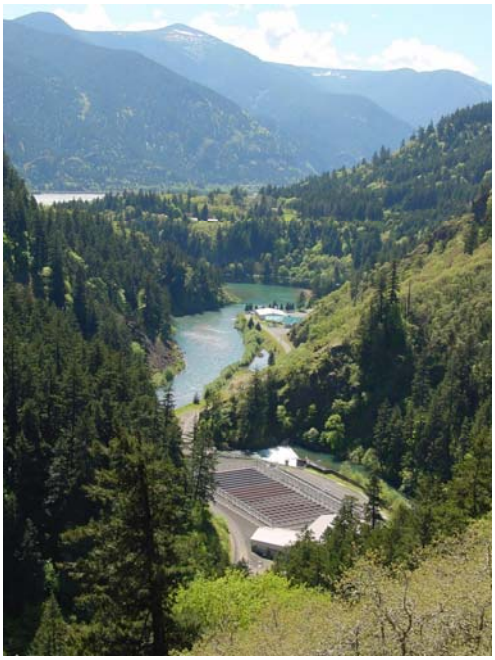
COMPREHENSIVE HATCHERY MANAGEMENT PLAN

Little White Salmon/Willard National Fish Hatchery Complex

Planning Report: Number 5
May 2005



Little White Salmon National Fish Hatchery

Willard National Fish Hatchery

U.S. FISH & WILDLIFE SERVICE

CONSERVING AMERICA'S fisheries

COMPREHENSIVE HATCHERY MANAGEMENT PLAN

Little White Salmon/Willard National Fish Hatchery Complex

Planning Report: Number 5

Prepared by:

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U.S. Fish & Wildlife Service
April 2005

Explanation of Purpose

Little White Salmon/Willard National Fish Hatchery Complex
Comprehensive Hatchery Management Plan

This Comprehensive Hatchery Management Plan (CHMP) for the Little White Salmon/Willard National Fish Hatchery Complex (Complex) is an operational management plan which outlines policy, legal mandates, goals and objectives relevant to the overall management of the station. This document is a planning and reference tool and is not a decision-making or policy-making document.

Additional documents being developed in separate processes are referenced in this CHMP and provide biological, policy, legal, and management analysis of the Little White Salmon/Willard National Fish Hatchery (NFH). These documents are the Biological Assessment and Biological Opinion on Artificial Production in the Columbia River Basin (NMFS 1999), the Federal Columbia River Power System Biological Opinion (NMFS 2001), the Hatchery and Genetic Management Plan, and the U.S. *v* Oregon Columbia River Fisheries Management Plan.

The correct citation for this plan is: U.S. Fish and Wildlife Service (USFWS). 2005. Comprehensive Hatchery Management Plan for the Little White Salmon/Willard National Fish Hatchery Complex. Planning Report: Number 5, U.S. Fish and Wildlife Service, Little White Salmon/Willard National Fish Hatchery Complex, Cook, Washington.

Signature Page

This Comprehensive Hatchery Management Plan for the Little White Salmon/Willard National Fish Hatchery Complex (Planning Report: Number 5) addresses the Pacific Region's requirement to integrate U.S. Fish and Wildlife Service objectives and priorities with those of co-managers, other agencies, and resource programs; fulfill obligations under the Endangered Species Act and relevant fisheries conservation, mitigation, and management programs; identify and define hatchery reforms that are implemented to achieve objectives; and, provide a foundation for future program and budget development and review.

Submitted by:		
	Project Leader, Little White Salmon/Willard NFH Complex	Date
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Approved:		
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Executive Summary

Plan Overview

The U.S. Fish and Wildlife Service (Service) has recognized the need for a comprehensive hatchery planning process to assist in meeting the challenge of changes to hatchery management as required by the conservation status of most Pacific salmon and other anadromous and freshwater fish species. The development of plans, such as this one, will help to: 1) integrate Service objectives and priorities with those of co-managers, other agencies, and resource programs; 2) fulfill our obligations under the Endangered Species Act (ESA) and relevant fisheries conservation, mitigation, and management programs; 3) identify and define hatchery reforms we are implementing to achieve our objectives; and, 4) provide a foundation for future program and budget development and review. This Comprehensive Hatchery Management Plan (CHMP) recognizes and complies with all management plans and Biological Opinions affecting the Columbia River Basin.

Hatchery Purpose

The Little White Salmon National Fish Hatchery (NFH) was authorized by 24 Stat. 523, March 3, 1887. This statute provided funding "for the establishment of a salmon hatchery upon the Columbia River, its tributaries or branches." The hatchery began operation in 1898 (although production began in 1896 on an experimental basis) to address the decline of Tule Fall Chinook, the native salmon stock that returned to the Little White Salmon River. Willard NFH was constructed in 1952 under authority of the Columbia River Fishery Development Program (Mitchell Act) to assist in the mitigation of fisheries lost due to the construction and operation of Bonneville Dam. Willard NFH initially reared tule fall Chinook although production shifted to the rearing of coho salmon by 1960. In 1975 the Little White Salmon NFH and Willard NFH were administratively combined to form the Little White Salmon/Willard NFH Complex. Administration of the Complex occurs at the Little White Salmon facility. The current program is funded almost entirely by authority of the Mitchell Act and fish production is accomplished with reimbursable funding received from the National Oceanic and Atmospheric Administration (NOAA) - Fisheries. The Complex also receives U.S. Army Corps of Engineers John Day Mitigation funds under a reimbursable agreement to provide fish as mitigation for John Day Dam. As a result, fish produced at the Complex are an important source of native fish for mitigating the impacts of hydroelectric projects on the Columbia River, and for restoring extinct or depleted native stocks in the Columbia River Basin. These fish are also an important genetic reserve of native fishes of the region.

Operation of both facilities assures that the Service continues to meet mandated Treaty Trust responsibilities. The current Complex production program is guided by specific fish production goals identified in the Columbia River Fish Management Plan. A result of the U.S. *v* Oregon agreement, the U.S. District Court-ordered Columbia River Fish Management

Plan was developed to address Native American fishery concerns. Fish production goals specified in this plan include:

Little White Salmon NFH

- 1,000,000 yearling spring Chinook salmon released on site.
- 210,000 yearling spring Chinook salmon released on the Umatilla Indian Reservation using native, locally adapted fish stocks.
- 2,000,000 subyearling upriver bright fall Chinook released on site.
- 1,700,000 subyearling upriver bright fall Chinook released off site on the Yakama Indian Reservation as part of mitigation for John Day Dam and to restore this stock to historic levels.

Willard NFH

- 1,000,000 yearling coho salmon released on site. This program was discontinued in 2004.
- 650,000 yearling coho salmon released off site in the Wenatchee River, Washington for the Yakama Nation using locally adapted fish stocks. This Mitchell Act funded restoration effort has been implemented to restore an extinct stock of coho salmon to the Wenatchee River Basin.
- 500,000 coho salmon released off site on the Yakima Indian Reservation as part of a Yakima River restoration effort to help restore this stock to historic levels. This program was moved to Eagle Creek NFH, OR in 2004.

During 2004 both the on site release of coho into the Little White Salmon River and transfer to the Yakima and Naches River were terminated due to Mitchell Act funding shortfalls. Subsequent negotiations between the Service and Yakama Nation (YN) resulted in a cost share arrangement where the YN would fund 60% of the Willard NFH operational costs to support the rearing of locally adapted coho for the tribe's Mid-Columbia River coho reintroduction program. The Service agreed to contribute funds to cover the remaining 40% operational costs.

The following hatchery management goals were adapted from the Mitchell Act, John Day Mitigation Act, Endangered Species Act (ESA) Biological Opinions, U.S. *v* Oregon agreements, and the Integrated Hatchery Operations Team - Operation Plans for Anadromous Fish Production Facilities in the Columbia River Basin Volume III - Washington, Annual Report for 1995 (IHOT 1996).

Hatchery Goals [1]

Goal 1: Return upriver bright fall and spring Chinook salmon upstream of Bonneville Dam as defined in the Mitchell Act of 1937 to mitigate for fisheries lost due to the construction and operation of Columbia River hydroelectric projects.

[1]Tasks and current practices to achieve objectives are described in Chapter 3.

Goal 2: Transfer upriver bright fall and spring Chinook and coho salmon for off-site acclimation and release in areas upstream of Bonneville Dam in support of tribal restoration programs and to support the development of locally adapted stocks.

Goal 3: Assure that all the requirements of legal orders and federally mandated legislation are met.

Goal 4: Develop public use opportunities related to recreational fishing on Drano Lake and provide information and educational opportunities to enhance public understanding of Little White Salmon NFH and Service programs.

Planning Issues

Several federal, state and tribal entities share responsibilities for development of subbasin plans, hatchery production, harvest management, and ESA considerations. Recent actions have centered around extremely popular sport and tribal fisheries that occur in Drano Lake, a large impoundment at the mouth of the Little White Salmon River immediately downstream of the hatchery. Hatchery adult returns provide an ideal terminal fishery, allowing both sport and tribal harvest in an area that does not support naturally spawning ESA-listed stocks of fish. The agencies involved in the management of the Drano Lake fisheries include the Service, NOAA – Fisheries, Washington Department of Fish and Wildlife (WDFW), and the YN.

The CHMP recognizes and complies with all management plans and Biological Opinions affecting the Columbia River Basin in general. The primary issues (of the Biological Opinion, CHMP or Planning) center around future mass marking, juvenile distribution and production numbers, tribal harvest, surplus adult distribution, negative impacts to listed and other aquatic resources and funding for operations, maintenance and evaluation.

Marking

- To help protect wild and naturally produced fish, the states of Washington, Oregon and Idaho are implementing selective sport and commercial fisheries (non-tribal) on marked hatchery fish. These selective fisheries require that all hatchery produced fish be marked. Mass marking of all hatchery fish is being implemented for steelhead trout and coho salmon, and most recently for spring Chinook salmon. Mass marking of fall Chinook salmon has not yet been implemented except for special cases. For example, under recent Congressional legislation in 2004, all federally funded hatchery fish will be mass marked, except for special conservation purposes. Mass marking all on station releases of fall Chinook salmon at Little White Salmon NFH is scheduled for 2005.
- Columbia River Treaty Tribes generally disagree with the management strategy for mass marking and selective fisheries.

- The Service will continue to coordinate our actions with the states and tribes through U.S. *v* Oregon and NOAA-Fisheries to comply with ESA actions and coordinate with the Pacific States Marine Fisheries Commission mark committee. In addition, state, federal, and tribal managers are discussing a comprehensive marking strategy for the Columbia River Basin as identified by Action 174-1 in the Federal Columbia River Power System Biological Opinion. NOAA-Fisheries will continue to meet with the states and tribes on this effort.

A comprehensive marking plan should:

- Improve our ability to assess and monitor the status of naturally reproducing (especially ESA listed) populations
- Monitor and evaluate hatchery programs, including hatchery reforms and stray rates
- Maintain critical harvest management and stock assessment information
- Monitor mark-selective fishery regimes established by the states
- Improve regional and watershed based marking decisions
- Be consistent with recovery plan goals
- Be coordinated through U.S. *v* Oregon, Pacific States Marine Fisheries Commission and U.S. - Canada forums

Juvenile Salmon Distribution and Production Numbers

- Juvenile salmon are released and transferred from the hatchery in several groups between March and June. These fish are either smolts or presmolts (both subyearling and yearling depending on species life history) to assure acclimation at off-site rearing ponds following transfer and/or to promote quick downstream migration following release through the Columbia River to the estuary and ocean. These release strategies are agreed to by the Service, Tribes, NOAA-Fisheries, Army Corps of Engineers (COE), and WDFW.

Water Shortage (Drought)

- While a concern at many hatcheries, drought is not an issue at both Little White Salmon and Willard NFH. Even in low water years, flows from the Little White Salmon River are sufficient to support hatchery operations. This has been made possible by the termination of the Broughton Lumber Flume and closure of the Broughton Lumber Mill at Willard, Washington during 1985. The Flume required large amounts of diverted water to move saw logs to a finishing mill in Underwood, Washington. Water used to support flume operations is now left in the Little White Salmon River and is responsible for maintaining more than adequate instream flows.

Surplus Adult Salmon Distribution.

- In many years, more fish return to the hatchery than are needed for brood stock. Surplus fish are distributed to the YN to support the tribe's nutrition program.

- For fish above and beyond those required to meet brood stock and tribal needs, the absence of wild and ESA-listed stocks in the Little White Salmon watershed allows management flexibility regarding the disposition of salmon excess to hatchery needs. Whenever possible, excess hatchery fish will be left in the Little White Salmon River to allow for natural spawning, consumption by wildlife, and stream nutrient enhancement from carcass decomposition.

- Fish not suitable for human consumption are typically rendered or supplied for stream enrichment programs.

Fish Passage and Ladder Management

- The waterfall located 1.75 miles above the confluence with the Columbia River is a natural barrier to anadromous fish passage in the upper watershed limiting options available for natural spawning activity. While agency managers agree that spawning habitat on the Little White Salmon River is marginal at best, small pockets of spawning gravel exist below the barrier. In addition, the hatchery (433 acres) is the site of an active bald eagle roost and is intensively used by wintering bald eagles. Allowing carcasses to remain in the river and Drano Lake is extremely beneficial to local wildlife and the Columbia River ecosystem. As a result, the hatchery has become a popular watchable wildlife viewing area.

- On high adult return years, not all adults are allowed to enter the hatchery. Rather adults are collected by pulsing the ladder openings through the spectrum of the run until escapements are met. Tribal requests for adult salmon are filled by additional ladder openings. Fish brought into the hatchery that exceed escapement goals are returned to the river. Fish enter the hatchery daily, are visually counted and guided to one of two holding ponds.

Negative Impacts to Listed and Other Aquatic Resources and Actions Taken to Help Recover Listed and Depressed Populations

All hatcheries must consider their potential for adversely affecting the aquatic community. Assessments to date have determined that hatchery operations at Little White Salmon NFH do not adversely affect ESA-listed stocks.

- To meet ESA obligations, the Service is proceeding with actions to comply with the 1999 Biological Opinion on hatcheries.

- The Service has also developed Hatchery and Genetic Management Plans (HGMPs) to help assess impacts from hatchery operations (USFWS 2004).

- The Service needs to take hatchery reform actions to help recover listed and depressed populations.

- Implementing measures identified by the HGMP, this CHMP, and in Biological Opinions will require additional resources.

Insufficient Operations and Maintenance Funding Through the Mitchell Act

- Mitchell Act funding has been inadequate for over ten years. Increased demands on hatchery programs, as required by ESA Biological Opinions, have strained hatchery budgets. Without increases in Mitchell Act funding, reductions in production programs will continue to occur. The Service is currently working with NOAA-Fisheries and other co-managers to address current budget shortfalls.

Harvest Contribution

- The spring and fall Chinook and coho salmon from the Complex have made significant contributions to commercial, sport and tribal fisheries in the ocean, the Columbia River, and Drano Lake. The Drano Lake sport and tribal fisheries are extremely popular, contributing several thousand fish annually to both sport and tribal fishers.

Economic Benefit

- The role of a federal mitigation hatchery is to compensate for natural habitat lost to federal hydro-projects. It follows then, that the economic benefit of the mitigation hatchery is interwoven into the economic benefit of the hydropower projects being mitigated for and that the hatchery can be characterized as an operating expense of the hydro-power project. The Service recognizes that mitigation hatcheries serve a significant role in supporting economically important fisheries.

Unmet Management Needs

The following unmet management needs, which are linked to hatchery goals and objectives, were identified in fiscal year 2001:

- The 1999 NOAA-Fisheries Biological Opinion on Artificial Propagation in the Columbia River Basin lists a host of measures which either must, in the case of Reasonable and Prudent Alternatives, be complied with or, in the case of Conservation Recommendations, should be implemented. Reasonable and Prudent Alternatives for both Little White Salmon and Willard NFH are listed in Chapter 4, under ESA compliance.

- Funding for Complex operations and support services are provided to the Service through the Mitchell Act as administered by the NOAA-Fisheries, COE-John Day mitigation, and the Bonneville Power Administration (BPA)-Umatilla Basin Fisheries

Program. Increased demands on hatchery programs, as required by ESA Biological Opinions, are inadequately funded through the Mitchell Act. Either Mitchell Act support needs to be increased or alternative funding sources need to be identified.

