objec ive 2

Measures	Species	Hatchery Goal 5-Year Average		Range	Constraints
Smolt Size at Release (fish/lb)	S. Steelhead	4-5	4.6	4.2-4.9	3
Acclimation	S. Steelhead	Partial	No	--	4
Volitional Release	S. Steelhead	No	No	--	

Objective 3

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

Objective 4

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

Objective 5

Measures	Species	Hatchery Goal 5-Year Average		Range	Constraints
Meet Requirements of NPDE Permit	All	Yes	Yes	--	

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	--	5
Develop and Review Future Brood Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments-Hagerman National Fish Hatchery

1. Bird predation reduced fry-to-smolt survival during the years analyzed for this report. A bird exclosure was completed in June 1993.

2. Steelhead fingerlings are produced and transferred to State or Federal hatcheries on an "as needed" basis.

3. Smolt size goal is set by Idaho Department of Fish and Game. The actual smolt size attained is dependent upon stocking dates, which often changes at the last minute.

4. Acclimation is being tested at this time. Approximately 524,200 smolts (1991 brood year) were released into Sawtooth Fish Hatchery raceways and 223,400 smolts were released into the Pahsimeroi Hatchery ponds in March 1992.

5. The Equilibrium Brood Document has not been completed at this time.

Kooskia National Fish Hatchery

INTRODUCTION

Kooskia NF.H is located in north-central Idaho, approximately 75 miles southeast of Lewiston in northwest Idaho County. The hatchery is situated in a narrow valley of Clear Creek, just upstream of the confluence with the Middle Fork Clearwater River. Site elevation is 1,295 feet above sea level. The facility is operated as a satellite facility of Dworshak NFH and is staffed with *4.0* FTE's.

The facility consists of 12 raceways, 6 Burrows ponds, 42 circular starter tanks, 32 rectangular starter tanks and 1 adult holding pond. Water rights total 13,456 gpm from six wells and Clear Creek. Just over half the water is from Clear Creek. Water available for hatchery use ranges from 4,389 gpm to 8,527 gpm, with the majority supplied from Clear Creek. The hatchery is operated with a water re-use system that incorporates bio-filters between uses.

PURPOSE

The hatchery was authorized in 1961 to facilitate restoration of depleted, nationally significant fishery resources. It is currently used for adult collection and rearing of spring chinook (spawning and incubation occurs at Dworshak NFH).

GOALS

Produce spring chinook to help restore depleted upriver salmon stocks.

OBJECTIVES

Objective 1 Hatchery Production

Produce 800,000 yearling spring chinook 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 adult collection procedures at Kooskia NFH is to collect as many adults as possible to maintain the hatchery production program and to establish tribal and sport harvest opportunities.

Entry of adult spring chinook into the subbasin occurs from May through September with a peak in early June. Adults are trapped at Kooskia NFH. However, because of warm Clear Creek water temperatures, fish must be transferred to Dworshak NFH for maturation and spawning. Eyed eggs are returned to Kooskia NFH in October.

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

Rearing and Release Strategies

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. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Spring Chinook: Transfer eyed eggs from Dworshak NFH to Kooskia NFH in October; rear 800,000 fish to a yearling smolt size of 20 fish/pound and release on-station in April.

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

No spawning occurs at this facility. The Kooskia adults transferred to Dworshak NFH are held in separate holding ponds and eggs remain segregated after spawning.

Acceptable Stocks

Only spring chinook returning to Clear Creek are used for broodstock.

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

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. 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.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions 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.

- Follow USFWS Fish Health Policy and Implementation Guidelines on 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 Kooskia NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish per lot.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit. This sample consists of a minimum of 60 fish per lot.

- 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 specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

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

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 the control of fungus on eggs and the control of parasites on 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 or those under Investive New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.

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

- Different fish/egg lots are physically distinct and kept in separate ponds or incubation units.

- Tank trucks or tagging trailers are disinfected when brought onto the station.

- 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 USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit. 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 month 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.

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

Coordination/Communication within USFWS

The USFWS holds an internal production meeting each year. At this meeting, hatchery project leaders report on the year's accomplishments and receive any changes in production requested by the fishery managers. This meeting also serves as a forum for the hatchery project leaders to share technical information.

The hatchery also holds two coordination meetings each year. Cooperators and other interested parties are invited to hear reports on the accomplishmentsi review plans for the following six months, and present management programs that might affect, or be affected by hatchery operations.

Interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional "Fishery Resource Offices," and a basin-wide "Office of the Columbia River Coordinator" that participates in the following forums:

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 PNFI-IPC): 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 Apreements: 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

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

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-KOOSKIA NATIONAL FISH HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	Spr. Chinook	700	625	465-1,021	1
Adult Prespawning Survival	Spr. Chinook	90%	90%	90%	
Egg-take	Spr. Chinook	1,050,000	NA[1]	NA	
Green Egg-to-Fry Survival	Spr. Chinook	NA[2]	NA	NA	
Fry-to-Smolt Survival	Spr. Chinook	85%	NA[3]	NA	
Fish Releases	Spr. Chinook	800,000	700,000	350K-800K	1
Egg Transfers	Spr. Chinook	0	0	0	
Fish Transfers	Spr. Chinook	0	0	0	
Adults Passed Upstream	Spr. Chinook	10%	--[4]	0-10%	
Percent Survival	Spr. Chinook	0.3%	--[4]	--[4]	

NA=Not applicable.
1 New program.
2 Eggs are incubated at Dworshak.
3 Fish are started at Dworshak.
4 Not estimated for this report.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release	Spr. Chinook	Yes	Yes	--	
Acclimation	Spr. Chinook	Yes	Yes	--	
Volitional Release	Spr. Chinook	No	No	--	

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constrain&
Collect Adults Throughout Run	Spr. Chinook	Yes	Yes	--	
Spawning Pop. *>500*	Spr. Chinook	Yes	Yes	*3/5*	
Spawning Ratio Male:Female	Spr. Chinook	NA	NA	NA	

Objective 4

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

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Meet Requirements of NPDE Permit	All	Yes	Yes	--	

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	--	2
Develop and Review Future Brood Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Commen ts-Kooskia National *Fish Hatchery*

1. Adult return is dependent upon migration conditions.
2. The Equilibrium Brood Document has not been completed at this time.