CHAPTER 1. INTRODUCTION/BACKGROUND

The Little White Salmon NFH was placed in operation following official Congressional authorization in 1898 with the intent to supplement the commercial fishing industry. The hatchery's role expanded during the 1930's under the Mitchell Act to one of mitigation for the loss of habitat due to the completion of Bonneville Dam in 1938. Operation of Willard NFH, initiated in 1952 under authority of the Columbia River Development Program, assisted with the mitigation effort to replace fisheries lost due to operation of Columbia River hydroelectric projects. Today the Little White Salmon/Willard NFH Complex program includes the production of three species of salmon for release and off-site transfer to provide mitigation for the construction and operation of dams on the Columbia River and to assist with tribal restoration efforts. The results of numerous recent scientific evaluations have been incorporated into both hatchery programs in an attempt to reform fish production operations to produce a more "natural-like" salmon smolt. The use of cover during rearing to simulate riparian habitat found in juvenile streams and the introduction of predators prior to release are examples of hatchery reform efforts made to enhance the survival of fish after release from both hatcheries. The results of this work were incorporated into a new raceway design where new raceway concrete has been colored to match the stream substrate of the Little White Salmon River, providing a hatchery environment that more closely matches the salmon natural stream environment. Today biologists tag fish before being released from the hatchery with coded wire tags that are part of an intensive hatchery evaluation effort to document survival of hatchery fish and monitor their interactions with wild fish. Mass marking by clipping a fin on coho and spring Chinook salmon reared at both the Little White Salmon and Willard NFHs is an integral part of an effort to manage the harvest of hatchery fish in a fishery that contains unmarked ESA-listed and wild stocks of fish. Plans are underway to mass mark fall Chinook starting in 2005 except for special conservation purposes. Recent hatchery reform efforts have added to the lessons learned over the last hundred years of fish culture in the Little White Salmon River watershed.

1.1 Purpose and Need for Plan

The Service has recognized the need for a comprehensive hatchery planning process to assist in meeting the challenge of changes to hatchery management required by the conservation status of most Pacific salmon and other anadromous and freshwater fish species. The development of plans, such as this one, will help to: 1) integrate Service objectives and priorities with those of co-managers, other agencies, and resource programs; 2) fulfill our obligations under the ESA and relevant fisheries conservation, mitigation, and management programs; 3) identify and define in specifics what hatchery reforms we are implementing to achieve our objectives; and, 4) provide a foundation for future program and budget development and review.

The Service is committed to developing and maintaining sound scientific and management support for its programs. The Service has participated with state, tribal and federal partners in reviewing and assessing hatchery operations as they evolve to become part of the solution to fisheries restoration and recovery goals. The Service has involved our cooperators in defining and evaluating our respective roles, and continues to reach out to the general public, individual constituent groups, and local governments to explain our programs and goals. A system of program evaluation that utilizes principles of adaptive management to integrate new information

and expectations has been implemented by the Service. The journey of developing these plans, the research, analysis, thought, and outreach, is as important as the product itself. The Service looks into this process to stabilize and strengthen fish production programs in fisheries restoration and recovery efforts throughout the nation.

1.2 Description of Planning Process

The planning process began in September 2003 with establishment of the Little White Salmon/Willard CHMP Team, the core group responsible for drafting and revising the CHMP as it moves towards its anticipated completion in Spring of 2005. The Team is composed of Service staff directly involved with the hatchery program. Additional coordination was provided by members from the Regional CHMP Steering Committee. The Steering Committee, composed of Service representatives from the Pacific Region (Region 1), provided oversight to the CHMP development process. In addition, the Steering Committee developed the general format, time line for completing the CHMP process, reviewed drafts of the Little White Salmon CHMP to ensure consistency with both the approved format and other CHMP's under development in the Region, and ensured consistency with regional and national goals of the Service Fishery Program.

1.3 Composition of Planning Team

The planning team was made up of Service representatives from the following offices:

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- Speros Doulos, Plan Co-Lead (Little White Salmon NFH)
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- Peter Long, (Little White Salmon NFH)
- Mary Stad, (Little White Salmon NFH)

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- Patty Crandell (AFTC)

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Susan Gutenberger (LCRFHC)

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Portland, OR 97232-4181
Rich Johnson, Steering Committee Liaison

1.4 Review and Update of Plan

Because the biological, sociological, economic, and political environment is constantly changing, the role and responsibilities of the Complex can also be expected to change. The intent from the beginning was that the CHMP would be dynamic in nature. Therefore, it was necessary to include a process for reviewing and updating the plan on a periodic basis. Review and update of this plan will take place approximately every five years and will be the responsibility of the Hatchery Evaluation Team (HET).

1.5 Fisheries Program Mission, Goals, and Priorities

Our National Fish Hatcheries have authority for construction, operation, and maintenance that is contained in a variety of specific and general statutes. The remainder of the Fisheries Program is guided by a variety of general statutory mandates and authorities. Without the specific direction that would come from organic legislation, the Service has continually adjusted the priorities of the entire Fisheries Program, at the national level, to guide the Program and ensure that each Region within the Service is focusing their limited resources on the highest priorities of the Nation.

The following paragraphs are excerpted from Conserving America's Fisheries - U.S. Fish and Wildlife Service Fisheries Program Vision for the Future (USFWS 2002) and outline the Fisheries Program's mission, goals and priorities. The entire document is available at http://pacific.fws.gov/Fisheries.

In order to better conserve and manage fish and other aquatic resources in the face of increasing threats, the Service worked with partners to refocus its Fisheries Program and develop a vision. **The vision of the Service and its Fisheries Program is working with partners to restore and maintain fish and other aquatic resources at self-sustaining levels and to support Federal mitigation programs for the benefit of the American public.** To achieve this vision, the Fisheries Program will work with its partners to:

- **Protect the health of aquatic habitats**
- **Restore fish and other aquatic resources**
- **Provide opportunities to enjoy the benefits of healthy aquatic resources**

In July, 2001, the Sport Fishing and Boating Partnership Council (SFBPC) was charged by the Service to convene a steering committee representing perspectives from a broad array of stakeholders in fish and aquatic resource conservation to work with the Fisheries Program during the development of a new blueprint for the future. This provided partners with a unique opportunity to be engaged before the strategic vision was drafted. It was also unique because the Fisheries Steering Committee included representatives from the Service, along with partners and stakeholders.

In January, 2002, the SFBPC Fisheries Steering Committee provided the Service with a set of consensus recommendations on the Fisheries Program's role in the partnership effort to conserve the Nation's fish and other aquatic resources. This report, entitled "A Partnership Agenda for Fisheries Conservation," along with the earlier SFBPC hatchery report, "Saving a System in Peril," were keystone elements in developing the Fisheries Program's strategic vision. Using these two reports and working collaboratively with partners, the Service has better defined its role in conserving and managing aquatic resources across the county. This strategic vision discusses where the Fisheries Program is today, where it needs to go in the future, and why it is important to get there. To move forward and be successful in this role, the Fisheries Program must be solidly supported, backed by sound science, and grounded in dynamic partnerships.

The Service will also ensure that actions taken by the Fisheries Program will be consistent with strategic plans being developed by the Department of the Interior and the Service as a whole, and that Fisheries Program actions will help achieve performance targets laid out in those plans. The Fisheries Program's strategic planning effort is proceeding parallel to the strategic planning efforts being conducted by the Department and the Service. These planning efforts have been closely coordinated to ensure agreement and consistency among the three levels of management.

The Service is re-committing to its role as a partner in conserving America's fish and other aquatic resources. In some cases, the Fisheries Program will lead; in others it will facilitate or follow. In all cases, the Fisheries Program will focus its efforts and activities on what it is best positioned to contribute based on its unique resources and capabilities, recognizing that sound science and solid partnerships will continue to be the key to aquatic resource stewardship. Working with its partners, the Fisheries Program has identified seven areas of emphasis with associated goals, objectives, and actions to focus on in the future. In some cases, these actions reflect a reaffirmation of current activities; in other cases, they reflect some change in those activities. In a few cases, the actions reflect a new activity for the Fisheries Program. Many of its current activities support these goals and objectives, and there will be some opportunities to refocus and change within existing resources. However, the scope and speed with which this blueprint for the future becomes reality will depend on the level of support and resources that are available to the Fisheries Program.

Listed below are the seven national level focus areas identified in Conserving America's Fisheries - U.S. Fish and Wildlife Service Fisheries Program Vision for the Future (USFWS 2002). Under each national focus area are sub-focus areas identified in the Pacific Region Fisheries Program Strategic Plan (USFWS 2003). This Regional Strategic Plan and the sub-focus areas listed were developed with the help of Tribal, State, internal and external partners, in addition to other stakeholders.

National Focus Area: Partnerships and Accountability

Regional Sub-Focus Areas

- Maintain communication with stakeholders and establish meaningful partnerships for the purpose of accomplishing all of our goals.
- Improve accountability by establishing and implementing a better system for measuring and reporting progress.

National Focus Area: Aquatic Species Conservation and Management

Regional Sub-Focus Areas

- Native species will be protected and enhanced while maximizing species diversity and recreational opportunities, and meeting tribal needs.
- Minimize introductions of aquatic nuisance species while attempting to contain, reduce, and eliminate them.
- Support, facilitate or lead collaborative approaches managing interjurisdictional fisheries while conserving and restoring fish populations.

National Focus Area: Public Use

Regional Sub-Focus Areas

- Promote quality recreational fishing.
- Identify, meet, and obtain full funding for mitigation fisheries.

National Focus Area: Cooperation with Native Americans

Regional Sub-Focus Area

- Assist Native American tribes in their endeavors to manage, protect, and conserve their trust resources.

National Focus Area: Leadership in Science and Technology

Regional Sub-Focus Area

- Provide leadership in science and technology by using state-of-the-art and scientifically sound research studies and management techniques.

National Focus Area: Aquatic Habitat Conservation and Management

Regional Sub-Focus Area

- Protect, conserve and restore aquatic habitat by collaborating with internal and external partners with land management or regulatory authority.

National Focus Area: Workforce Management

Regional Sub-Focus Area

- Develop a diverse, effective, and motivated workforce.

1.6 National Fish Hatchery System – National/Regional Overview and Statutory Mandates/Authorities

The Service's stewardship of the nation's varied and valuable fishery resources dates from the appointment of Spencer Baird as Commissioner of Fish and Fisheries by President Ulysses S. Grant in 1871. That initial federal involvement was in response to concern over the widespread decline in domestic food fish supplies. In 1872, Congress provided the first appropriation for the Fishery Program when it funded the introduction of shad, salmon, whitefish, and other food fishes into waters to which they were best adapted. A little later that year, the propriety was strongly urged, at the Boston meeting, of sending an experienced fish-culturist to the west coast for the purpose of securing a large amount of spawn of the California salmon. Mr. Livingston Stone traveled to California and established a "hatching-works" on the McCloud River. This was the first salmon breeding unit in the United States, the first hatchery to be established with federal funds, and the beginning of the National Fish Hatchery System.

During the early years of the hatchery program, most national fish hatcheries were established under general authorizations for fisheries development as specified in appropriation acts. Then in the 1930's a series of acts provided authorizations for hatchery development. This permitted the National Fish Hatchery System to expand on a planned basis.

The Service has a 130-year history of leading federal fishery conservation efforts in the Pacific Northwest. During this time, our federal fishery resource involvement and responsibilities have grown, diversified, and undergone several modifications in response to continually changing needs. The program shifts and expansions evolved to address the circumstances of each era. Today, the Service is taking a holistic approach to fishery conservation. Present activities focus on a broad array of scientific fishery management and conservation efforts.

Attachment 1 provides a historical background into the establishment and operation of national fish hatcheries in the Pacific region. Since the establishment of the first salmon hatchery on the McCloud River, 67 hatcheries or fish facilities have been established in California, Idaho, Nevada, Oregon, and Washington. Only 19 of those hatcheries, 2 fish facilities, and 1 technology center are in operation today. The remainder have either been closed or transferred to state or other federal agencies.

Attachment 2 documents the development of a broad range of statutory mandates and authorities under which the Service conducts its hatchery program and numerous other fishery related activities in cooperation with other federal, state, tribal, and private entities. Vested with significant legal responsibilities under state and international agreements, treaties and laws, the Service conducts an extensive conservation effort in order to help protect and restore native aquatic species and their habitats with the goal of preempting severe declines and potential listings under the ESA.

The Pacific Region Fisheries Program consists of four major program activities: National Fish Hatcheries, Fish Health Centers, the Abernathy Fish Technology Center, and Fishery Resource Offices/Fish and Wildlife Offices. Successful implementation of the Service's hatchery activities requires close coordination and cooperation with the other three Fisheries Program

activities. Abernathy Fish Technology Center provides state-of-the-art applied research in several fields including development of new fish diets for fish, use of genetic identification in the recovery and restoration of native stocks, and development of new and improved techniques to increase the efficiency of fish culture and captive brood stock operations. Fish Health Centers participate in Investigational New Animal Drug registration that provide diagnostic and veterinarian services on wild fish stocks and hatchery-reared fish, and supply health certifications for the export of fish and fish eggs. Fishery Resource Offices/Fish and Wildlife Offices participate in a wide variety of activities including coast-wide stock assessment and evaluation, coded-wire tagging of hatchery indicator stocks for the U.S./Canada Treaty, evaluation of hatchery production, and assessment of new approaches to produce "wild type" fish at culture facilities. These offices also participate in a broad range of other activities including habitat assessment and restoration, non-indigenous species coordination, natural production studies, harvest assessment, fish passage coordination, and endangered species listing and recovery activities.

1.7 Regional Fishery Goals and Priorities

The Pacific Region Fisheries Program is committed to focusing its priorities and resources toward the conservation, recovery, and restoration of native resident and interjurisdictional species. The Fisheries Program works with state, federal, tribal and other partners, as well as on Service, tribal, and other federal lands, to ensure that its actions purposefully contribute to these objectives. Regional priorities are as follows:

1.7.1 Implementing Hatchery Reform. National fish hatcheries are reforming hatchery practices to conform with their associated scientific foundations and management evaluations of those efforts. National fish hatcheries in the Pacific Region produce and release stocks of fish, as identified in approved Hatchery Genetic Managements Plans (HGMPs).

1.7.2 Implementing Comprehensive Hatchery Management Plans (CHMPs). Implementation of the CHMPs is a Regional priority. Comprehensive plans incorporate the rationale, authorities and supportive documentation for operation and management of national fish hatchery programs.

1.7.3 Hatchery Evaluations. Monitoring and evaluation of hatchery production programs are a critical component of effective hatchery operations. Completion of hatchery management plans, including this one, will help identify research needs.

1.7.4 Hatchery Evaluation Teams (HETs). To foster and enhance communication in the hatchery production and evaluation process, active participation in HETs by Service programs, resource agencies, and public partners is a Fisheries Program priority.

1.7.5 Habitat Restoration and Technical Assistance to Other Regional Programs. Providing technical assistance to other Regional programs on Service lands with Partners for Fish and Wildlife and other Service habitat restoration efforts is a high priority of the Fisheries Program.

1.7.6 Tribal and Federal Lands. Providing support to tribal governments and federal land management agencies for fish and wildlife resources on their lands has always been, and continues to be, a high priority.

1.7.7 Fish Passage Improvement. An important part of the Fisheries Program is habitat restoration which re-establishes access to important historic habitats for fish. As such, emphasis is placed on fish passage improvement. A high priority is given to identifying and correcting fish passage problems at national fish hatcheries, other Service and non-Service lands.

1.7.8 Endangered Species Act (ESA). The Fisheries Program promotes and initiates actions that ensure all fisheries stations in the Pacific Region are in compliance with the ESA.

1.7.9 Compliance With Court Agreements and Other Legal Obligations. The Fisheries Program complies with court agreements and other legal obligations, and enhancement efforts that contribute to the mitigation, conservation, restoration, and recovery of listed, candidate and imperiled fish species, both anadromous native fish and resident native fish, such as, bull trout, cutthroat trout, desert fishes, and others.

1.7.10 Mitigation. The Fisheries Program implements artificial production to comply with mitigation responsibilities consistent with Congressional mandates and funding.