Leavenworth National Fish Hatchery

INTRODUCTION

Leavenworth NFH is located along Icicle Creek, a tributary of the Wenatchee River approximately 30 miles above the Wenatchee's confluence with the Columbia River. The hatchery is about 40 miles northeast of of Leavenworth, Washington. Site elevation is 1,155 feet above sea level.

Hatchery rearing units are in poor condition and consists of 2 adult holding ponds, 45 raceways, 40 Foster Lucas raceways, 198 troughs, and 90 starter tanks.

Water rights total 25,551 gpm from wells, Icicle Creek, and Snow and Nada lakes. Average flow available to the hatchery is 18,170 gpm. There is insufficient water to operate all rearing facilities. Water from Snow Lake and Nada Lake is used to supplement Icicle Creek during low flow periods. The hatchery is staffed with 9.0 FTE's.

PURPOSE

The hatchery was originally authorized by the Grand Coulee Fish Maintenance Project in 1937 and reauthorized by the Mitchell Act in 1938. It began operations in 1942. Leavenworth is 1 of 3 mid-Columbia hatcheries constructed by the Bureau of Reclamation as mitigation for the Grand Coulee Dam-Columbia Basin Project. It is used for adult collection, egg incubation and rearing of summer steelhead and spring chinook. Entiat NFH and Winthrop NFH are operated as satellite facilities.

GOALS

Produce spring chinook and summer steelhead to help compensate for fish losses in the Columbia River Basin caused by Grand Coulee Dam.

OBJECTIVES

Objective 1: Hatchery Production

Summer Steelhead
Produce 100,000 smolts for on-station release.

Spring Chinook
Produce 1.6 million 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 salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Summer Steelhead: Adult fish return to the hatchery from late April to early May. The fish swim directly into the broodstock holding pond and are spawned in May. Hook and line capture methods are sometimes used to collect adult broodstock when ladder collection is insufficient to meet production goals.

Spring Chinook: Adult fish return to the hatchery from June to August. Fish swim directly into the hatchery's broodstock holding pond and are spawned in September.

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

Rearing and Release Strategies

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. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Summer Steelhead: Rear 100,000 fish to a yearling smolt size of 7 fish / pound and release on-station (acclimated) in April. No fish are released as fry.

Spring Chinook: Rear 1.6 million fish to a yearling smolt size of 16-18 fish / pound and release on-station (acclimated) in April. No fish are released as fry.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

Broodstock are selected so that a representative portion of the entire run contributes to egg collection. Excess fish are allocated to sport and tribal fisheries or distributed from the broodstock holding ponds to tribal subsistence food bank programs.

Spawning Protocol

Fish are randomly selected and spawned at a 1:l male to female spawning ratio. If excess eggs are taken, a randomly selected portion of eggs representing the entire run are destroyed.

Acceptable Stocks

If numbers of returning broodstock are insufficient to meet the hatchery production objectives (i.e., numbers of fish), the hatchery will rear fewer fish. In the extreme case of very poor adult returns, hatchery production may be achieved using Wenatchee River stock, upper mid-Columbia stock or Carson stock, in that order of preference.

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

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at USEWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. 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.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- **Prescribe appropriate treatments and remedies to disease.**
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions 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.

- Follow USFWS Fish Health Policy and Implementation Guidelines on 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 Leavenworth NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish per lot.

- 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. This sample consists of a minimum of 60 fish per lot.

- 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 specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

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

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 the control of fungus on eggs and the control of parasites on 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 or those under Investive New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.

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

- Different fish/egg lots are physically distinct and kept in separate ponds or incubation units.

- **Tank trucks or tagging trailers are disinfected when brought onto the station.**

- 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 USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit. 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 month 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.

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

Coordination/Communication within USFWS

The USFWS holds an internal production meeting each year. At this meeting, hatchery project leaders report on the year's accomplishments and receive any changes in production requested by the fishery managers. This meeting also serves as a forum for the hatchery project leaders to share technical information.

The hatchery also holds a coordination meeting each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the next year, and present management programs that might affect, or be affected by hatchery operations.

Interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional "Fishery Resource Offices," and a basin-wide "Office of the Columbia River Coordinator" that participates in the following forums:

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. 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

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

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-LEAVENWORTH NATIONAL FISH HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	S. Steelhead	NA	NA	NA	
	Spr. Chinook	1,500	2,271	2,027-2,594	
Adult Prespawning Survival	S. Steelhead	NA	NA	NA	
	Spr. Chinook	98%	94%	89-96%	
Egg-take	S. Steelhead	NA	NA	NA	
	Spr. Chinook	2.4M	4.8M	3.7M-5.9M	1
Green Egg-to-Fry Survival	S. Steelhead	NA	NA	NA	
	Spr. Chinook	95%	91%	89-92%	
Fry-to-Smolt Survival	S. Steelhead	NA	NA	NA	
	Spr. Chinook	95%	93.4%	90-96%	
Fish Releases	S. Steelhead	100,000	40,000	20K-1OOK	
	Spr. Chinook	2.2M	2.1M	1.9M-23M	1
Egg Transfers	S. Steelhead	0	0	0	
	Spr. Chinook	0	1.6M	0-2M	
Fish Transfers	S. Steelhead	0	0	0	
	Spr. Chinook	0	0	0	
Adults Passed Upstream	S. Steelhead	0	0	0	
	Spr. Chinook	0	0	0	
Percent Survival	S. Steelhead	NA	Unknown	Unknown	2
	Spr. Chinook	0.5%	0.5%	0.12-0.92%	

NA=Not applicable.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	S. Steelhead	6	6.1	5.8-6.9	
	Spr. Chinook	16-18	17.1	16.0-18.2	3
Acclimation	S. Steelhead	Yes	Yes	--	
	Spr. Chinook	Yes	Yes	--	
Volitional Release	S. Steelhead	Partial	Partial	--	
	Spr. Chinook	Partial	Partial	--	

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	S. Steelhead	Yes	Yes	--	
	Spr. Chinook	Yes	Yes	--	4
Spawning Pop. >500	S. Steelhead	Yes	Yes	--	
	Spr. Chinook	Yes	Yes	--	
Spawning Ratio Male:Female	S. Steelhead	1:l	-- [1]	--[1]	5
	Spr. Chinook	1:l	-- [1]	--[1]	5

Objective 4

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

1 **Not estimated for this report.**

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Meet Requirements of NPDE Permit	All	Yes	Yes	--	

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	--	6
Develop and Review Future Broad Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments-Leavenworth National Fish Hatchery

1. Fish production is limited by antiquated, inefficient rearing units (Foster-Lucas ponds) and the hatchery's inability to move the full allocation of Icicle Creek water through the main pipeline. Declining groundwater production from existing wells further limits production.

2. No tag data for this time period.

3. The optimal size at release for spring chinook at this facility has not been defined through rigorous controlled experimentation. This subject needs to be fully evaluated before size at release is other than a best guess.

4. The size and configuration of the broodstock holding pond makes separation of fish according to the time of arrival extremely difficult. This impairs the ability to insure that adults are collected from throughout the run at representative proportions.

5. There are not always sufficient numbers of males available to permit a 1:1 spawning ratio.

6. The Equilibrium Brood Document has not been completed at this time.

Little White Salmon National Fish Hatchery

INTRODUCTION

Little White Salmon NFH is located on the Little White Salmon River approximately 12 miles east of Stevenson, Washington. The hatchery is situated just above Drano Lake, a water body where the Little White Salmon River joins the Columbia River. Site elevation is 90 feet above sea level.

Rearing facilities consist of 52 raceways of various sizes, 4 adult holding ponds and 10 starter tanks. The hatchery is staffed with 12 FTE's.

Water rights total 33,868 gpm from the Little White Salmon River and springs. Water use for fish production ranges from 11,221 gpm to 28,232 gpm. The river supplies most of this water flow. A water reuse system was constructed in 1967 for egg incubation.

PURPOSE

The hatchery was originally constructed in 1898 and was remodeled and expanded in 1958. It currently operates as part of the Columbia River Fisheries Development Program (Mitchell Act)-a program to provide for the conservation of Columbia River fishery resources. The hatchery is used for adult collection, egg incubation and rearing of Upriver Bright (URB) fall chinook and spring chinook.

GOALS

Restore and maintain URB fall chinook and spring chinook salmon stocks in the Columbia River Basin.

OBJECTIVES

Objective 1: Hatchery Production

Spring Chinook
Produce 1.5 million fish for on-station release.

URB Fall Chinook
Produce 1.7 million subyearling smolts for on-station release.

Produce 3.7 million subyearling smolts for release above John Day Dam.

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

Spring Chinook: Adults enter the hatchery holding ponds from mid-April to mid-June. Spawning occurs from mid-July to mid-August.

URB Fall Chinook: Adults enter the hatchery holding ponds from September through October. Spawning occurs from late October to mid-November.

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

Rearing and Release Strategies

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. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Spring Chinook: Rear 1 million yearlings to a size of 16 fish / pound and 500,000 subyearlings to a size of 40 fish / pound. Fish are released on-station into the Little White Salmon River in April (yearlings) and June (subyearlings).

URB Fall Chinook: Rear 1.7 million fish to a size of 100 fish / pound and release on-station into the Little White Salmon River in June. Rear an additional 3.7 million fish to a size of 160 fish / pound and transfer to an acclimation site above John Day Dam in March. Fish are acclimated for 16 weeks and released in July.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection-All Stocks

Adult fish return directly to the hatchery facility. Adults are selected so that a representative portion of the entire run contributes to egg collection.

Spawning Protocol-All Stocks

All fish used for spawning are randomly selected. The hatchery goal is to spawn fall chinook at a 1:3 male to female ratio and spring chinook at a 1:l ratio.

Acceptable Stocks

If numbers of returning adults are insufficient to meet the hatchery production objectives, Carson spring chinook and Bonneville fall chinook are acceptable for broodstock use.

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

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. 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.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions 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.

- Follow USFWS Fish Health Policy and Implementation Guidelines on 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 Little White Salmon NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish per lot.

- 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. This sample consists of a minimum of 60 fish per lot.

- 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 specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

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

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 the control of fungus on eggs and the control of parasites on 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 or those under Investive New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.

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

- Different fish/egg lots are physically distinct and kept in separate ponds or incubation units.

- Tank trucks or tagging trailers are disinfected when brought onto the station.

- 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 USPWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit. 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 month 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.

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

Coordination/Communication within USFWS

The USFWS holds an internal production meeting each year. At this meeting, hatchery project leaders report on the year's accomplishments and receive any changes in production requested by the fishery managers. This meeting also serves as a forum for the hatchery project leaders to share technical information.

The hatchery also holds two coordination meetings each year. Cooperators and other interested parties are invited to hear reports on the accomplishmentsi review plans for the following six months, and present management programs that might affect, or be affected by hatchery operations.

Interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional "Fishery Resource Offices," and a basin-wide "Office of the Columbia River Coordinator" that participates in the following forums:

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.

Inteprated 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.