1.7.11 Restoration and Recovery of Native Fishes. Restoration and recovery of native fishes is a priority. Healthy stocks of native fish are indicators of clean water and healthy aquatic ecosystems. Healthy stocks of native fish also provide harvest opportunities for recreational, commercial, and tribal fishers.

1.7.12 Ecosystem and Cross-program Approach. The Fisheries Program continues to work within an ecosystem and cross-program approach using the collective expertise of our employees and Programs in coordinated fashion.

1.7.13 Make Full Use of Computer and Database Technology. An ongoing effort is to strengthen staff capabilities and make full use of computer and database technology in order to increase program effectiveness and efficiency, and meet the needs of resource management agencies, tribes, and other federal agencies.

1.7.14 Outreach. Educational and outreach opportunities are pursued to enhance public understanding of program responsibilities, capabilities, and accomplishments, and will continue to be an important component of the Fisheries Program.

1.8 Legal and Policy Guidance

National fish hatchery programs in the Columbia River Basin are shaped by various policies, regulations, laws, agreements and legislative mandates. National fish hatchery managers and policy makers are constantly challenged with the complex task of implementing a comprehensive state-of-the-art hatchery program while complying with legal, regulatory, and legislative mandates which have different and sometimes conflicting purposes. For example, the U.S.-

Canada Pacific Salmon Treaty, Mitchell Act and subsequent amendments, ESA and subsequent Biological Opinions, Treaty of 1855 with Columbia River Tribes, U.S. *v* Oregon court order of 1969 and subsequent Columbia River Fish Management Plan all guide production in the Columbia River. Chapters 3 and 4 further discuss legal justification and operational guidance for Little White Salmon NFH.

CHAPTER 2. HATCHERY AND RESOURCE DESCRIPTIONS

2.1 Hatchery Overview

Little White Salmon NFH is located in south-central Washington one mile upstream of the mouth of the Little White Salmon River. The Little White Salmon River joins the Columbia River at river mile 162. Drano Lake, a natural impoundment at the mouth of the river, is a popular sport and tribal fishing area. The hatchery encompasses 433 acres of land including easements. Operations are closely tied to Willard NFH.

Construction began at Willard NFH in 1952. The Willard facility was authorized by an amendment to the Mitchell Act to mitigate for fisheries lost due to the construction and operation of hydroelectric dams on the Columbia River. The earliest reports available regarding the Willard hatchery indicate that it was planned and constructed as a fall Chinook salmon production facility. The extremely cold water temperatures characteristic of the Willard NFH rearing water supply proved to be too excessive for the rearing of fall Chinook but were adequate for the rearing of coho and spring Chinook salmon. Located above an impassable natural waterfall, migrating adult salmon were unable to reach the Willard facility. Adult fish were collected and spawned at Little White Salmon and eggs shipped to Willard to initiate fish production. Originally, Willard was co-located with the former Western Fish Nutrition Laboratory which was responsible for making significant early advances in fish nutrition. The laboratory building is now occupied by the U.S. Geological Survey (USGS) Columbia River Research Laboratory, a substation of the Western Fisheries Research Center, Seattle, WA. In 1975, the Little White Salmon NFH and Willard NFH were administratively combined to form the Little White Salmon/Willard NFH Complex (Complex). Administration of the Complex occurs at the Little White Salmon facility. Complex facilities are managed, staffed, and budgeted as a single entity. The Complex has 12 full-time employees. The staff includes the Complex Manager, Deputy Complex Manager, Hatchery Manager – Willard NFH, two Fishery Biologists, a Maintenance Worker, and five Animal Caretakers.

2.2 Facility and Site Descriptions

Major facilities are located in two areas. The lower hatchery area includes the following major facilities:

- office building
- four stall garage
- feed storage building
- freezer/cold storage building
- hatchery building
- WDFW law enforcement office building
- 9 – 8’ X 79’ raceways with building enclosure
- spring collection box
- biofilter reuse system

Major facilities located at the upper hatchery area include:

- fish ladder
- barrier dam
- pollution abatement facility
- adult holding/spawning building
- road bridge over the Little White Salmon River
- 22 – 10’ X 110’ raceways
- 2 – 10’ X 235’ raceways

In addition, five government residences are located approximately ½ mile from the lower hatchery area.

Willard NFH is located on the Little White Salmon River approximately 5 miles upstream from the Little White Salmon facility. The hatchery includes 83.80 acres of land including an easement deed of 1.76 acres for water supply lines. A laboratory and associated buildings are located on the hatchery grounds. These facilities are now occupied by the USGS, Columbia River Research Laboratory. Major facilities located at Willard NFH include:

- hatchery building
- hazardous materials storage building
- metal-sided storage building
- pump house
- laboratory building and garage
- 50 – 8’ X 80’ raceways
- screen chamber and settling Basin
- concrete dam
- pollution abatement facility
- 9 government residences

Carson Depot Springs is a separate substation of the Little White Salmon/Willard NFH Complex. Located approximately 15 miles west of Little White Salmon NFH, this facility has a water supply and space for egg incubation. The Service has an indefinite lease with Burlington Northern Railroad for use of this 55’ X 100’ land parcel. This area includes a spring water supply and a small building equipped with 50 -16 tray incubators for egg incubation. Carson Depot Springs is primarily used for incubation of coho salmon eggs prior to shipment to Willard NFH and for various research activities requiring egg isolation (quarantine to prevent the spread of fish disease for eggs from outside the Little White Salmon River watershed).

Table 1 contains descriptions of primary buildings located at Little White Salmon NFH.

Table 1. Hatchery buildings, primary use of buildings, size and construction type. Further information can be found within the Little White Salmon NFH Real Property Inventory and the Complex station development plan (USFWS 1987).

Building	Area (ft^2)	Construction Material	Year Constructed and Remodeled	Purpose
Hatchery Building	4,228	Concrete & Wood	1939 and 1998	Used to incubate eggs and fry
Office/Visitor Center	3,180	Wood	1952 and 2000	Administration and public information
Cold Storage Building	3,684	Cement/Brick	1949, 1954 and 1999	Used to store fish feed
4-Stall Garage	1,456	Cement Block	1955	Used for vehicle storage and welding area
Adult Holding Spawning Bldg.	10,800	Cement/Metal	1983 and 1991	Used to hold and spawn adult fish
Spring House	495	Cement/Wood	1998	Contains microscreen drum filter and provides river, spring, and well water for incubation.
Heavy Equipment Garage	2,160	Metal	1981	Used for vehicle and equipment storage
WDFW Law Enforcement Building	500	Metal	1988	Office and equipment storage for WDFW Law Enforcement
Quarters #3A	1,100	Brick	1952	Hatchery staff residence
Quarters #4A	1,100	Brick	1952	Hatchery staff residence
Quarters #5A	1,100	Brick	1952	Hatchery staff residence
Quarters #6A	1,100	Brick	1952	Hatchery staff residence
Quarters #7A	1,100	Brick	1952	Hatchery staff residence

Facilities used for the incubation and rearing of both spring Chinook and upriver bright fall Chinook salmon are described in Table 2.

Table 2. Incubation and rearing facilities located at Little White Salmon NFH.

Unit type	Length (ft)	Width (ft)	Depth (ft)	Volume (ft^3)	No.	Material	Age	Condition
Lower Raceways 25-33	79	8	1.8	1,159	9	concrete	50	Good
Upper Raceways 1-22	110	10	3.5	3,850	22	concrete	3	Good
Upper Raceways 23-24	214	10	3.5	7,490	2	concrete	3	Good
Adult Holding Ponds	90	30	6	16,200	2	concrete	12	Good
Vertical Stack, 16 Tray Incubators					132	fiberglass	20	Good
Pollution Abatement Clarifier, Circular				19,625	1	concrete	28	Fair
Nursery Tanks 1-10	16	3	2	96	10	fiberglass	30	Good

Table 3 contains descriptions of primary buildings located at Willard NFH.

Table 3. Hatchery buildings, primary use of buildings, size and construction type. Further information can be found within the Willard NFH Real Property Inventory and the Complex station development plan (USFWS 1987).

Building	Area (ft^2)	Construction Material	Year Constructed and Remodeled	Purpose
Hatchery Building	21,840	Brick	1952 and 2001	Office space and used to incubate eggs and fry
Garage	1,740	Brick	1952	Contains shop areas
Storage Building	2,304	Metal	1955	Equipment storage
Laboratory Building	7,792	Brick	1952	Currently occupied by USGS
Laboratory Garage	2,070	Brick	1952	Used for USGS fish rearing experiments
Quarters 1-9	1,100 each	Brick	1952	Occupied by employees from the Complex, USGS, Spring Creek NFH, and LCRFHC

Facilities used for the incubation and rearing of coho salmon at Willard NFH are described in Table 4.

Table 4. Incubation and rearing facilities located at Willard NFH.

Unit type	Length (ft)	Width (ft)	Depth (ft)	Volume (ft^3)	No.	Material	Age	Condition
Raceways 1-50	80	8	2.2	1,408	50	concrete	52	Good
Vertical Stack, 16 Tray Incubators					30	fiberglass	20	Good
Nursery Tanks 1-52	16	3	1.9	91	52	concrete	30	Good
Carson Depot Springs					48	fiberglass	20	Good

2.3 Hatchery Purpose

Little White Salmon NFH was placed into operation in 1898 to supplement the commercial fishing industry. Little White Salmon NFH was authorized by Appropriations Act, 24 Stat. 523, March 3, 1887 and again by the White Act, 46 Stat. 37, May 21, 1930. The hatchery was reauthorized by the Mitchell Act (16 USC 755-757; 52 Stat. 345) May 11, 1938 and amended on August 8, 1946, (60 Stat. 932) for conservation of fishery resources in the Columbia River Basin. Willard NFH began operation in 1952 as part of the Columbia River Fishery Development Program also authorized by the Mitchell Act (16 USC 755-757; 52 Stat. 345) May 11, 1938 and amended on August 8, 1946, (60 Stat. 932) for conservation of fishery resources in the Columbia River Basin. In addition, the Little White Salmon facility serves as part of the COE's mitigation for John Day Dam, Flood Control Act of 1950. Today the hatchery complex includes the production of three species of salmon for release and off-site transfer to provide mitigation for the construction and operation of dams on the Columbia River and to assist with tribal restoration efforts.

The following hatchery management goals were adapted from the Mitchell Act, ESA Biological Opinions, U.S. *v* Oregon agreements, COE's John Day Mitigation, and the Integrated Hatchery Operations Team – Operation Plans for Anadromous Fish Production Facilities in the Columbia River Basin Volume III – Washington, Annual Report for 1995 (IHOT 1996).

Goal 1: Return upriver bright fall and spring Chinook salmon upstream of Bonneville Dam as defined in the Mitchell Act of 1937 to mitigate for fisheries lost due to the construction and operation of Columbia River hydroelectric projects.

Goal 2: Transfer upriver bright fall and spring Chinook and coho salmon for off-site acclimation and release in areas upstream of Bonneville Dam in support of tribal restoration programs and to support the development of locally adapted stocks.

Goal 3: Assure that all the requirements of legal orders and federally mandated legislation are met.

Goal 4: Develop public use opportunities related to recreational fishing on Drano Lake, and provide information and educational opportunities to enhance public understanding of Little White Salmon NFH and Service programs.

To achieve these goals, 2,000 upriver bright fall Chinook and 1,500 spring Chinook adult brood stock from the Little White Salmon River are collected, spawned, eggs incubated and reared at the hatchery to produce 3.7 million sub-yearling upriver bright fall Chinook smolts and 1.0 million spring Chinook yearling smolts for release into the Columbia River or transfer for acclimation and release at other facilities. In addition, eggs are received from adult spring Chinook collected and spawned on the Umatilla River and coho salmon collected and spawned on the Wenatchee River to initiate production of locally adapted stocks. This will result in the transfer of 210,000 spring Chinook yearling smolts back to the Umatilla River and 650,000 yearling coho smolts for release in the Wenatchee River Basin. Objectives, tasks, and current practices to achieve these goals are described in Chapter 3.

2.4 Archeology / Cultural Resources

The Little White Salmon NFH was established in 1898, although production began in 1896 on an experimental basis. The hatchery was built to address the decline of tule fall Chinook, the native salmon stock that returned to the Little White Salmon River. This site was selected since it was considered one of the principal spawning areas of the quinnat or Chinook salmon. Assistant U.S. Fish Commissioner William Ravenel, describing the significance of the hatchery site noted in 1898 that "*During the season, the salmon appeared in such large numbers below the rack that the Indians often speared two and three at one cast of the spear*." The original hatchery was described as a rough wooden structure without a floor and lit by skylights. It was equipped with 50 troughs that were fed by water from a nearby stream. Other buildings included a mess-house and sleeping quarters for employees. Eggs were taken from adult fish that were captured in a downstream trap from mid-September through mid-October. It was noted in 1898 that the best "fishing" occurred at night about one hour after dark. Spawning began in the morning and continued until eggs had been removed from all ripe fish. Hatchery records indicate that an average 16.5 million eggs were taken annually between 1896 and 1915. These eggs were incubated in baskets, hatched and eventually released as fry. Once the fry were released the station was closed for the season. The cost of constructing and operating the hatchery during the first year was $2,288.27 (Nelson and Bodle 1990, Attachment 11).

Profound changes occurred in hatchery operations during the next 50 years. While the hatchery continued to produce the native tule fall Chinook salmon, production was expanded to included chum, coho, sockeye and spring Chinook salmon. The completion of Bonneville Dam was probably the most significant event of the time. Not only was the hatchery flooded by the rising Bonneville pool, but the average annual egg take of tule fall Chinook declined by 44%. The natural spawning grounds of this fish were lost as habitat at the mouth of the river was inundated by the Bonneville pool. Led by scientific advances in fish culture, the hatchery program continued to change in an attempt to reverse the decline of the native stock. New fish culture techniques were implemented in an attempt to enhance hatchery survival, the most notable being the production of a formulated, pelleted fish food diet during 1958 (Nelson and Bodle 1990).

U.S. Fish & Wildlife Service ownership associated with Little White Salmon NFH encompasses 433 acres of land on the Little White Salmon River above its confluence with the Columbia River and approximately 15 miles up the Columbia from the Bridge of the Gods. The Little White Salmon River runs through its own steeply-sloped gorge, flattening out slightly as it approaches its confluence with the Columbia. Densely forested hillsides flank the river as it winds down out of the Cascades into the Columbia River.

The Little White Salmon NFH is located in south-central Washington in the Columbia River Gorge, a canyon cut through the Cascade Mountains by the Columbia River. Hajda (1984) notes that the Columbia "creates the only water-level pass through the Cascades and was the major route for Indian travel between coast and interior." Various geologic phenomena have shaped and reshaped the landscape of the Columbia Gorge, among them the Missoula Floods of the late Pleistocene, the series of landslides referred to as the Cascade Landslide, and most recently (ca. AD1100) the Bonneville Landslide (Minor et al 1986).

Human manipulation in the form of the Bonneville Dam, completed in 1938, has also changed the landscape of the Columbia Gorge and its tributaries. The backwater resulting from the construction of the dam altered the hydrology at the mouth of the Little White Salmon River, increasing the size of Drano Lake and raising the level of the river upstream. Seasonal flooding is routine and can be severe in the hatchery area.

Chinookan speakers occupied the area around the hatchery when Lewis and Clark came down the river in 1805.

". ..we came too at 3 houses on Stard. Side, back of which is a pond in which I Saw great numbers of Small Swan, Capt. Lewis and [I] went into the houses of those people who appeared Somewhat Surprised at first Their houses are built on the Same Construction of those above, Speak the Same language and Dress in the Same way. ..Here the mountains are high on each Side, those to the Lard. Side has Some Snow on them at this time, more timber than above and of greater variety."

Clark, October 29, 1805

The Corps of Discovery made camp beside these three houses of Indians on the south shore of Drano Lake (the pond). The notation on the map identifies the people as the "Smack Shop N[ation]" an ethnological study in the 1930s, "Investigators report two villages in this area on the north shore of the Columbia occupied by White Salmon and Klickitat peoples". The Klickitat were Sahaptin speakers and it has been suggested that they moved into the area following the arrival of the horse (Parks and Speulda 2001).