Record Keeping

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

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-LITTLE WHITE SALMON NATIONAL FISH HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	Fall Chinook	2,893	2,141	1,818-2,381	
	Spr. Chinook	1,800	2,461	1,791-4,020	
Adult Prespawning Survival	Fall Chinook	98%	5.5%	94.5-98.6%	
	Spr. Chinook	92%	82.3%	74.2-92.1%	
Egg-take	Fall Chinook	5.5M	5.5M	3.5M-6.3M	
	Spr. Chinook	2.0M	2.1M	1.8M-2.9M	
Green Egg-to-Fry Survival	Fall Chinook	94%	82.2%	62.2-91.8%	2,4
	Spr. Chinook	94%	81.2%	68.9-92.0%	2,4
Fry-to-Smolt Survival	Fall Chinook	96%	96%	93-98.5%	L3,4,5
	Spr. Chinook	95%	95%	87.9-96.8%	1,3,4,5
Fish Releases	Fall Chinook	5.4M	4.5M	3.5M-5.5M	
	Spr. Chinook	1.8M	1.5M	1.4M-1.8M	
Egg Transfers	Fall Chinook	0	--[1]	--[1]	
	Spr. Chinook	0	--[1]	--[1]	
Fish Transfers	Fall Chinook	0	--[1]	--[1]	
	Spr. Chinook	0	--[1]	--[1]	
Adults Passed Upstream	Fall Chinook	0	0	0	
	Spr. Chinook	0	0	0	
Percent Survival	Fall Chinook	1.0%	1.03%	0.7-1.6%	
	Spr. Chinook	0.2%	0.18%	0.17-0.22%	

NA=Not applicable.
[1] Not estimated for this report.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Fall Chinook	100	107.6	95.3-122.6	
	Spr. Chinook	16	15.9	12.9-18.1	
Acclimation	Fall Chinook	Yes	Yes	--	
	Spr. Chinook	Yes	Yes	--	
Volitional Release	Fall Chinook	Yes	No	--	
	Spr. Chinook	Yes	No	--	

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Fall Chinook	Yes	Yes	--	
	Spr. Chinook	Yes	Yes	--	
Spawning Pop. >500	Fall Chinook	Yes	Yes	--	7
	Spr. Chinook	Yes	Yes	--	
Spawning Ratio Male:Female	Fall Chinook	1:3	1:3	1:3	
	Spr. Chinook	1:1	1:1	1:1	

Objective 4

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

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Meet Requirements of NPDE Permit	All	Yes	Yes	--	6

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	--	*8*
Develop and Review Future Brood Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Cons train ts/Commen ts-Little White Salmon National Fish Hatchery

1. Raceway reconstruction and rehabilitation would facilitate disease control and prevention.

2. Construction of a new incubation facility (or replumbing the existing facility) and the installation of an additional production well would promote species separation and would allow the use of single-pass water during incubation and early fish rearing.

3. Water quality on the Little White Salmon River, the major hatchery water source, is directly affected by heavy rains, logging and other human-related disturbances. Results of these activities create heavy silt loads in rearing units and intensive maintenance at hatchery intake structure.

4. There is no disinfection of hatchery water that is used for production purposes. There are brook, brown and rainbow trout populations upstream of the hatchery intake. The Willard NFH and the National Fisheries Research Center are also above this hatchery's intake.

5. Installation of raceway covers would reduce "sunburn" or "white back disease" of young salmon fry. Covers would also reduce stress on fish caused by predatory birds and other animals.

6. Although adequate, expansion of hatchery pollution abatement system would support hatchery compliance with the National Pollutant Elimination System and would ease restrictions in the cleaning rearing units.

7. Harvest regulations could allow a 1:1 male to female spawning ratio. However, because of the uneven sex ratio of returning adults, all fisheries would have to be unduly restricted.

8. The Equilibrium Brood Document has not been completed at this time.

Spring Creek National Fish Hatchery

INTRODUCTION

Spring Creek NFH is located along the Columbia River at Underwood, Washington, approximately 30 miles upstream of Bonneville Dam. Site elevation is 93 feet above sea level.

Rearing units consist of 44 Burrows ponds, 30 troughs and 1 circular pond. The station is authorized 11 FTE's.

Water rights total 12,290 gpm from an unnamed creek, two springs, one well and the Columbia River. The Columbia River accounts for about 50 percent of the water right and is only used as a heat source when production water requires heating to accelerate fish growth. Spring water at a constant 46°F is provided from a series of springs that emerge from the cliffs adjacent to the hatchery. This water supply has slowly decreased in recent years from a historical 4,000 gpm to a recent low of 2,250 gpm. The hatchery uses a 90 percent water re-use system with rock and oyster-shell filters. Water is used up to 10 times before being discharged to the the pollution abatement facilities.

PURPOSE

Spring Creek NFH was constructed in 1900 and began operating in 1901. It was remodeled in 1955 under Mitchell Act authorization as part of the Columbia River Fisheries Development Program. In 1970, the Army Corps of Engineers razed and remodeled most of the facility to mitigate for fishery losses caused by construction of the John Day Dam. The hatchery is currently used for adult collection, egg incubation and rearing of tule fall chinook.

GOALS

Produce tule fall chinook to help compensate for fish losses in the Columbia River Basin caused by mainstem dams.

OBJECTIVES

Objective 1: Hatchery Production

Produce 15-30 million tule fall chinook 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 salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Tule fall chinook adults return to the hatchery in September. Fish swim directly into the hatchery from the Columbia River and are spawned as they become ripe in September and October.

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

Rearing and Release Strategies

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. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Fall Chinook: Rear 15-30 million fish to a smolt size of 35-110 fish / pound and serially release from the hatchery raceways (acclimated) in March, April, and May. Fish in excess of the hatchery's rearing capacity are placed into two large holding ponds and volitionally released into the Bonneville Pool (Columbia River) starting in February.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

All adults that enter the hatchery are used for broodstock unless they are identified as not originating from Spring Creek Hatchery.