There are two previously recorded archaeological sites that occur in the vicinity of Little White Salmon NFH. Site 43SA103H is an historic Indian village on the north shore of Drano Lake, within the boundaries of the hatchery (recorded 5/82, by Service archaeologist Jan Peterson). According to the site record, informants indicate that there is also a prehistoric village at that location which is largely under water. At the time of site recording, scattered sawn boards from houses and two possible house depressions were visible, and many blue beads, projectile points, doughnut net sinkers and other stone artifacts had been collected from the area under water. Many of the artifacts were in the collection of Frank Wilkey of Bingen, WA, part of which was kept at the Maryhill Museum. His collection was sold when he died. The site is approximately 1 mile downstream from the project area. The "Smack Shop N" cluster of three houses beside which Lewis and Clark camped in 1805 on the south side of Drano Lake is completely submerged.

The other known cultural resource in the area is the Broughton Lumber Company Flume, constructed ca. 1921, which is listed on the Washington State Inventory of Historic Places. According to the inventory form, prepared in October 1974 by Washington State University, the wooden lumber flume runs about nine miles from Willard to Hood and is said to be the longest such structure ever built. In 1974 it was believed to be the last of the many flumes in the Pacific Northwest still in operation. A heritage marker installed at the pull-off beside Drano Lake tells the flume's history. A small portion of the flume route (ca. 1500') runs parallel to and apparently inside the easternmost boundary of the hatchery. It is located high on the hillside on the east side of the Little White Salmon River. In addition, another known resource

in the vicinity of Willard NFH is Site 45SA108, identified as a small transient habitation site on and adjacent to the floodplain at the south end of the hatchery (recorded by D. Abbott, 11/20/83 in Parks 2001).

2.5 Watershed/Ecosystem Setting

This section was taken from the draft Little White Salmon River Subbasin Plan (NWPPC 2000).

The Little White Salmon River originates in the Gifford Pinchot National Forest west of Monte Cristo Peak in south-central Washington and enters Drano Lake near Cook, Washington. Drano Lake, a backwater created by impoundment of the Columbia River, enters Bonneville Reservoir at River Mile (RM) 162 (Figure 1).

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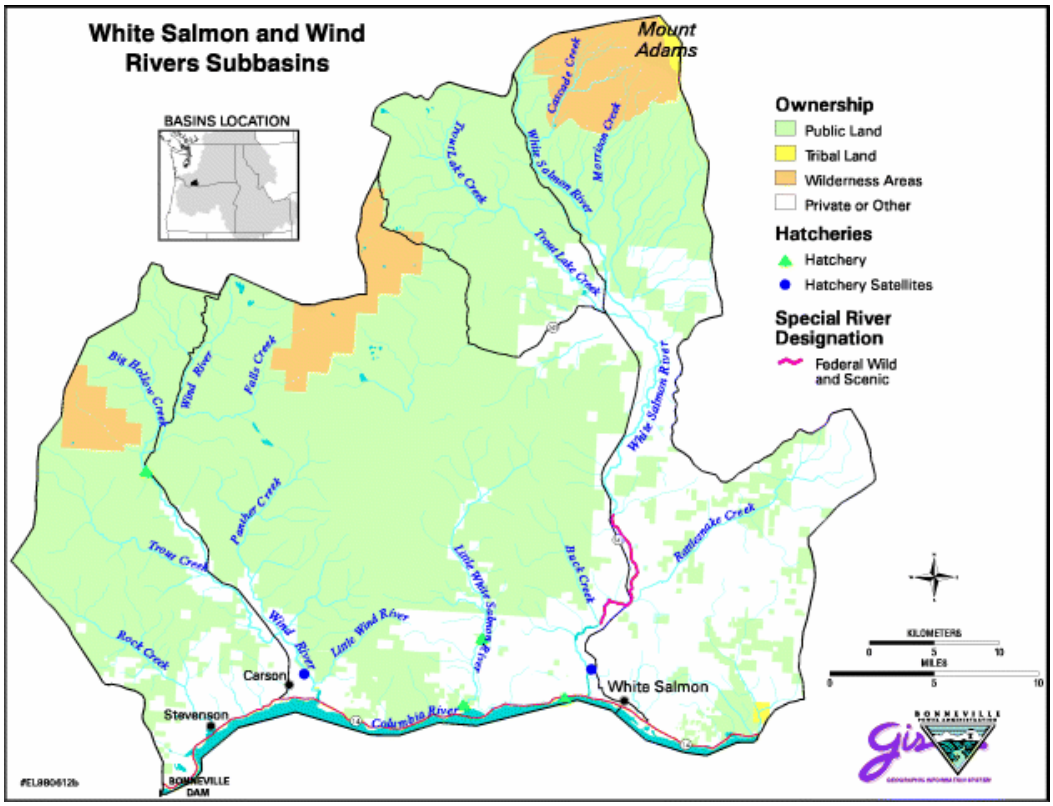


Figure 1. Location of the Little White Salmon Subbasin in the Columbia Gorge Province

The Columbia River is the fourth largest river in North America and drains parts of Washington, Oregon, Idaho, western Montana, northern Nevada and southern British Columbia (Bonneville Power Administration 1994). Little White Salmon NFH is located one mile upstream from the confluence of the Little White Salmon and the Columbia River within the Columbia River Gorge National Scenic Area upstream from the Bonneville Dam hydropower facility and downstream

of The Dalles hydropower facility. Located in the lower Columbia Basin, the Columbia River Gorge National Scenic Area is managed by the U.S. Department of Agriculture – Forest Service and was established by Congress in 1986 (Perry and Perry 1997). Being designated as a National Scenic Area allows for existing rural and scenic characteristics to be retained within the Columbia Gorge, while encouraging compatible growth and development within urban areas. The Columbia River Gorge itself is a deep canyon between Washington and Oregon and is the only sea-level passage through the Cascade Mountains. The western Columbia River gorge consists of forested hillsides of Douglas fir, Western cedar, and many fern and moss species. The eastern gorge consists of grassland interspersed with Ponderosa Pine and oaks. Within the Columbia Gorge there are massive canyon walls, large rock formations, waterfalls and numerous small tributary streams and springs (Perry and Perry 1997).

2.5.1 Geology The geology of the Little White Salmon Watershed is dominated by past volcanic activity. Subbasin soils are the result of volcanism and glaciation. The older tertiary deposits form most of the mainstem and these deposits have a tendency to decompose into silts and clays. Soils are deep in alluvial deposits and shallow on side slopes. Landslides occur where the erosion potential of surface soil is high and soil fertility is low. Large past active deep seated slides have flowed from Augsburger Mountain toward the Little White Salmon River. The younger quaternary deposits have shallower soils and are more stable. An example of this is the Big Lava Bed flow covering 16,000 acres of the watershed.

The Basin is oriented northwest to southeast with elevations ranging from 80-feet to 5,300-feet. Topography varies within the watershed from gentle slopes formed by lava flows and volcanic cones to steep rugged landforms. Based on geomorphology the watershed can be split into one area containing tertiary deposits of tuff and pyroclastic flow (Monte Cristo Range) and another containing younger quaternary basalt/andesite flows originating from the Indian Heaven Area. The mainstem of the Little White Salmon River drops 3,520-feet in 19 miles for an average gradient of 3.5%. Anadromous fish passage is blocked by a series of waterfalls located 2 miles upstream from the river confluence with the Bonneville Reservoir.

2.5.2 Climate and Hydrology Climatic patterns of the Little White Salmon Subbasin are controlled by marine-influenced air masses from the Pacific Ocean and continental air masses from eastern Washington. Winters are usually wet and mild, while summers are warm and dry. Approximately 75% of the precipitation is delivered in the form of rainfall or snow between October and March. The mean annual precipitation is approximately 65-inches.

The Little White Salmon River drains approximately 135 square miles of Skamania and Klickitat counties over a distance of approximately 19 miles. Principle tributaries to the Little White Salmon River include Lost (north and south), Beetle, Lusk, Homes, Berry, Cabbage, Moss, and Rock creeks. Stream flows in the watershed range from summer low flows to peak flows in the winter. Some streams only flow during high flow events and are dry the remainder of the year (ephemeral streams). Others such as the mainstem increase from an average daily flow of less than 60 cubic feet per second (cfs) during August and September to peak flows, which exceed 2,000 cfs during the winter. The largest stream flows typically occur in response to rain-on-snow events, when heavy rains combine with high air temperatures and high winds to cause

widespread snowmelt. Low flows are maintained by late season snowmelt and areas of water retention or recharge.

2.5.3 Vegetation Subbasin vegetation is generally comprised of mostly Douglas fir, western hemlock and grand fir. Unique habitats containing Oregon white oak and golden chinquapin are present within the watershed. There are 16,870 acres of early successional (seedling and sapling size up to 5 inches DBH); 24,840 acres of mid-successional (5-12 inches DBH), and 15,180 acres of late successional (stands greater than 880 years old and 21 inches DBH); and 14,160 acres of stands meeting the U.S.D.A. Forest Service (USFS) - Region Six definition of old growth.

2.5.4 Fish and Wildlife Fish assemblages in the Little White Salmon River are divided into the area above and below the RM 2 Falls. Species found downstream from the falls include spring and fall Chinook, coho salmon, winter and summer steelhead, largescale and bridgelip suckers, pacific and brook lamprey, threespine stickleback, sculpins, white sturgeon, redside shiners, peamouth, and northern pikeminnow. Historically, pink and chum salmon likely used this area but are believed to be extirpated. Species found upstream of the falls included rainbow trout, sculpin, brook trout (non-endemic) and coho salmon (non-endemic). No anadromous fish except hatchery coho smolts, which are released from Willard NFH, are found above the falls at RM 2.

Steelhead (Threatened, Lower Columbia Ecologically Significant Unit (ESU), 3/98)

Natural spawning of summer and winter steelhead in the Little White Salmon River below the hatchery diversion is limited. Size of historical spawning populations is not well documented, but is believed to be low since distribution was limited to only two miles of habitat.

Since 1998, Skamania stock summer steelhead have been released in the Little White Salmon River watershed. Due to the reduced ecological and genetic risks in the Little White Salmon River, Wind River releases were transferred to this site to provide local recreational and tribal fishing opportunities. All hatchery steelhead are adipose fin clipped and the river has been managed under catch-and-release sport fishing regulations for wild steelhead since 1986.

The Drano Lake area of the Little White Salmon River supports a tremendous steelhead fishery. As upriver summer steelhead migrate up the Columbia River, they seek refuge in the cooler waters of Drano Lake. These fish will hold in the cooler water for days or weeks before continuing their upstream migration. This area provides a thermal refuge for summer steelhead stocks migrating up the Columbia River.

Chinook Salmon (Threatened, Lower Columbia ESU, 3/99)

Spring Chinook are not native to the Little White Salmon River. The WDFW believes any naturally spawning fish are hatchery strays, and that this population is not self-sustaining. Currently, spring Chinook salmon in the Little White Salmon River are managed for hatchery production.

Natural spawning of tule fall Chinook in the Little White Salmon River occurs below the barrier. Completion of Bonneville Dam inundated the primary habitat in the lower Little White Salmon

River and created Drano Lake. Natural production is likely composed of hatchery strays. The abundance of both tule and upriver bright fall Chinook salmon has been enumerated since 1997.

Upriver bright fall Chinook salmon originated from the Columbia River above John Day Dam. These fish have been reared at Bonneville and Little White Salmon hatcheries to mitigate for Chinook salmon lost due to the construction and operation of mainstem Columbia River dams. Stray upriver bright fall Chinook from these facilities have been observed in the Little White Salmon River and natural production of upriver bright fall Chinook occurs in the Little White Salmon River. Natural production is minimal since most suitable habitat was inundated by the Bonneville Pool following completion of the Bonneville Dam in 1938. Upriver bright fall Chinook salmon spawn later than tule fall Chinook and the abundance of the upriver bright fall Chinook salmon has been enumerated since 1997 in the Little White Salmon River.

Bull Trout (Threatened, 1998)

Bull trout have been observed in Drano Lake and managers believe these fish are part of an adfluvial population, which uses the Bonneville Pool. No bull trout were found in the Little White Salmon River (including a snorkel survey conducted during September 1995) aside from one caught in Drano Lake during 1988. Most recently, fisheries biologist Jim Byrne, WDFW, conducted a snorkel survey in the lower reach during spring 2004 and confirmed no evidence of bull trout found in the Little White Salmon River during surveys completed in the last 3 years. The WDFW believes that there are no resident bull trout in Drano Lake (Byrne personal communication June 24, 2004).

Coastal Cutthroat Trout (ESA candidate)

Because of the limited information and the lack of sampling that specifically targeted cutthroat trout, the status of coastal cutthroat trout in the watershed is unknown.

Coho (ESA candidate, Lower Columbia ESU, 7/95)

A small spawning population of coho persists in the Little White Salmon River. Hatchery coho are released in the Basin and hatchery strays are a likely source of any natural production.

Resident Rainbow

Resident rainbow trout are native to the Little White Salmon River drainage. Hatchery rainbow trout have also been stocked into this watershed. Hatchery trout were stocked throughout the Basin but most of the current stocking is confined to areas adjacent to camping sites in the middle section of the river. The purpose of this program is to provide recreational opportunities for local anglers. Stocking occurs annually at the end of May just prior to the start of the statewide stream fishing season on June 1. The status of the rainbow trout population is unknown.

Brook Trout

Brook trout are not indigenous to the Little White Salmon River watershed. Hatchery releases have been discontinued, but naturally reproducing populations have been established within this watershed from previous stockings. The status of brook trout populations is unknown at this time.

Pacific Lamprey (YN Species of Concern)

Pacific lamprey were historically and are currently important to the Yakama Nation (YN). The status of this species is unknown.

Black-tailed Deer (WDFW Priority Species)

Black-tailed deer inhabit most of western Washington and extend their range east of the Cascades in the Columbia River Gorge. Typically, black-tailed deer reside in finite home ranges in the lower elevation temperate forests. The Little White Salmon River is considered important black-tailed deer habitat and the majority of the upper drainage is in the Gifford Pinchot National Forest. The lower drainage is considered important deer winter range and specific habitat has been identified by the USFS.

Fisher ("Endangered" in Washington, 10/98; Federal "Species of Concern")

It is not know whether the Little White Salmon River Subbasin is part of the historical range of the fisher. Although extensive surveys for fishers have been conducted throughout their historical range, no known population of fishers exists in Washington. The apparent absence of fishers in Washington represents a significant gap (i.e., lack of population continuity) in the species range from Canada to Oregon and California. Oregon now has a resident population of fishers in the Cascades that could serve as a source population for Washington. However, the Bonneville Dam makes the Columbia River a more formidable barrier for fisher dispersal from Oregon to Washington.

Larch Mountain Salamander ("Sensitive" in Washington, 1993)

The Larch Mountain Salamander has a restricted range, and is almost entirely endemic to a small area in Washington. Its known distribution includes west-side habitats of the southern Cascades region in Washington and the Columbia Gorge area of Oregon and Washington. This range includes the Little White Salmon River Subbasin. The Larch Mountain salamander requires cool, moist environments in upland areas. Nearly all populations of these salamanders have been found on steep talus slopes in forested areas. They are also found in steep slopes in older forests, under woody debris on the forest floor or in detritus at the base of a snag.

Riparian Bird Guild

A great number of bird species are associated with or require riparian habitats in the Little White Salmon River Subbasin. As a subset of this guild, the neotropical migrants (e.g., willow flycatcher, yellow warbler, yellow-breasted chat, red-eyed vireo, Vaux's swift) continually exhibit declining population trends in this region. Lewis's woodpeckers are closely associated with large cottonwood stands. Historically, they were common in cottonwood habitats of the Columbia River but declines were noted after 1965 and they are now considered extirpated from the Columbia River riparian habitat. The yellow-billed cuckoo is a riparian obligate species that was once common along the Columbia River but has not been reported in this area since 1977. Species that are marsh obligates include the Virginia rail, sora rail, and marsh wren. Loss of riparian and riparian-marsh habitat for these birds resulted from the inundation and alteration of habitats in the Little White Salmon River Subbasin and in the mainstem of the Columbia River.

Western Pond Turtle (WDFW endangered species)

The western pond turtle is listed by Washington State as an endangered species. The western pond turtle is declining throughout most of its range and is highly vulnerable to extirpation in Washington. The species requires a continued recovery program to ensure its survival in the state until sources of excessive mortality can be reduced or eliminated. Additional turtles may still occur in wetlands that have not been surveyed in western Washington and the Columbia Gorge.