Spawning Protocol

Fish are randomly selected and spawned at a 1:1 male to female ratio.

Acceptable Stocks

In extreme cases such as a natural disaster, hatchery production may be achieved using fish from Abernathy or Bonneville hatcheries, in that order of preference.

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

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. 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.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions 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.

- Follow USFWS Fish Health Policy and Implementation Guidelines on 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 Spring Creek NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish per lot.

- 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. This sample consists of a minimum of 60 fish per lot.

- 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 specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

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

Therapeutic and Prophylactic Treatments

- Eggs are disinfected with iodophor three time per week until they hatch.

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

- Formalin (37% formaldehyde) is dispensed into water for the control of fungus on eggs and the control of parasites on 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 or those under Investive New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.

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

- Tank trucks or tagging trailers are disinfected when brought onto the station.

- 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 USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit. 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 month 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.

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

Coordination/Communication within USFWS

The USFWS holds an internal production meeting each year. At this meeting, hatchery project leaders report on the year's accomplishments and receive any changes in production requested by the fishery managers. This meeting also serves as a forum for the hatchery project leaders to share technical information.

The hatchery also holds two coordination meetings each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the following six months, and present management programs that might affect, or be affected by hatchery operations.

Interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional "Fishery Resource Offices," and a basin-wide "Office of the Columbia River Coordinator" that participates in the following forums:

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

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

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-SPRING CREEK NATIONAL FISH HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	Fall Chinook	*8,200*	**9,800**	3,160-11,500	
Adult Prespawning Survival	Fall Chinook	*90%*	**96%**	89-98%	
Egg-take	Fall Chinook	23M	16M	lOM-6OM	
Green Egg-to-Fry Survival	Fall Chinook	90%	92%	82-94%	
Fry-to-Smolt Survival	Fall Chinook	97%	**97%**	**90-97%**	
Fish Releases	Fall Chinook	15M	12.4M	9.1M-15.3M	
Egg Transfers	Fall Chinook	5M	4.1M	0-16M	
Fish Transfers	Fall Chinook	0	**0**	0	
Adults Passed Upstream	Fall Chinook	0	**0**	0	
Percent Survival	Fall Chinook	1.5%	0.33%	0.04-l .12%	

NA=Not applicable.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Fall Chinook	110 (March) 80 (April) 40 (May)	110 72 36	105-135 65-90 35-45	
Acclimation	Fall Chinook	Yes	Yes	--	
Volitional Release	Fall Chinook	Partial	Partial	--	

Objective 3

Measures	Species	Hatchery Goal	$-Year Average	Range	Constraints
Collect Adults Throughout Run	Fall Chinook	Yes	Yes	--	1
Spawning Pop. >500	Fall Chinook	Yes	Yes	--	
Spawning Ratio Male:Female	Fall Chinook	>2:1	1:3	l:l-1:3	1

Objective 4

Measures	Species	Hatchery Goal	5-year Average	Range	Constraints
Adhere to Disease Policy	Fall Chinook	Yes	Yes	--	

Objective 5

Measures	Species	Hatchery Goal	5-year Average	Range	Constraints
Meet Requirements of NPDE Permit	All	Yes	Yes	--	

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	--	2
Develop and Review Future Brood Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Cons train ts/Commen ts-Spring Creek National Fish Hatchery

1. Extensive manipulation of commercial fishing seasons prohibits the hatchery from meeting preferred brood collection and spawning goals.

2. The Equilibrium Brood Document has not been completed at this time.

Warm Springs National Fish Hatchery

INTRODUCTION

Warm Springs NFH is located on the north bank of the Warm Springs River, approximately 14 miles north of Warm Springs, Oregon. The hatchery site is leased by the federal government from the Confederated Tribes of the Warm Springs Indian Reservation (CTWSIR). Site elevation is 1,525 feet above sea level.

Rearing units consist of 6 adult holding ponds, 20 Burrows ponds, 20 converted Burrows ponds and 20 starter tanks. The facility is staffed with 5.0 FTE's

All water rights on the Warm Springs River are the property of the CTWSIR. Nonconsumptive water use is included in the business lease between CTWSIR and the U.S. Fish and Wildlife Service. The lease specifies use of approximately 100 cfs (44,883 gpm) from the Warm Springs River. Water is supplied by pumping from the Warm Spring River. Water use ranges from 9,000 gpm to 13,500 gpm. All rearing ponds are supplied with single-pass water.

PURPOSE

Warm Springs NFH was authorized in 1966 and began operating in 1978. The Confederated Tribes of the Warm Springs Indian Reservation of Oregon entered into an agreement with the U.S. Fish and Wildlife Service to increase tribal fishing opportunities. The facility is used for adult collection, egg incubation and rearing of spring chinook salmon. The Tribe has the sole management responsibility for the fishery resources on the reservation.

GOALS

Produce spring chinook salmon that will contribute to the CTWSIR fishery while providing adequate escapement for hatchery production. The USFWS and Tribe have an agreement to assure that hatchery operations are compatible with the Tribe’s fishery management goals.

OBJECTIVES

Objective 1: Hatchery Production

Produce 750,000 spring chinook 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 salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Adult spring chinook arrive at the hatchery from mid-April to September. Adults are captured at the hatchery weir. Most wild spring chinook are passed upstream to spawn naturally. Only spring chinook endemic to the Warm Springs River are used for broodstock. The trap and weir at the hatchery are operated to allow only wild spring chinook above the weir, keeping hatchery spring chinook from passing upstream. This is to protect the genetic integrity of the wild spring chinook.

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

Rearing and Release Strategies

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. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Spring: Chinook: The operation plan calls for a total production target of 750,000 spring chinook smolts. Approximately, 25 percent of the fish are reared to a yearling size of 10 fish/pound and volitionally released in the fall. The remaining fish are released the following spring as 1+ age smolts. This release strategy mimics the wild spring chinook migration pattern. All juvenile fish released from the hatchery are marked (coded-wire tagged and adipose clipped) to differentiate them from wild fish upon return.

Objective 3: Maintain stock Integrity and genetic diversity.

Broodstock Selection

Adults are collected throughout the entire run to ensure that the run timing for this stock is maintained. In order to help promote the retention of wild genetic traits in the hatchery broodstock, approximately 10 percent of the broodstock is of wild fish origin.

Spawning *Protocol*

The intent is to utilize a spawning population of at least 700 adults and use a 1:l male to female spawning ratio. When numbers of returning males are low, the male to female spawning ratio will be 1:2. Fish that are 60 centimeters or longer will be considered adults. A minimum of 2 percent of the broodstock will be fish less than 60 centimeters in length and approximately *10* percent of the broodstock will be wild fish.

Acceptable Stocks

Only spring chinook indigenous to the Warm Springs River are used for broodstock.

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

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. 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.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions 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.

- Follow USFWS Fish Health Policy and Implementation Guidelines on 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 Warm Springs NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish per lot.

- 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. This sample consists of a minimum of 60 fish per lot.

- 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 specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

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

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 the control of fungus on eggs and the control of parasites on 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 or those under Investive New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.

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

- Different fish/egg lots are physically distinct and kept in separate ponds or incubation units.

- Tank trucks or tagging trailers are disinfected when brought onto the station.

- 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 USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit. 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 month on effluent and influent samples. Once per week on pollution abatement pond influent and efluent samples.

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

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

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

Coordination/Communication within USFWS

The USFWS holds an internal production meeting each year. At this meeting, hatchery project leaders report on the year's accomplishments and receive any changes in production requested by the fishery managers. This meeting also serves as a forum for the hatchery project leaders to share technical information.

The hatchery also holds two coordination meetings each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the following six months, and present management programs that might affect, or be affected by hatchery operations.

interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional "Fishery Resource Offices," and a basin-wide "Office of the Columbia River Coordinator" that participates in the following forums:

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.

Operation Plan Meetings: The USFWS meets with the Tribe and State to develop a five-year hatchery operation plan. This plan is reviewed annually. Monthly meetings are also held with Tribe to discuss hatchery operations.

Record Keeping

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

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-WARM SPRINGS NATIONAL FISH HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	Spr. Chinook	700	1,212	*371-2,538*	
Adult Prespawning Survival	Spr. Chinook	90%	88%	**87-96%**	
Egg-take	Spr. Chinook	975K	908K	385K-1,152K	
Green Egg-to-Fry Survival	Spr. Chinook	98%	97%	94-99%	
Fry-to-Smolt Survival	Spr. Chinook	**95%**	96.9%	**95.0-97.7%**	
Fish Releases	Spr. Chinook	750K	777K	179K-1,071K	
Egg Transfers	Spr. Chinook	0	0	0	
Fish Transfers	Spr. Chinook	0	0	0	
Adults Passed Upstream	Spr. Chinook	1,200	1,312	651-2,015	
Percent Survival	Spr. Chinook	*0.5%*	0.31%	*0.03-0.84%*	*2*

NA=Not applicable.

Objec ive 2

Measures	Species	Hatchery Goal 5-Year Averagg		Range	Constraints
Smolt Size at Release (fish/lb)	Spr. Chinook	12	12	8-21	
Acclimation	Spr. Chinook	Yes	Yes	--	
Volitional Release	Spr. Chinook	Partial	Partial	--	

Objective 3

Measures	Species	Hatchery Goal 5-Year Average		Range	Constraints
Collect Adults Throughout Run	Spr. Chinook	Yes	Yes	--	
Spawning Pop. *>500*	Spr. Chinook	Yes	Yes	*4/5* Years	
Spawning Ratio Male:Female	Spr. Chinook	1:l	1:1.5	l:l-1:1.5	

Objective 4

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

Objective 5

Measures	Species	Hatchery Goal 5-Year Average		Range	Constraints
Meet Requirements of NPDE Permit	All	Yes	Yes	--	

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	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes		

Cons train ts/Commen ts— Warm Springs National *Fish Hatchery*

1. Segregation and culling of eggs from high titer, BKD adult carriers reduces survival.

2. Low survival is caused by several factors, including high water temperatures, parasite loads, and passage problems.

3. Concerns over wild fish interactions prevent complete volitional release.

4. The Equilibrium Brood Document has not been completed at this time.

Willard National Fish Hatchery

INTRODUCTION

Willard NFH is located on the Little White Salmon River approximately 4 miles upstream from the Little White Salmon NFH. These two hatcheries are operated as a complex. The manager of Little White Salmon NFH is responsible for both facilities. The facility is authorized a staff of 5 FTE's.

The facilities include 50 standard raceways and 52 starter tanks. Water rights total 24,685 gpm from the Little White Salmon River, wells, a spring, and Carson Depot Springs. Water use at the hatchery ranges from 11,221 gpm to 24,442 gpm with most of the water supplied by the Little White Salmon River. Carson Depot Springs is located off station and is used for incubation. Well water is used for incubation and temperature control during early rearing. All rearing facilities are normally supplied with single-pass water, but in low flow years, water from the upper bank of raceways is reused in the middle bank.

PURPOSE

Willard NFH was authorized by the Mitchell Act in 1946 and constructed in 1952. The facility was originally planned as a fall chinook hatchery. Because of the cold water temperatures, however, the hatchery switched to spring chinook and coho production. This continued until the mid-1960s when the hatchery switched entirely to coho production. Currently, the hatchery is still only used for rearing coho (adult collection and spawning occurs at Little White Salmon NFH).

GOALS

Produce coho salmon that will contribute to the tribal, commercial and sport fisheries of the Columbia River Basin while providing adequate escapement for hatchery production.

OBJECTIVES

Objective 1: Hatchery Production

Produce 2.5 million coho smolts (166,600 pounds) for on-station release.