Western Gray Squirrel (threatened in Washington, 1993)

The western gray squirrel was listed as a state threatened species in Washington in 1993, when surveys indicated that the species' distribution was becoming increasingly patchy and disjunct. Small, isolated, populations remain in south Puget Sound, the Lake Chelan area, the southeast slope Cascade region, and the Columbia River Gorge, the latter being the largest in the state. The exact reasons for this decline are unknown; however, changes in the landscape likely play a key role.

The core population of the western gray squirrel is currently found in the lower Klickitat drainage from the southern YN boundary to the mouth of the Klickitat River. Western gray squirrels have been documented in the Little White Salmon drainage by the USFS. However, the existence of a population is still in question. Current threats include loss of habitat from logging, residential development, and invasion of the eastern gray squirrel.

2.5.5 Habitat Condition Current habitat conditions are a result of natural and stochastic events. In the Little White Salmon River these events include volcanic eruptions, earthquakes, fire, erosion/sedimentation, steam bank vegetation, large woody debris, and peak flow (USFS 1996). Human activities including riparian and upslope timber harvest, hydro and splash damming, water withdrawal, road building, and rural development have negatively affected fish and wildlife habitat.

Fish

The USFS classified stream channels in the Little White Salmon River based on the Rosgen classification system, which incorporates channel slope, meander width ratio, channel entrenchment, sinuosity, and width to depth ratio (Rosgen 1994). Channels were typed out as A, B, C, or E. Low gradient meandering stream channels (generally Rosgen C and E channels) contain substrate and water velocity that are preferred by salmonids for spawning and early rearing. In addition, Coho and Chinook salmon prefer these channels for rearing to the smolt stage. Rosgen A and B channels have moderate to low sinuosity, moderate to low width to depth ratio, moderate to high gradient and high to moderate entrenchment. "A" and "B" channels are dominant in this watershed and provide excellent rainbow trout rearing habitat and limited spawning habitat.

The Little White Salmon only supported about 2 miles of anadromous spawning and rearing habitat. Most of the anadromous habitat has been eliminated by the construction of Bonneville Dam. A barrier at the Little White Salmon NFH limits fish passage for the short distance between the hatchery barrier and the natural barrier. There is limited potential anadromous habitat above the natural barrier due to the steep gradient and other barrier falls located between the Little White Salmon NFH and the Willard NFH at RM 6. The single largest loss of habitat

occurred with the flooding of the lower Little White Salmon River after the construction of Bonneville Dam. The dam inundated the primary spawning area for the tule fall Chinook salmon and rendered the habitat unusable for this purpose.

The USFS manages 79% of the land within the Little White Salmon River Subbasin. The President's Forest Plan Record of Decision (ROD) categorizes the Little White Salmon River Basin as a Tier 2, Key Watershed that provides habitat for salmonids. The quality of habitat in the Little White Salmon River Subbasin will be largely be determined by federal management. Currently, habitat is considered fair to excellent depending on the location. Most habitat in the Subbasin is degraded compared to historic conditions. Habitat problems noted in the Subbasin plan are mainly related to timber harvesting practices and rural development. This is evidenced by increased peak flows, increased sedimentation, lack of large woody debris, increased width-to-depth ratios, and lack of riparian vegetation (USFS 1995). Throughout the Subbasin there continues to be a need to restore riparian vegetation, reduce sediment delivery to streams, enhance channel complexity, and ensure adequate recruitment of large woody debris into the system. The Washington Department of Ecology has designated stream segments of the Little White Salmon River Subbasin as water quality impaired. The 303(d) list identifies segments that do not meet the standards of the federal Clean Water Act. This Basin had pH below 6.5 on a number of occasions. The USFS believes this data may be suspect to equipment or operator error. However, low pH acid rain has been detected in the Columbia River Gorge and recently made headline news in *The Oregonian* newspaper, April 5, 2005.

Wildlife

The majority of terrestrial vertebrate species use riparian habitat for essential life activities and the density of wildlife in riparian areas is comparatively high. Forested riparian habitat has an abundance of snags and downed logs that are critical to many cavity birds, mammals, reptiles, and amphibians. This habitat is often characterized by relatively dense understory and overstory vegetation; cottonwood, alder, and willow are commonly dominant tree species in riparian areas. Riparian habitats are often forested, however they may contain important habitat subcomponents such as marshes and ponds that provide critical habitat for a number of species (e.g., Virginia rails, sora rails, marsh wren). Riparian habitats also function as travel corridors between and connectivity to essential habitats (e.g., breeding, feeding, season ranges). Inundation of the lower reaches of the Subbasin resulted in the loss of riparian habitat but also the loss of connectivity provided by that habitat along the Little White Salmon River to the Columbia River, and along the Columbia River to other Subbasins.

2.5.6 Current and Future Development The Little White Salmon River Subbasin is part of the Yakama Nation (YN) lands ceded to the United States in the Treaty of June 9, 1855. Within this area the tribe reserves the right to hunt and fish at all usual and accustomed places in common with citizens of the territory. The upper portion of the Basin and its tributaries are located within the legislated boundary of the Gifford Pinchot National Forest (GPNF) and federal ownership accounts for 68,660 acres (79%) of the watershed. The Washington State Department of Natural Resources (DNR) owns land in the middle Basin, and extensive private ownership in the lower Subbasin. Private ownership in the Basin also extends along a narrow path on both sides of the mainstem Little White Salmon River into the headwaters, primarily in the valley bottoms. Most of the first six miles of mainstem river and its drainage are outside the

GPNF, but a large portion of this area lies within the Columbia River Gorge National Scenic Area (CRGNSA). ROD categorizes the Little White Salmon River Basin as a Tier 2, Key Watershed that provides habitat for salmonids.

The Little White Salmon River drainage was traditionally managed for timber production; however, under ROD, much of the drainage has been designated as riparian reserves, or reserved through other means. In addition to the GPNF and DNR, there is a limited amount of commercial timberland ownership in the lower valley. The land holdings within the CRGNSA are regulated by the CRGNSA's land use regulations as administered by Skamania County in addition to the Washington Forest Practices Act. Those outside the CRGNSA are regulated by the Washington State Forest Practices Regulations. Urban development has been concentrated in Willard, Washington, which is located five miles from the mouth of the river. Large-scale industrial activities are limited by lack of available land outside the National Forest and Scenic Area.

The proximity of the Columbia River Gorge to the Portland/Vancouver area makes it a popular recreation destination for cross country skiing, tubing, sledding, fishing, mineral prospecting, swimming, golfing, camping, hiking, picnicking, waterfall viewing, hunting, and berry picking.

2.6 History of Hatchery Stocks

The Little White Salmon NFH was built in 1896 to supplement the run of tule fall Chinook salmon (*Oncorhynchus tshawytscha*). The tule fall Chinook salmon egg take peaked at over 40 million in 1917, and the release of juveniles peaked at nearly 24 million in 1914. Fish were released as unfed fry until 1908, when increasing numbers were reared for later release. Construction of Bonneville Dam in 1938 severely disrupted hatchery operations by flooding the hatchery, and diseases were not a problem until the 1950's. From the 1917 peak of 40 million, the tule fall Chinook salmon egg take declined to a low of about 1.7 million in 1944 before recovering to nearly 30 million in 1958. In response to a generally declining and highly variable egg take after 1958, increasing numbers of eggs were obtained from other sources; after 1968, more than 50% of the fish released were not native. By 1985, the native tule fall Chinook salmon run had become depressed. Due to programmatic changes at Spring Creek NFH and given the depressed state of the stock, rearing tule fall Chinook salmon was abandoned at Little White Salmon NFH. Although the construction of Bonneville Dam had a deleterious effect on production and survival, the importation of nonnative stocks (which changed the genetic fitness of tule fall Chinook and introduced diseases) and rearing fish longer (which reduced survival in the hatchery) were contributing factors.

Therefore, after 90 years of rearing a native stock originally described as so abundant that the spawners filled the river for a month, efforts are now dedicated to rearing transplanted upriver bright fall and spring Chinook salmon stocks (Nelson and Bodle 1990).

Following a severe outbreak of bacterial gill disease in 1985 at Spring Creek NFH, the Service, in cooperation with other fishery agencies and tribes, evaluated actions necessary to restore the historical productivity of the Spring Creek NFH. Remedial measures included moving production of upriver bright fall Chinook from Spring Creek NFH to Little White Salmon NFH. In exchange, the native tule fall Chinook at Little White Salmon NFH were moved to Spring

Creek NFH. This avoided the rearing of two different sized (due to differential run timing) stocks of fall Chinook salmon, the smaller which suffered catastrophic mortality as a result of high bacterial loads in the Spring Creek NFH reuse system. This decision was made based on the best interests of hatchery production with no regard for determining the appropriateness of relocating a stock of salmon from its native watershed.

Beginning in 1977, upriver bright fall Chinook were trapped from Bonneville Dam fish ladder and spawned at Bonneville Hatchery. These trapped fish were used to establish a brood stock and evaluate their use in mitigating loss of spawners in John Day Pool. Following the unsuccessful attempt to rear upriver bright fall Chinook at Spring Creek NFH, these fish were moved to Little White Salmon NFH in 1988 (TAC 1997).

The Little White Salmon NFH spring Chinook are considered derivatives of the Carson NFH stock (Nelson and Bodle 1990). The Carson NFH stock is a mixture of upriver Columbia River spring Chinook stocks and is the brood stock founding source for Carson NFH. The founding brood fish were trapped at Bonneville Dam during 1958 – 1963 to initiate production of spring Chinook at Carson NFH. Genetic analyses have shown that the Carson NFH stock was founded from an unknown genetic admixture of fish from both the Snake and mid-Columbia rivers upstream from Bonneville Dam (Campton 2000).

Coho salmon formerly reared at Willard NFH are considered derivatives of Toutle River, WA stock (Nelson and Bodle 1990). Today these fish are included in the all-encompassing stock description referred to as the lower river stock, referencing early returning hatchery stocks of coho both immediately upstream and downstream of Bonneville Dam. A southern coastal distribution in relation to the mouth of the Columbia River is characteristic of the early returning, lower river stock coho. As a result, this stock provides harvest opportunities along the Oregon and northern California coasts; however, harvest can and does occur as far north as Alaska.

2.6.1 Legal Authority Congress passed the Mitchell Act, which was intended to help remedy the decline of salmon and steelhead, particularly from the negative effects of constructing Bonneville Dam. On August 8, 1946, the Act was amended (60 Stat. 932) by Congress to authorize the Secretary of Interior the transfer of funds to the states for specific projects to develop salmon resources (i.e. hatcheries). In 1947, the Columbia River Fisheries Development Program was formed to plan and coordinate the use of Mitchell Act funds. In 1956, Congress expanded the Mitchell Act to include the preservation of fisheries resources above McNary Dam. Administration of the Mitchell Act was shifted from the Department of the Interior to the Department of Commerce by the Reorganization Plan No. 4 of 1970 (84 Stat. 2090). The Act is currently administered by the NOAA-Fisheries which provides part of the funding to the Service for operation and maintenance of the Complex.

In addition to the initial authorizations listed above, hatchery operations are authorized, sanctioned and influenced by the following treaties, judicial decisions and specific legislation:

Treaty with the Makah, 01/31/1855;
Treaty with the Walla Walla, Cayuse, Umatilla Tribes, 06/09/1855;
Treaty with the Yakama, 06/09/1855;

Treaty with the Nez Perce, 06/11/1855;
Treaty with the Tribes of Middle Oregon, 06/25/1855;
Treaty with the Quinault and Quileute, 07/01/1855;
Mitchell Act, 52 STAT. 345, 05/11/1938;
Mitchell Act (Amended), 60 STAT. 932, 08/08/1946;
Shoalwater Bay Tribe, Executive Order, 09/22/1886;
Chehalis Tribe, Executive Order, 10/01/1886;
Hoh Tribe, Executive Order, 09/11/1983;
U.S. v. Oregon (Sohappy v. Smith, Belloni decision: Case 899), 07/08/1969;
Flood Control Act of 1944; (amended in 1950), 58 Stat. 887, 12/22/1944
Endangered Species Act of 1973, 87 STAT. 884, 12/28/1973;
Salmon and Steelhead Conservation and Enhancement Act, 94 Stat. 3299, 12/22/1980; Pacific Salmon Treaty Act of 1985 (U.S./Canada Pacific Salmon Treaty), Public law 99-5, 16 U.S.C. 363, 03/15/1985.

2.6.2 Production and Management History

Production and management history through 1985 is provided in Attachment 11 (Nelson and Bodle 1990). Major hatchery construction at Little White Salmon NFH and substantial changes in the production programs at both facilities occurred after this time.

Little White Salmon NFH Fish Production History 1985 – Present

Failure of the water reuse system at Spring Creek NFH coupled with other problems including heavy rearing densities in the hatchery ponds precipitated an outbreak of bacterial gill disease in February 1985 affecting both upriver bright and tule fall Chinook. The Service, in cooperation with the other fishery co-managers, determined that several actions were necessary to restore the historical productivity of Spring Creek NFH (CBFWA 1990). Some of these actions included moving production of upriver bright fall Chinook to Little White Salmon NFH in 1988. In addition, tule fall Chinook production at the Little White Salmon facility was moved to Spring Creek NFH to avoid mixed stock rearing in the Spring Creek reuse system, a condition that contributed to the outbreak of bacterial gill disease (TAC 1997). The Little White Salmon NFH fall Chinook program currently involves the rearing of the upriver bright stock to support the COE John Day Mitigation program. Fish are moved upstream to mitigate for fisheries lost due to the construction of John Day Dam. Upriver bright fall Chinook are currently transferred to the YN Prosser hatchery on the Yakima River for acclimation and release. In addition, the upriver bright stock from Little White Salmon NFH have been previously transferred to the Priest Rapids Hatchery, Hanford Reservation K-Basin ponds, Ringold Springs Hatchery, and the Umatilla River.

The spring Chinook program at Little White Salmon NFH has remained relatively stable since 1985. Between 1985 and 1995 there was a subyearling spring Chinook program at Little White Salmon NFH. The ultimate goal of the subyearling (fingerling) releases was to lessen the tim of hatchery rearing and increase survival to the adult stage. Adult spring Chinook were collected and exposed to decreasing photoperiod to advance maturation and spawning date (Zaugg et al. 1986). This ultimately led to the production of large pre-smolts at an earlier age, reducing

hatchery rearing time by one half. Unfortunately, coded-wire tag recovery data revealed that 0-age releases contributed few adults to the hatchery return. As a result, this program was terminated after the 1995 releases.

The hatchery began rearing spring Chinook yearling smolts in 1996 for transfer to the Umatilla River, OR. This is a cooperative effort between the hatchery, ODFW, and the CTUIR that involves the collection of adult spring Chinook at Threemile Dam on the Umatilla River with subsequent holding and spawning at the CTUIR South Fork Walla Walla facility. Eggs are eyed at the ODFW Umatilla Hatchery and shipped to Little White Salmon NFH for hatching, rearing and transfer to Imeques acclimation site on the Umatilla River as yearling smolts. The hatchery continues to rear yearling spring Chinook for release into the Little White Salmon River.

Willard NFH Fish Production History 1985 – Present

The Willard NFH coho salmon production program remained relatively consistent producing 2.5 million smolts for release into the Little White Salmon River. The program experienced a dramatic change with an increasing emphasis on moving fish upriver to meet tribal fishery management goals. The first of these transfers occurred on March 18, 1998 when 475,000 coho salmon smolts were transferred to Lapwai and Potlatch Creeks, tributaries of the Clearwater River, ID, to assist with a Nez Perce Tribe coho salmon restoration effort. In addition, during March 2000 a total of 1 million coho salmon smolts were transferred to the Yakima and Naches Rivers to support a YN coho salmon restoration and research effort. These fish received 100% coded wire tags to evaluate both early and late releases from 4 acclimation sites within the Yakima Basin. In both instances lower river stock coho salmon were used in support of these programs. This philosophy changed during December 2001 when eyed eggs derived from adult coho returning to the Wenatchee River were shipped to Willard NFH. Collected and spawned at Dryden Dam, this program is part of the YN mid-Columbia River coho restoration program that is attempting to use locally adapted coho stocks for reintroduction efforts.