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

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

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

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

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

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

There are no adults collected at Willard NFH. Adult coho are collected and spawned at Little White Salmon NFH. Adults enter the holding facility at Little White Salmon from late September through mid-November. Spawning starts in late October and ends in mid-November. Eggs are incubated at Carson Depot Springs and the eyed eggs are transferred to Willard NFH for rearing and release.

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

Rearing and Release Strategies

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. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Rear 2.5 million fish to a size of [illegible]
Little White Salmon River in April.

Objective Maintain stock integrity and genetic diversity.

Broodstock Selection and Spawning

No adults are collected or spawned at this facility.

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 USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. 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.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

Disease Control

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions 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.
- Follow USFWS Fish Health Policy and Implementation Guidelines on 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 *Willard NFH*

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish per lot.

- Prior to transfer or release, fish are given a health exam. This exam may be in conjunction with the routine monthly visit. This sample consists of a minimum of 60 fish per lot.

- 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 specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

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

Therapeutic and Prophylactic Treatments

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

- Formalin (37% formaldehyde) is dispensed into water for the control of fungus on eggs and the control of parasites on 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 or those under Investive New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.

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

- Different fish/egg lots are physically distinct and kept in separate ponds or incubation units.

- Tank trucks or tagging trailers are disinfected when brought onto the station.

- 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 USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit. 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.

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

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

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

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

Coordination/Communication within USFWS

The USFWS holds an internal production meeting each year. At this meeting, hatchery project leaders report on the year's accomplishments and receive any changes in production requested by the fishery managers. This meeting also serves as a forum for the hatchery project leaders to share technical information.

The hatchery also holds two coordination meetings each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the following six months, and present management programs that might affect, or be affected by hatchery operations.

interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional "Fishery Resource Offices," and a basin-wide "Office of the Columbia River Coordinator" that participates in the following forums:

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

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

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-WILLARD NATIONAL FISH HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	Coho	5,000	8,075	3,834-12,711	
Adult Prespawning Survival	Coho	98%	96.5%	94.3-97.8%	
Egg-take	Coho	5M	4.2M	2.1M-7.3M	
Green Egg-to-Fry Survival	Coho	75%	74%	59-82%	*1,3*
Fry- to-Smolt Survival	Coho	**98%**	97%	95-98%	2
Fish Releases	Coho	2.5M	2.1M	1.5M-2.9M	
Egg Transfers	Coho	0.8M	0.5M	0-1.7M	
Fish Transfers	Coho	**0**	0	0	
Adults Passed Upstream	Coho	**0**	0	0	
Percent Survival	Coho	NA	Unknown	Unknown	

NA=Not applicable.

Objective 2

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Coho	15	15	14-17	
Acclimation	Coho	Yes	Yes	--	
Volitional Release	Coho	No	No		

Objective 3

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Collect Adults Throughout Run	Coho	Yes	Yes	--	
Spawning Pop. *>500*	Coho	Yes	Yes	--	
Spawning Ratio Male:Female	Coho	1:l	1:2	l:l-1:3	

Objective 4

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

Objective 5

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Meet Requirements of NPDE Permit	All	Yes	Yes	--	

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	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes		

Cons train ts/Commen ts— Willard National Fish Hatchery

1. Water intake structure (grisly) is in need of rehabilitation and/or modification. The existing horizontal bar arrangement allows sticks and other debris to enter the hatchery water supply and restrict **water flows.**

2. Barrier dam at the intake site is in need of rehabilitation. The current structure **leaks and does not allow for maximum water flows during low-flow periods.**

3. A larger or more efficient settling structure is needed to allow removal of settleable solids in the hatchery water, particularly during periods of heavy silt loads in the river.

4. **The Equilibrium Brood Document has not been completed at this time.**

Winthrop National Fish Hatchery

INTRODUCTION

Winthrop NFH is located along the Methow River in north-central Washington, near the town of Winthrop. Site elevation is 1,760 feet above sea level. The facility is operated as a satellite to Leavenworth NFH and is authorized a staff of 5.0 FTE's.

Rearing units consist of 62 raceways, 1 adult holding pond, 32 troughs and 46 starter tanks. Water rights total 29,930 gpm from the Methow River, Spring Branch Spring and two wells. Water use ranges from 8,528 to 27,636 gpm with the Methow River providing the majority of the flow. All rearing facilities are normally supplied with single-pass water; however, some serial re-use occurs in low flow years.

PURPOSE

The hatchery was originally authorized as part of the Grand Coulee Fish Maintenance Project. The first fish cultural operations began in 1942 by trapping adult sockeye, chinook and steelhead at Rock Island Dam and transporting them to the hatchery. By 1951, the station was rearing sockeye, chinook, steelhead, kokanee, coho and resident trout. Winthrop NFH is currently used for adult collection, egg incubation and rearing of spring chinook.

GOALS

Produce spring chinook to help compensate for fish losses in the upper Columbia River drainage caused by construction of Grand Coulee Dam.

OBJECTIVES

Objective 1: Hatchery Production

Produce 1 million yearling spring chinook 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 salmon producers and managers in the Columbia River Basin.

CURRENT PRACTICES TO ACHIEVE OBJECTIVES

Objective 1: Hatchery Production

Adult Collection

Adult spring chinook return to the Methow River from mid-May to August. Fish voluntarily swim directly into the hatchery broodstock ponds and are spawned from mid-August to early September.

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

Rearing and Release Strategies

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. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Spring Chinook: Rear 1.0 million fish to a yearling smolt size of 16-22 fish/pound and release on-station (acclimated) into the Methow River before April 1. (Note: Research is still needed to determine the optimal release size.) Volitional releases have been made with no apparent improvement in adult returns.

Objective 3: Maintain stock integrity and genetic diversity.

Broodstock Selection

Adult fish return directly the hatchery broodstock pond. The hatchery goal is to collect fish throughout the entire run for spawning.

Spawning Protocol

Fish are randomly selected and spawned at a 1:l male to female ratio. If excess eggs are taken, a randomly selected portion of eggs representing the entire run is destroyed.

Acceptable Stocks

If numbers of returning broodstock are insufficient to meet the hatchery production goals, the production may be achieved using wild Methow River fish or Leavenworth stock, in that order of preference.

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

Fish Health Management Programs-All Stocks

The primary objective of fish health management programs at USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. 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.

The USFWS has Fish Health Policy and Implementation Guidelines as well as disease prevention programs at all of its facilities to try and achieve these objectives. These programs include the following standard elements:

<u>Disease Control</u>

- Perform necropsies to diagnose the cause of fish loss.
- Prescribe appropriate treatments and remedies to disease.
- Follow USFWS Fish Health Policy and Implementation Guidelines for restrictions 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.

- Follow USFWS Fish Health Policy and Implementation Guidelines on 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 Winthrop NFH

Health Monitoring

- On at least a monthly basis, both healthy and clinically diseased fish from each fish lot are given a health exam. The sample includes a minimum of 60 fish per lot.

- 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. This sample consists of a minimum of 60 fish per lot.

- 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 specific fish pathogens are conducted in accordance with the Co-Managers Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

Fish and Egg Movements

- Movements of fish **and eggs are conducted in accordance with the Co-Managers** Fish Disease Control Policy and the USFWS Fish Health Policy and Implementation Guidelines.

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 the control of fungus on eggs and the control of parasites on 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 or those under Investive New Animal Drug permits are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor as per the USFWS Fish Health Policy.

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

- Different fish/egg lots are physically distinct and kept in separate ponds or incubation units.

- Tank trucks or tagging trailers are disinfected when brought onto the station.

- 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 USFWS facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination Permit. 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 month 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.

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

Coordination/Communication within USFWS

The USFWS holds an internal production meeting each year. At this meeting, hatchery project leaders report on the year's accomplishments and receive any changes in production requested by the fishery managers. This meeting also serves as a forum for the hatchery project leaders to share technical information.

The hatchery also holds a coordination meeting each year. Cooperators and other interested parties are invited to hear reports on the accomplishments, review plans for the next year, and present management programs that might affect, or be affected by hatchery operations.

interagency Coordination/Communication

The USFWS hatchery managers communicate through the regional "Fishery Resource Offices," and a basin-wide "Office of the Columbia River Coordinator" that participates in the following forums:

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

This station reports through the Columbia River Information System (CRIS) of the U.S. Fish and Wildlife Service. Future record keeping will be coordinated with the basin-wide Coordinated Information System (CIS) currently under development. The CIS development is being funded by Bonneville Power Administration. It will be a system to access all necessary databases in the region. It is hoped that coordinated information collection and reporting will result in consistency between the various agencies.

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-WINTHROP NATIONAL FISH HATCHERY

Objective 1

Measures	Species	Hatchery Goal	5-Year Average	Range	Constraints
Adult Capture	Spr. Chinook	800	**300**	**64-942**	1
Adult Prespawning Survival	Spr. Chinook	95%	**66%**	64-78%	2
Egg-take	Spr. Chinook	1.3M	700K	118K-2,300K	
Green Egg-to-Fry Survival	Spr. Chinook	95%	84.8%	72-93%	
Fry-to-Smolt Survival	Spr. Chinook	95%	89.2%	82-94%	3
Fish Releases	Spr. Chinook	1.0M	1,268K	998K-1,581K	3
Egg Transfers	Spr. Chinook	**0**	0	0	
Fish Transfers	Spr. Chinook	**0**	0	0	
Adults Passed Upstream	Spr. Chinook	**0**	0	0	
Percent Survival	Spr. Chinook	0.5%	Unknown	Unknown	4

Objective 2

Measures	Species	Hatchery Goal	$-Year Average	Range	Constraints
Smolt Size at Release (fish/lb)	Spr. Chinook	16-22	17.6	17.2-19	5
Acclimation	Spr. Chinook	Yes	Yes	--	
Volitional Release	Spr. Chinook	Yes	Yes	--	

Objective 3

Measures	Species	Hatchery Goal 5-Year Average		Range	Constraints
Collect Adults Throughout Run	Spr. Chinook	Yes	Yes	--	6
Spawning Pop. >500	Spr. Chinook	Yes	No	2/5 Years	
Spawning Ratio Male:Female	Spr. Chinook	1:l	1:1	1:l	1,7

Objective 4

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

Objective 5

Measures	Species	Hatchery Goal 5-Year Average		Range	Constraints
Meet Requirements of NPDE Permit	All	Yes	Yes	--	

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	--	8
Develop and Review Future Brood Doc.	All	Yes	Yes	--	
Develop and Review Current Brood Doc.	All	Yes	Yes	--	

Constraints/Comments – Winthrop National Fish Hatchery

1. Insufficient adult returns.

2. The adult holding pond is only partially complete and there are currently no construction funds available to complete the project.

3. Production and fish health are limited by several factors, including unusable, antiquated Foster-Lucas ponds, inefficient 12' x 100' raceways, inadequate groundwater supply, and an uncompleted smolt/adult holding pond. In addition, the configuration of the hatchery plumbing limits water management options and reduces the efficiency of groundwater use.

4. No tag return data for this time period.

5. The optimal release size for spring chinook at this facility has not been defined through rigorous, controlled experimentation. This subject needs to be fully evaluated before a target size at release is other than a best guess.

6. The size and configuration of the broodstock holding pond makes separation of fish according to time of arrival extremely difficult. This impairs the ability to insure that adults are collected from throughout the run in representative proportions.

7. There are not always sufficient numbers of males available to permit a 1:1 male to female spawning ratio.

8. The Equilibrium Brood Document has not been completed at this time.