In addition, Willard NFH participated in the rearing of upriver bright fall Chinook for transfer to the Umatilla River as yearling smolts in 1998. This production effort was plagued with fish health problems, most notably the increased incidence of bacterial kidney disease in the non-routine rearing of fall Chinook to the yearling stage (fish had achieved a size of 8 fish per pound and a length of 7.834 inches) . Also, Willard NFH participated in the rearing of spring Chinook for the Umatilla River program during the 2001 construction of new raceways at Little White Salmon NFH. Moved to Willard to avoid construction-related rearing problems, this stock of fish performed quite well with a successful transfer to the Umatilla River in February and March 2002 at 22 and 21 fish per pound respectively. Spring Chinook were reintroduced to Willard NFH during 2005 to assist with the off-site rearing of Leavenworth stock spring Chinook during a major pipeline and water intake rehabilitation project at Leavenworth NFH.

A major change occurred in the Willard NFH coho program when shortfalls in Mitchell Act funding nearly resulted in the closure of the facility. A total of 2.5 million Brood Year 2003 coho eggs and fry were destroyed and another 974,000 coho pre-smolts were released 3 months prematurely as cost saving measures. As a result, 2005 will be the last year that Willard NFH adult coho return to the Little White Salmon River. Willard NFH continues to operate in support

of the YN Wenatchee River and mid-Columbia coho reintroduction program using Wenatchee River returning fish to initiate production.

2.7 Biological Risks and Ecological Interactions between Hatchery Upriver Bright Fall and Spring Chinook and Coho Salmon and Wild (Listed) Salmon

All hatcheries must consider their potential to adversely affect the aquatic community. To help assess potential impacts, the Service has developed Hatchery and Genetic Management Plans (HGMPs) for each species reared at a NFH in the lower Columbia River, including Little White Salmon NFH (USFWS 2004a,b,c). These HGMPs are being drafted to assess our program and meet ESA requirements identified by the Service and NOAA-Fisheries. It is anticipated that these plans will be updated regularly and re-submitted to NOAA-Fisheries and the Service, as necessary.

In the HGMP, the Service assessed the potential impacts from hatchery operations including: water withdrawal and effluent discharge, brood stock collection, genetic introgression, juvenile fish releases, disease, competition, predation, residualism, and migration corridor and ocean impacts. Our assessment to date, with NOAA-Fisheries concurrence, concludes that operation of Little White Salmon NFH will not jeopardize listed fish populations (NMFS 1999). However, we also recognize that more research is needed to more fully understand the impacts of hatchery operations, releases, and impact of straying into local tributaries (see Chapter 4: Monitoring and Evaluation). In addition to completing documentation to comply with our ESA responsibilities, we must also meet our mitigation responsibilities under the Mitchell Act, John Day mitigation as well as meet our Tribal Trust and U.S. *v* Oregon obligations. In order to balance these sometimes conflicting mandates, we regularly meet with our co-managers to discuss operation and management of the hatchery. The following information was primarily extracted from the Little White Salmon NFH HGMP (USFWS 2004):

> The Little White Salmon NFH upriver bright fall Chinook, spring Chinook, and coho salmon programs may adversely affect listed populations, but impacts are substantially below the jeopardy threshold (NMFS 1999a). The 1999 Biological Assessment for the Operation of Hatcheries Funded by the NOAA-Fisheries under the Columbia River Fisheries Development Program (NMFS 1999a) and the 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin (NMFS 1999b) present a discussion of the potential effects of hatchery programs on listed salmon and steelhead populations.

2.7.1 Hatchery Water Intake and Use The water source for the Little White Salmon NFH is withdrawal from the Little White Salmon River, a series of springs, and a well. An impassable falls immediately upstream from the Little White Salmon NFH site in the lower Little White Salmon River precludes anadromous fish passage into the upper Basin. Water withdrawals for hatchery operation do not impact listed anadromous species because there is essentially no natural spawning or rearing habitat accessible to anadromous species in the Basin. Hatchery effluents meet established National Pollutant Discharge Elimination System (NPDES) release standards criteria and are diluted by the flow in the Little White Salmon River, reducing potential negative impacts to natural stocks.

The water source for the Willard NFH is withdrawal from the Little White Salmon River. An impassable falls immediately upstream from the Little White Salmon NFH site in the lower Little

White Salmon River precludes anadromous fish passage into the upper basin. Water withdrawals for hatchery operation do not impact listed anadromous species because there is essentially no natural spawning or rearing habitat accessible to anadromous species in the basin. Hatchery effluents meet established NPDES release standards criteria and are diluted by the flow in Little White Salmon River, reducing potential negative impacts to natural stocks.

2.7.2 Brood Stock Collection Little White Salmon spring Chinook are Carson stock and are not part of either the lower Columbia River Chinook ESU, which is listed as threatened, or the mid-Columbia River Spring Chinook ESU which is not listed. Returning spring Chinook are collected for brood stock at the Little White Salmon NFH rack near the mouth of the Little White Salmon River. Stray hatchery spring Chinook from other locations (primarily from Carson NFH and occasionally from upper Columbia and Snake River facilities) do occur at Little White Salmon NFH. Incidental collection of listed upper Columbia and Snake River spring Chinook are believed to be very low based on coded-wire tag (CWT) recoveries and should not have a significant impact on the listed stocks or the genetic integrity of the brood stock at the Complex.

Upriver bright fall Chinook are not native to the Little White Salmon River Basin and are not a part of the lower Columbia River Chinook ESU. This stock was introduced as part of the John Day Dam mitigation program in the early 1980s. Because upriver bright fall Chinook are an introduced stock for this area, there is a higher level of concern regarding potential ecological effects, especially hatchery introgression effects, if wide spread straying of this stock occurs. Returning upriver bright fall Chinook are collected for brood stock at the Little White Salmon NFH rack near the mouth of the river. Stray tule fall Chinook, presumably from Spring Creek NFH, are also collected but not spawned unless there is an identified shortfall at Spring Creek NFH, at which time Little White Salmon NFH may collect tule fall Chinook eggs and transfer them to Spring Creek NFH. Numbers of tule fall Chinook returning and spawned for this purpose are generally very low. Temporal separation of spawning (tule fall Chinook generally spawn about a month earlier) as well as differing visual characteristics of the two stocks assist in avoiding hybridization of the two stocks. Little White Salmon NFH also receives stray upriver bright fall Chinook from Bonneville Hatchery releases (same stock) based on CWT recoveries. CWT recoveries from upper Columbia and Snake River Basin upriver bright fall Chinook are rare.

Mitchell Act funding shortfalls resulted in recent coho program changes. As a result, coho salmon are no longer collected and spawned at Little White Salmon NFH for eventual transfer of eggs to Willard NFH. Previously, returning early stock coho were collected for brood stock at the Little White Salmon NFH rack near the mouth of the Little White Salmon River. Stray hatchery coho from other locations or returns from natural production are not known to occur at Little White Salmon NFH. Columbia River coho are currently not listed but natural populations continue to be a candidate species.

2.7.3 Genetic Introgression Little White Salmon spring Chinook do not contribute to a significant straying problem outside of the local area (Pastor 2004). There is essentially very little, if any, productive spawning habitat below Little White Salmon NFH at the mouth of the Little White Salmon River (Drano Lake). Historical spring Chinook habitat was inundated by Bonneville Pool when Bonneville Dam was constructed in 1938. There is no indication that the

Carson stock of spring Chinook reared and released at Little White Salmon NFH is negatively impacting other listed stocks through straying and genetic introgression. The very low numbers of non-Carson stock strays that occur on occasion in the Little White Salmon brood stock collection are at a level that should not significantly alter the genetic structure of the Carson stock used in the Little White Salmon NFH spring Chinook production program.

Little White Salmon NFH upriver bright fall Chinook are known to contribute to natural spawning populations in the local tributaries of the Wind and Big White Salmon Rivers (Pastor 2004). CWT recoveries from Little White Salmon NFH upriver bright fall Chinook have been recovered in annual spawning ground surveys and upriver bright fall Chinook have been colonizing these local tributaries since the mid 1980s (Harlan 1999). There is essentially very little, if any, productive spawning habitat below Little White Salmon NFH at the mouth of the Little White Salmon River (Drano Lake). Historical tule fall Chinook habitat was inundated by Bonneville Pool when Bonneville Dam was constructed in 1938.

Although upriver bright fall Chinook are colonizing the nearby Wind and Big White Salmon tributaries, the potential for genetic introgression with the local tule populations is diminished by the temporal separation in spawn timing of the two stocks, with tule fall Chinook spawning in September and early October and upriver bright fall Chinook spawning in late October and November. It is believed that the tule populations in the Wind and Big White Salmon Rivers may be largely supported by Spring Creek NFH strays (NMFS 1999a). Thus, it appears that both the tule and upriver bright naturally spawning populations of fall Chinook in the Wind and Big White Salmon Rivers may be heavily influenced by hatchery strays. Fisheries managers have expressed some concern that natural spawning by tule fall Chinook is disturbed by upriver bright fall Chinook spawning in these local areas. However, the fall Chinook natural production areas in these tributaries is very limited and comprise a very minor part of the lower Columbia River Chinook ESU as a whole. Therefore, the potential negative effect on the ESU as a whole is likely to be relatively minor. It would be advantageous to begin collecting genetic samples from progeny of the naturally spawning populations of tule and upriver bright fall Chinook in the two tributaries for comparison with samples from Spring Creek tule and Little White Salmon NFH upriver bright fall Chinook. Additional comparisons with samples from other natural populations in the lower Columbia River are needed to determine and monitor the genetic stock structure of the various populations.

Willard NFH coho do not contribute to a significant straying problem outside of the local area (Pastor 2004). There is essentially very little, if any, productive spawning habitat below Little White Salmon NFH at the mouth of the Little White Salmon River (Drano Lake). Historical coho habitat was inundated by Bonneville Pool when Bonneville Dam was constructed in 1938 (Bryant 1949).

2.7.4 Hatchery Production Little White Salmon NFH spring Chinook releases from the facility are moderate in magnitude (typically about 1.0 million spring Chinook smolts) relative to other Columbia River spring Chinook production programs. This level of release is not expected to cause serious density dependent effects in the mainstem Columbia River. Little White Salmon NFH spring Chinook are assumed to migrate quickly after release like their Carson NFH counterparts. However, these fish are not currently tagged with passive integrated transponders

(PIT) to verify out-migration timing. Since brood year 2000, all on-station releases of spring Chinook are 100% adipose fin clipped with 5% to 10% also coded wire tagged.

Little White Salmon NFH upriver bright fall Chinook releases from the facility are moderate in magnitude (typically about 2.0 million fall Chinook smolts) relative to other Columbia River fall Chinook production programs (e.g. Spring Creek NFH releases over 7 million smolts in March). This level of release is not expected to cause serious density dependent effects in the mainstem Columbia River. Little White Salmon NFH fall Chinook are assumed to migrate rapidly after release. PIT tagging would help to test this assumption, but would require additional funding. Starting with brood year 2004, all fall Chinook released on-station are to be marked with either an adipose fin clip or coded wire tag or both.

On site release of coho from Willard NFH have been terminated due to program changes resulting from shortfalls in Mitchell Act funding. Previous Willard NFH coho releases from the facility were moderate in magnitude (typically about 1.0 to 2.0 million coho smolts) relative to other Columbia River coho production programs. This level of release is not expected to cause serious density dependent effects in the mainstem Columbia River. The current 650,000 fish produced for the YN Mid-Columbia coho reintroduction program is minimal compared to the former on station program. All coho released on-station previously were marked (adipose clipped) to promote selective harvest while providing protection for wild stocks.

2.7.5 Disease Under the guidance of the Service's Lower Columbia River Fish Health Center (LCRFHC), the Complex follows the US Fish and Wildlife Service's fish health policy (713 FW in the Service's manual) and Integrated Hatchery Operations Team (IHOT 1995) protocols to produce healthy fish and prevent disease transmission (see sections 9.1.6 and 9.2.7). Most pathogens enter hatcheries through returning adult fish, surface water supplies, and other mechanisms involving direct contact with naturally spawning fish. Procedures used at the hatchery and the LCRFHC reduce pathogen transmission from these sources.

The fish health goal for Little White Salmon NFH upriver bright fall Chinook is to release healthy fish that are physiologically ready to migrate. The upriver bright fall Chinook are relatively disease-free and have a reduced potential for transmission of disease to other populations relative to other upriver programs which are subjected to the high density impacts and stresses of collection for transport and/or diversion through multiple bypass systems. Staff at the Little White Salmon NFH take appropriate measures to control disease and the release of diseased fish. As a consequence, infection of natural fish by hatchery fish would not appear to be a problem.

The fish health goal for Little White Salmon NFH spring Chinook is to release healthy fish that are physiologically ready to migrate. Hatchery managers largely understand the strain, abundance, and virulence (epidemiology) of pathogens and parasites in hatchery fish. Recent studies suggest that the incidence of some pathogens in naturally spawning populations may be higher than in hatchery populations (Elliot and Pascho 1994). Indeed, the incidence of high ELISA titers for *Renibacterium salmoninarum*, the causative agent of Bacterial Kidney Disease (BKD), appears to be significantly more prevalent among wild smolts of spring/summer Chinook salmon than hatchery smolts (Congleton et al. 1995; Elliot et al. 1997). For example, 95%

versus 68% of wild and hatchery smolts, respectively, at Lower Granite Dam in 1995 had detectable levels of *R. salmoninarum* (Congleton et al. 1995). Although pathogens may cause significant post-release mortality among hatchery fish, there is little evidence that hatchery origin fish routinely infect naturally produced salmon and steelhead in the Pacific Northwest (Enhancement Planning Team 1986; Steward and Bjornn 1990). Many biologists believe disease-related losses often go undetected and that the impact of disease on naturally spawning populations may be underestimated (Goede 1986; Steward and Bjornn 1990).

The fish health goal for Willard coho is to transfer healthy fish that are physiologically ready to migrate. At the time of transfer, the coho are relatively disease-free. Outbreaks of bacterial coldwater disease, more commonly seen in coho compared to other species of Pacific salmon, are routinely treated with antibiotics and have resolved well before the time of release. The Complex takes appropriate measures to control disease and the release of diseased fish. As a consequence, infection of natural fish by hatchery fish would not appear to be a problem.

The hatchery takes appropriate measures to control disease and the release of diseased fish, including chemotherapeutant administration to adults and juveniles. In addition, Little White Salmon NFH spring Chinook are released directly into the Little White Salmon River at the hatchery site near the river mouth and pass only one mainstem Columbia River dam (Bonneville Dam) en route to the ocean. Therefore, these spring Chinook have a much reduced potential for transmission of disease to other populations relative to other upriver programs which are subjected to the high density impacts and stresses of collection for transport and/or diversion through multiple bypass systems. Little White Salmon NFH takes extensive measures to control disease and the release of diseased fish. As a consequence, infection of natural fish by hatchery fish would not appear to be a problem.

2.7.6 Competition The impacts from competition are assumed to be greatest in the spawning and nursery areas at points of highest density (release areas) and diminish as hatchery smolts disperse (USFWS 1994). Salmon and steelhead smolts actively feed during their downstream migration (Becker 1973; Muir and Emmett 1988; Sager and Glova 1988). Competition in reservoirs could occur where food supplies are inadequate for migrating salmon and steelhead. However, the degree to which smolt performance and survival are affected by insufficient food supplies is unknown (Muir and Coley 1994). On the other hand, the available data are more consistent with the alternative hypothesis that hatchery-produced smolts are at a competitive disadvantage relative to naturally produced fish in tributaries and free-flowing mainstem sections (Steward and Bjornn 1990). Although limited information exists, available data reveal no significant relationship between level of crowding and condition of fish at mainstem dams. Consequently, survival of natural smolts during passage at mainstem dams does not appear to be affected directly by the number – or density – of hatchery smolts passing through the system at present population levels. While smolts may be delayed at mainstem dams, the general consensus is that smolts do not normally compete for space when swimming through the bypass facilities (Enhancement Planning Team 1986). The main factor causing mortality during bypass appears to be confinement and handling in the bypass facilities, not the number of fish being bypassed.

Juvenile salmon and steelhead, of both natural and hatchery origin, rear for varying lengths of time in the Columbia River estuary and pre-estuary before moving out to sea. The intensity and magnitude of competition in the area depends on location and duration of estuarine residence for the various species of fish. Research suggests, for some species, a negative correlation between size of fish and residence time in the estuary (Simenstad et al. 1982).

While competition may occur between natural and hatchery juvenile salmonids in – or immediately above – the Columbia River estuary, few studies have been conducted to evaluate the extent of this potential problem (Dawley et al. 1986). The general conclusion is that competition may occur between natural and hatchery salmonid juveniles in the Columbia River estuary, particularly in years when ocean productivity is low. Competition may affect survival and growth of juveniles and thus affect subsequent abundance of returning adults. However, these are postulated effects that have not been quantified or well documented.

The release of hatchery smolts that are physiologically ready to migrate is expected to minimize competitive interactions as they should quickly migrate from the release site. Little White Salmon NFH spring and upriver bright fall Chinook are released into the Little White Salmon River at the Little White Salmon NFH site. It is assumed that they migrate quickly into the mainstem Columbia River migration corridor en route to the ocean, as does the same stock released from Carson NFH, thereby reducing the potential for competitive interactions with listed stocks. There have been no mortalities recorded during saltwater challenges conducted during the last three brood years at the Little White Salmon NFH. Released fish have been fully smolted and begin their downstream migration immediately following release. In addition, blood plasma collected from brood year 1995 spring Chinook was analyzed for sodium and potassium concentrations. Those results also indicated that the spring Chinook are functional smolts at time of release. PIT tagging would provide additional, valuable information on the timing of emigration, but would require additional funding. Because Little White Salmon NFH spring Chinook releases occur “low” in the Columbia Basin system relative to many other upriver programs, there is reduced opportunity for competitive interactions. However, competitive interactions between the Little White Salmon NFH upriver bright fall Chinook and tule fall Chinook juveniles may be occurring in local tributaries.

Other observations leading to conclusions regarding the behavior of released smolts included physiological and survival data collected during recent NATURES rearing studies conducted for spring Chinook at Little White Salmon NFH and coho salmon at Willard NFH. For several brood years, researchers from the (now) Biological Resources Division of the U.S. Geological Survey collected data to evaluate the use of cover (simulating natural riparian cover) during hatchery rearing to improve the post-release survival of hatchery-reared salmon and to alter their behavior to more closely match wild (naturally produced) fish. In addition to this study, hatchery-reared fish at Little White Salmon NFH were exposed to predators six months prior to release in an attempt to “teach” them to avoid predators following release. As many as six northern pikeminnow were placed in each of three raceways as part of this predator avoidance study. Preliminary physiological and survival data collected to date for both studies indicate that, although there were no differences detected among treatment groups when compared to control groups, the behavior of hatchery-produced fish from the Little White Salmon NFH appears to be normal when compared to naturally produced fish.

There are no natural fish populations that spawn in the target area. Fish headed further up the Columbia River may dip into Drano Lake and hold in the favorable water conditions. Characteristic of steelhead, this species holds in Drano Lake during periods of low Columbia River flow and high water temperature, preferring the cooler Little White Salmon River water during the period of July through August. Since the majority of spring Chinook have entered the hatchery, and this period is sooner than migration of hatchery upriver bright fall Chinook and coho salmon, it is doubtful that there is any interaction between program fish and any natural fish.

The natural spawning spring Chinook salmon in the Wind River is not a targeted population of the Little White Salmon NFH program. That hatchery-induced population in the Wind River is considered a depressed, non-native, composite production (wild and hatchery fish) population by WDFW. NOAA-Fisheries (Myers et al. 1998) consider this population as not an ESA issue, as these fish were not historically present in the watershed. The five-year geometric mean natural spawning population size is 162 fish. The short-term abundance trend (the most recent 7-10 years, based on total escapement) is positive, + 0.1 % per year. The long-term abundance trend (1970-1996) is negative, - 2.9 % per year (Myers et al. 1998). The run of spring Chinook into the White Salmon River is considered extinct, primarily attributable to dam construction and habitat degradation (Myers et al. 1998).

2.7.7 Predation Releases of spring and upriver bright fall Chinook occur at the Little White Salmon hatchery site near the mouth of the river. Previous releases of coho occur in the upper Little White Salmon River at Willard NFH where other anadromous stocks do not have access. Predation effects would therefore be limited to the migration corridor where effects are likely to be reduced relative to spawning and nursery areas. It is likely that Little White Salmon NFH spring Chinook have much reduced predatory impacts on natural stocks relative to other yearling releases in natural production spawning and rearing areas. Depending on species and population, hatchery smolts are often released at a size that is greater than their naturally-produced counterparts. In addition, for species that typically smolt at one year of age or older (e.g. steelhead, spring Chinook salmon), hatchery-origin smolts may displace younger year classes of naturally-produced fish from their territorial feeding areas. Both factors could lead to predation by hatchery fish on naturally produced fish, but these effects have not been extensively documented, nor are the effects consistent (Steward and Bjornn 1990). The Service (1994) presented information that salmonid predators are generally thought to prey on fish approximately one-third or less their size.

In general, the extent to which salmon and steelhead smolts of hatchery origin prey on fry from naturally reproducing populations is not known, particularly in the Columbia River Basin. The available information – while limited – is consistent with the hypothesis that predation by hatchery-origin fish is, most likely, not a major source of mortality to naturally reproducing populations, at least in freshwater environments of the Columbia River Basin (Enhancement Planning Team 1986). For example, peak emergence of listed chum salmon at Ives Island, a natural production area below Bonneville Dam, was estimated to occur during the latter half of March in 1999 (2/19/99 fax to Donna Allard from Wayne Vander Naald, Oregon Department of Fish and Wildlife (ODFW). Out-migrant sampling conducted by the Service in 1998 and 1999

in Hardy Creek, which is adjacent to the mainstem Pierce/Ives Island natural production area, indicated that peak emigration of chum fry from this tributary occurred during the first two weeks of March (unpublished data). Based on life history traits, it is expected that most of the chum fry would have emigrated from the natural production area before the mid-April release of larger hatchery spring Chinook occurs at the Little White Salmon NFH. The potential for the Little White Salmon NFH smolts to prey on emerging chum fry would not be significant. However, virtually no information exists regarding the potential for such interactions in the marine environment.

The presence of large numbers of hatchery fish may also alter the listed species behavioral patterns, which may influence vulnerability and prey susceptibility (USFWS 1994). Releasing large numbers of hatchery fish may also lead to a shift in the density or behavior of non-salmonid predators, thus increasing predation on naturally reproducing populations. Conversely, large numbers of hatchery fish may mask or buffer the presence of naturally produced fish, thus providing sufficient distraction to allow natural juveniles to escape (Park 1993). Prey densities at which consumption rates are highest, such as northern pikeminnow in the tailraces of mainstem dams (Beamesderfer et al. 1996; Isaak and Bjornn 1996), have the greatest potential for adversely affecting the viability of naturally reproducing populations, similar to the effects of mixed fisheries on hatchery and wild fish. However, hatchery fish may be substantially more susceptible to predation than naturally produced fish, particularly at the juvenile and smolt stages (Piggins and Mills 1985; Olla et al. 1993).

Predation by birds and marine mammals (e.g. seals and sea lions) may also be significant source of mortality to juvenile salmonid fishes, but functional relationships between the abundance of smolts and rates of predation have not been demonstrated. Nevertheless, shorebirds, marine fish, and marine mammals can be significant predators of hatchery fish immediately below dams and in estuaries (Bayer 1986; Ruggerone 1986; Beamish et al. 1992; Park 1993). Unfortunately, the degree to which adding large numbers of hatchery smolts affects predation on naturally produced fish in the Columbia River estuary and marine environments is unknown, although many of the caveats associated with predation by northern pikeminnow in freshwater are true also for marine predators in saltwater.

2.7.8 Residualism Little White Salmon NFH spring Chinook, upriver bright fall Chinook, and coho salmon are not known to residualize in the Little White Salmon or Columbia Rivers. PIT tagging would help to provide information relative to hatchery out-migration questions.

2.7.9 Migration Corridor/Ocean The hatchery production ceiling called for in the Proposed Recovery Plan for Snake River Salmon of approximately 197.4 million fish (1994 release levels) has been incorporated by NOAA-Fisheries into their recent hatchery biological opinions to address potential mainstem corridor and ocean effects as well as other potential ecological effects from hatchery fish. Although hatchery releases occur throughout the year, approximately 80 percent occur from April to June (NMFS 1999a) and Columbia River out-migration occurs primarily from April through August. Willard NFH coho salmon are transferred to the Wenatchee River Basin during mid to late March. The Little White Salmon NFH spring Chinook production is released in April, at the beginning of the general out-migration season for other hatchery and natural populations. This is followed by a June release of upriver bright fall

Chinook. The total number of hatchery fish released in the Columbia River Basin has declined by about 26% since 1994 (NMFS 1999c) reducing potential ecological interactions throughout the Basin.

Ocean rearing conditions are dynamic. Consequently, fish culture programs might cause density-dependent effects during years of low ocean productivity, especially in near shore areas affected by upwelling (Chapman and Witty 1993). To date, research has not demonstrated that hatchery and naturally produced salmonids compete directly in the ocean, or that the survival and return rates of naturally produced and hatchery origin fish are inversely related to the number of hatchery origin smolts entering the ocean (Enhancement Planning Team 1986). If competition occurs, it most likely occurs in near shore areas when (a) upwelling is suppressed due to warm ocean temperatures and/or (b) when the abundance or concentration of smolts entering the ocean is relatively high. However, we are only beginning to understand the food-chain effects of cyclic, warm ocean conditions in the eastern North Pacific Ocean and associated impacts on salmon survival and productivity (Beamish 1995; Mantua et al. 1997). Consequently, the potential for competition effects in the ocean cannot be discounted (Emlen et al. 1990).

2.7.10 Harvest The upriver bright fall Chinook program fish have contributed to commercial and sport fisheries along the west coast of the U.S. and Canada from Alaska to California. Of the upriver bright fall Chinook from Little White Salmon NFH that reach catchable size, commercial fisheries in Alaska, British Columbia and gillnet fisheries in the Columbia River each harvest greater than 10% of the total CWT recoveries. Sport fisheries in B.C. and the Pacific coast states account for a much smaller percentage of adult fish caught. By contrast, adult spring Chinook contribute mostly to Columbia River commercial, sport and tribal fisheries. This contribution includes an intensive sport and tribal fishery in Drano Lake immediately downstream of Little White Salmon NFH. The near coast distribution of Willard NFH coho results in a contribution to both Washington and Oregon coastal fisheries, and Columbia River commercial, sport and tribal fisheries.

All stocks are a major component of the Zone 6 tribal fishery area (Bonneville Dam to McNary Dam) per U.S. *v* Oregon negotiations. The abundance of these stocks can also relieve the harvest pressure on listed stocks as they travel toward their spawning locations. The Drano Lake sport and tribal fisheries provide an excellent terminal harvest opportunity that avoids impact to listed fish. Biological assessments are completed by the management agencies to ensure listed species are not jeopardized. More detailed information is available in the Stock Assessment Report (Pastor 2002).

2.8 Beneficial Uses (Historic and Present Cultural and Public Uses, Fishery Benefits, Harvest Contributions, Economic Value)

Outreach efforts at the Complex have increased in the last 10 years to help address important questions regarding the role of hatcheries in the recovery and restoration of Columbia River salmon. The hatchery is strategically located in the Columbia River Gorge within an easy commute of the Portland/Vancouver metropolitan area. As a result, the hatchery is a popular destination for a number of organization and leadership program tours as well as a topic for a variety of off-site presentations. School group tours are quite popular during the fall spawning

season as is the traditional annual visit by new Service employees attending New Employee Orientation. This visit to the hatchery provides a greater understanding of the mission of Service hatcheries and issues related to Pacific salmon in the Columbia River Basin. In addition, an underwater viewing webcam in the Little White Salmon River provides an opportunity for the web-browsing public to experience real time viewing of adult fish migrating back to Little White Salmon NFH. The webcam can be viewed by making an internet connection at: http://pacific.fws.gov/webcam .

2.8.1 Public Uses The Columbia River Gorge proximity to the Portland/Vancouver area makes it a popular recreation destination for fishing, windsurfing, swimming, camping, hiking, picnicking, waterfall viewing, hunting, and berry picking. The scenic beauty of Little White Salmon NFH as part of the CRGNSA along with the intensive sport fishery in Drano Lake and on adjacent Service-owned land attracts many visitors to the hatchery.

The hatchery program and adjacent Service-owned lands are managed to support local wildlife populations. Wildlife viewing is becoming an increasingly popular activity at the hatchery. As a result, other public outreach efforts focus on the use of surplus adult hatchery fish resulting from successful returns of spring Chinook, upriver bright fall Chinook and coho salmon to promote the hatchery watchable wildlife program.

2.8.2 Harvest Contribution Little White Salmon NFH spring Chinook contribute primarily to the Columbia River commercial, sport and tribal fisheries. Average CWT recoveries since brood year 1980 show that nearly 20% returning adult spring Chinook salmon destined for Little White Salmon NFH are caught in the Columbia River sport fishery; a smaller percentage contributes to the Columbia River treaty ceremonial and subsistence harvest. Most recently, the alternating tribal gillnet and sport fishery in Drano Lake alone resulted in the harvest of over 6,000 adult spring Chinook annually.

By contrast, CWT recoveries for Little White Salmon NFH upriver bright fall Chinook, as a measure of harvest, reveals that approximately 25% of harvested adult salmon are caught in the Alaska and British Columbia commercial fisheries. Harvest also occurs in the Alaska, British Columbia, Washington, Oregon, and California sport fisheries. Returning upriver bright fall Chinook salmon also make a significant contribution to the Zone 6 tribal and Columbia River sport fisheries (Pastor 2000).

CWT recoveries for the former Willard NFH on site releases of coho salmon, as a measure of harvest, reveals that approximately 25% of harvested adult salmon are caught in the Oregon and Washington ocean sport fisheries. Willard NFH coho also contribute to the Oregon and Washington commercial fisheries and the Columbia River gillnet harvest. These fish are harvested to a lesser degree in the California sport and commercial fisheries (Pastor 2000).

2.8.3 Economic Benefit Spring Chinook, upriver bright fall Chinook, and coho salmon provide a significant ocean and Columbia River contribution to sport, tribal and commercial fisheries. A review of the economic effects of four Mid-Columbia River hatcheries operated by the Service revealed that the annual economic effect of the Complex's fish production program at a one percent return rate exceeds $2.0 million (Caudill 2001). See section 3.8.5 for more

information regarding the Little White Salmon and Willard NFH contribution to ocean and freshwater harvest.

2.8.4 Cultural Values The Columbia River treaty tribes (Yakama, Warm Springs, Nez Perce, and Umatilla) share the in-river harvest of spring Chinook and upriver bright fall Chinook salmon returning to Little White Salmon NFH. The YN also benefits from these fish which enter the hatchery holding ponds. Excess fish are provided to the YN to support the tribal nutrition program and for ceremonial and subsistence use. The cultural significance of these fish to the tribes is best characterized by the following quotations:

"For the Yakama people salmon is seen as one of the gifts from the Creator. Since the beginning of time the Yakama people have relied upon salmon as well as the roots, berries, deer, elk and herbal medicines still important today. When the Yakama people were placed on this part of Mother Earth they were told by the Creator that He was going to give us some gifts. Those gifts came in the form of salmon and other natural resources.

He also instructed the Yakama people on how to care for the resources and warned that if any of the resources disappear, then we too as people, would disappear. That is why the Yakama people continually care for the salmon, the deer, the elk, the roots, the berries and the herbal medicines. We are also taught at a very young age that we are not here on Mother Earth to live and go away. Our Yakama elders tell us that we are only borrowing the water, the salmon, the Yakama language and everything else and we are preparing for the up and coming generations. Its like remembering the future."- Carol Craig, Yakama Nation Fisheries Resource Management, Public Information Officer, personal communication.

"Salmon was presented to me and my family through our religion as our brother. The same with the deer. And our sisters are the roots and berries. And you would treat them as such. Their life to you is just as important as another person would be."- Margeret Saluskin,Yakama Nation, Columbia River Inter-Tribal Fish Commission Web-Page.

CHAPTER 3. HATCHERY AND RESOURCE MANAGEMENT

3.1 Hatchery Goals, Objectives, and Tasks [2]

The following hatchery management goals were adapted from the Mitchell Act, ESA Biological Opinions, U.S. *v* Oregon agreements, and the IHOT– Operation Plans for Anadromous Fish Production Facilities in the Columbia River Basin Volume III – Washington, Annual Report for 1995 (IHOT 1996). Additionally, Hatchery Genetic Management Plans (HGMP) for Little White Salmon NFH were submitted to NOAA-Fisheries in May 2004 for section 7 consultation.

[2]Tasks and current practices to achieve objectives are described in this chapter.

Within the HGMPs,, specific Performance Standards and Indicators (PSIs) that have been established will be adhered to by the Service during operation of Little White Salmon NFH.

Goal 1: Return spring and upriver bright fall Chinook salmon upstream of Bonneville Dam as defined in the Mitchell Act of 1937 to mitigate for fisheries lost due to the construction and operation of Columbia River hydroelectric projects.

Objective 1: Release 2.0 million upriver bright fall Chinook and 1.0 million spring Chinook into the Little White Salmon River annually.

Task 1: Return, at a minimum, 1,850 adult upriver bright fall Chinook and 1,000 spring Chinook salmon to the Little White Salmon NFH annually for brood stock.

Task 2: Collect brood stock to represent the full spectrum of the run.

Task 3: Maintain a 1:1 male to female spawning ratio.

Task 4: Spawn adults to represent the entire range of timing of reproductive maturity.

Task 5: Spawn adults so that all age classes are proportionally represented.

Objective 2: Produce the healthiest, highest quality fish possible at every stage of production.

Task 1: Monitor health and disease status of fish, following the Service's Fish Health Policy and IHOT Guidelines.

Task 2: Maximize survival at all life stages using disease control and prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Task 3: Sample 100% of spring Chinook brood stock for BKD using ELISA and cull medium and high titer progeny.

Task 4: Conduct hatchery evaluation studies and HET meetings to investigate alternative strategies to improve water management, brood stock management, incubation, rearing, and release strategies. Support research on physiology, diet, fish health, and genetics and other Columbia River Basin projects.

Objective 3: Conduct monitoring activities that will provide information on the progress of the hatchery in meeting its return goal for spring and upriver bright fall Chinook salmon.

Task 1: Bio-sample returning adults.

Task 2: Use CWTs to mark and track representative production groups in the ocean and Columbia River Basin.

Task 3: Cooperate with WDFW and the YN to obtain estimates of sport and tribal harvest in Drano Lake.

Objective 4: Cooperate and coordinate with the WDFW and the YN to develop opportunities for sport and tribal harvest in Drano Lake.

Task 1: Attend YN annual tribal coordination meetings.

Task 2: Provide surplus adult fish to the YN to support tribal nutrition and ceremonial and subsistence programs.

Task 3: Release excess adult fish beyond the needs of the hatchery and the YN back into the Little White Salmon River and Drano Lake.

Goal 2: Transfer fish for off-site acclimation and release in areas upstream of Bonneville Dam in support of YN tribal restoration programs and to support the development of locally adapted stocks.

Objective 1: Transfer 1.7 million upriver bright fall Chinook to the YN Prosser Hatchery annually to assist with the John Day Dam mitigation effort.

Task 1: Continue to produce fish of the proper size and at the appropriate time to facilitate marking and a high tag retention rate prior to off-site transfer.

Task 2: Continue to produce fish of the proper size and at the appropriate time to enhance off-site acclimation survival and smoltification.

Task 3: Cooperate and coordinate with the YN to assure the successful transport of fish to off-site acclimation sites.

Objective 2: Produce the healthiest, highest quality upriver bright fall Chinook possible at every stage of production for transfer to the YN.

Task 1: Monitor health and disease status of fish, following the Service Fish Health Policy and IHOT Guidelines.

Task 2: Maximize survival at all life stages using disease control and prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Task 3: Sample fish prior to transfer to assure proper health and to enhance post-transfer survival.

Objective 3: Cooperate and coordinate with the YN and WDFW to develop opportunities for sport and tribal harvest in upriver locations.

Task 1: Cooperate with the YN by providing fish food necessary for the off-site rearing of fish from time of transfer to release per agreement with the COE-John Day Mitigation plan.

Task 2: Cooperate with the WDFW by providing the feed necessary to produce 1.7 million upriver bright fall Chinook at Priest Rapids Fish Hatchery per agreement with the COE-John Day Mitigation Plan.

Objective 4: Transfer up to 350,000 locally adapted spring Chinook salmon to Umatilla River acclimation sites to support CTUIR restoration efforts.

Task 1: Assist with the development of locally adapted brood stock by initiating production using eggs derived from adult spring Chinook returning to the Umatilla River Basin.

Task 2: Continue to produce fish of the proper size and at the appropriate time to facilitate marking and a high tag retention rate prior to off-site transfer.

Task 3: Continue to produce fish of the proper size and at the appropriate time to enhance off-site acclimation survival and smoltification.

Task 4: Cooperate and coordinate with the CTUIR and ODFW to assure the successful transport of fish to off-site acclimation sites.

Objective 5: Produce the healthiest, highest quality spring Chinook possible at every stage of production for transfer to the CTUIR.

Task 1: Monitor health and disease status of fish, following the Service's Fish Health Policy and IHOT Guidelines.

Task 2: Maximize survival at all life stages using disease control and prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Task 3: Sample fish prior to transfer to ensure proper health and enhance post-transfer survival.

Objective 6: Cooperate and coordinate with the CTUIR, ODFW, and BPA to enhance the survival and return of spring Chinook salmon to the Umatilla River.

Task 1: Provide back-up spring Chinook brood stock if shortfalls exist in fish returning to the Umatilla River.

Task 2: Provide production data to assist ODFW evaluation efforts.

Task 3: Attend annual Umatilla Basin annual operational plan meeting to assist with the update and development of future programs.

Goal 3: Assure that all the requirements of legal orders and federally mandated legislation are met.

Objective 1: Conduct hatchery operations consistently with requirements and obligations called for under the ESA.

Task 1: Implement the HGMP.

Task 2: Mass mark spring Chinook salmon to identify them from naturally produced fish.

Task 3: Implement measures to produce juvenile fish that are fully smolted and ready to emigrate (reduce residualism).

Task 4: Implement measures to minimize interactions between hatchery and naturally reproducing fish.

Task 5: Return any ESA listed or naturally reproducing fish into the river that enter hatchery ladder during brood stock collection.

Objective 2: Operate the hatchery so that all requirements and obligations called for under the Clean Water Act are satisfied.

Task 1: Collect and store on site fish waste from the pollution abatement clarifier.

Task 2: Collect and analyze water samples monthly in accordance with the NPDES permit.

Task 3: Adhere to best management practices included in the Little White Salmon NFH Pollution Prevention Plan.

Objective 3: Assure that hatchery operations support Columbia River Fish Management Plan (U.S. *v* Oregon) production and harvest objectives.

Task 1: Work with the Columbia River Basin co-managers to provide sport, commercial and tribal harvest opportunities.

Task 2: Provide pertinent data and information to Service representatives on U.S. *v* Oregon Production Advisory Committee (PAC) and Technical Advisory Committee (TAC) meetings.

Task 3: Meet tribal trust responsibilities by following pertinent laws, agreements, policies and executive orders on consultation and coordination with tribal governments.

Task 4: Develop and maintain effective partnerships with tribal, state and other federal agencies with shared responsibility for managing fishery resources within the Columbia River Basin.

Goal 4: Develop public use opportunities related to recreational fishing on Drano Lake, and provide information and educational opportunities to enhance public understanding of Little White Salmon NFH and Service programs.

Objective 1: Increase public awareness of Little White Salmon NFH.

Task 1: Use on and off station presentations to emphasize the important role of the hatchery program and resulting Drano Lake sport and tribal terminal area fisheries in mitigating fisheries due to lost habitat and protecting ESA-listed and wild mainstem Columbia River stocks from over harvest.

Task 2: Coordinate with other federal, state, and local information/public affairs offices to incorporate information about Little White Salmon NFH and the Drano Lake fishery.

Task 3: Facilitate interagency cooperation with existing and new programs in the Columbia River Gorge.

Objective 2: Develop new and maintain existing levels of public contact and education programs both on- and off-site.

Task 1: Continue to focus on the use of Little White Salmon NFH as a destination for numerous organization and leadership program tours.

Task 2: Cooperate with other agency and non-government organizations by providing speakers for off-site presentations regarding the hatchery program and Basin-wide issues.

Objective 3: Develop external partnerships with new and existing private, non-profit and special interest groups and local, regional and national organizations, institutions tribes and agencies, to promote public awareness and stewardship of fishery resources in the Columbia River Basin.

Task 1: Promote use of hatchery by inviting special interest groups to tour.

Task 2: Participate in local advisory or community outreach forums and groups.

Task 3: Continue to provide annual legislative briefing packet distribution to Washington State elected officials; invite them to visit the hatchery.

Task 4: Continue to promote and participate in tribal outreach events that emphasize the importance of responsible management and care for the environment.

Task 5: Develop cooperative land management opportunities with the Cold Springs Conservancy to restore habitats native to the Columbia River Gorge.

3.2 Current Practices to Achieve Goals, Objectives, and Tasks

3.2.1 Water Use and Management

Table 5. Certificates of water right held by Little White Salmon NFH.

Source	Permit No.	Date	Flow (ft^3/s)	Use
Little White Salmon River	235	12/12/1921	4.456	Fish propagation
Little White Salmon River	2914	06/12/1939	15.6	Fish propagation
Little White Salmon River	6042	03/08/1949	34.4	Fish propagation
Little White Salmon River	10423	07/20/1956	18.0	Fish propagation
2 unnamed springs (Bailey)	11795	01/07/1958	3.0	Fish propagation
Unnamed spring (Hillside)	Vested	Pre-1914	0.978	Fish propagation
Unnamed spring	7069	09/19/1950	0.11	Domestic
Well	29251	07/19/1995	0.668	Fish propagation

Table 6. Certificates of water right held by Willard NFH.

Source	Permit No.	Date	Flow (ft^3/s)	Use
Little White Salmon River	5013	07/30/49	50.0	Fish propagation
unnamed springs	5010	02/24/51	0.2	Domestic

Well #1	3024A	05/22/65	1.11	Fish propagation
Well #2	3027A	03/06/1957	1.11	Laboratory
Well #3	4855A	01/17/1961	2.22	Fish propagation
Carson Depot Springs	S2-01077C	07/07/1958	0.34	Fish propagation

The principle water supply for both hatcheries is the Little White Salmon River which drains an area of approximately 134 square miles. Average monthly flows once monitored at a gauge located near the hatchery intake varied between 166 cfs in September to 975 cfs in February (USFWS 1987) and is susceptible to heavy silt loads during periods of heavy rains and snow melt. Prior to use at Little White Salmon NFH, the river water is passed through the hatchery settling basin where the heavier solids carried by the water are allowed to settle and then piped to the appropriate rearing units. All of the river water for the hatchery is gravity fed.

The warmer spring water is a critical component for the incubation and early rearing stages of spring and upriver bright fall Chinook salmon, and is used as the sole water source initially and latter mixed with river water. Unfortunately the hatchery program cannot maintain the desired warm water temperatures for an extended period of time due to a lack of available spring water. To help extend the period of warm water incubation and rearing, a well was drilled (depth 300-feet) and a submersible pump installed to provide the warm well water to the system. Studies have shown well water temperatures are similar to the spring sources (approximately 48° F) compared to the much colder river source (mean 44° F).

Turbidity and excessive sediment have been identified as a problem in the Little White Salmon River at least as early as the late 1960's. As an example, in 1968 the Willard National Fish Hatchery settling basin filled with over 300 cubic yards of sediment during a five-day period. The Service had written several letters to the U.S. Forest Service expressing concern about logging roads, undersized culverts, clear cut harvesting along streams, and logging debris in stream channels. This resulted in a major review of forest practices on federal land within the Little White Salmon watershed and initiation of a water quality monitoring program. A more recent reduction in logging activity on federal land, road decommissioning and the revegetation of previously cut stream banks has led to a gradual improvement in stream sediment loads. However, escalating timber harvest in riparian areas on private land in the lower reach of the watershed increases the risk for additional sedimentation. This complicates hatchery operations downstream at the Little White Salmon National Fish Hatchery and ultimately jeopardizes the survival of hatchery fish. To circumvent this problem, three wells were drilled during the 1960's to provide a clean source of water for the early rearing of hatchery coho. The normally turbid river water supply is used in outdoor raceways containing larger fish that can tolerate elevated levels of sediment. Well water is used as the sole source during the nursery rearing of hatchery fish to promote fish health and growth during the early rearing period.

The unnamed spring (Permit No. 7069) used solely for domestic and irrigation is located approximately 100 yards uphill on the west side of Cook-Underwood Road (MP 1.5). Water for domestic use is diverted into the hatchery purification building, disinfected with chlorine and stored in a 30,000 gallon concrete reservoir. The water is then piped to hatchery buildings, hatchery residences and two local residences for domestic use. Domestic water is tested monthly for fecal coliform contamination in addition to annual testing for nitrate, volatile organic compounds, and inorganic compounds to assure adherence with State of Washington Department of Health drinking water standards. Irrigation water used from this source is not disinfected with chlorine.

Similarly, the unnamed spring at Willard NFH (Permit No. 5010) is used solely for drinking and irrigation water. The springs, reservoir and initial 8-inch ductile iron pipeline are located on land obtained by easement from Broughton Lumber Company, approximately one-half mile northwest of the hatchery. Water for domestic use is diverted into the disinfection building, disinfected with ultraviolet light and stored in a 50,000 gallon concrete reservoir. The water is then piped to hatchery buildings, hatchery residences and USGS laboratory for domestic use. Domestic water is tested monthly for fecal coliform contamination in addition to annual testing for nitrate, volatile organic compounds, and inorganic compounds to assure adherence with State of Washington Department of Health drinking water standards. The Willard NFH drinking water system is classified as a Group A Community system and is subject to a high degree of monitoring due to the number of residents it serves.

3.2.2 Screening Little White Salmon River water enters the hatchery through a trash rack to screen larger debris. The rack is constructed from steel angle with 1-3/4-inch spaced vertical openings. The water then passes through two rotating drum screens that measure 8-feet long and 6-feet in diameter. Each drum is screened with stainless steel woven mesh with ¼-inch openings. Both drum screens are operated independently of each other by adjustable timers allowing adjustment according to river conditions. All screened debris is floated off on the down flow side of the drum screen and channeled back to the river.

All of the hatchery spring water first passes through stainless steel screen and/or grating at the point of collection. Spring water used for incubation and early rearing of spring Chinook is diverted through the hatchery spring box building where it passes over an 8 foot square incline bar screen with 1/32-inch horizontal openings. Finer screening occurs using a micro-screen drum filter. The 4-foot diameter drum filter is 6-foot in length and screened with 60-micron filter panels. Filter operation can be set to full time rotation or on an as needed basis using an automated float switch. During operation, the filter is back washed using high pressure domestic water filtered through a charcoal filter to neutralize residual chlorine.

River water at Willard NFH enters the hatchery through a trash rack and 36-inch diameter pipe. This water is filtered at the large screen chamber where heavier debris is separated by ¼-inch stainless steel woven screen. This chamber has an overflow back to the river and can be diverted into the sand/grit settling basin to remove accumulated river debris once annually. Similarly, river water is screened at the smaller screen chamber for use in nursery tanks located within the hatchery building. This hatchery building supply line also has a connection to two well water chambers that divert well water following degassing through two 24-inch packed columns. In

addition, excess drinking water (ultraviolet light-treated spring water) that overflows at the domestic water storage tank is available for use during early rearing at Willard NFH. A 2003 construction project tied the 30-inch excess spring water pipeline into the 24-inch hatchery building supply line for use in nursery tanks. This water supply is not currently screened.

3.2.3 Conveyance System to Hatchery and Ponds River water is collected at the main intake, passed through the hatchery settling basin, and piped to adult holding ponds, raceways and spring box building. Spring water is collected as close as possible to the originating source and piped primarily to the spring box building. From this location, spring water can be directed into the nursery building or lower raceways. Water from the two Bailey springs can also be piped directly to the upper hatchery raceways for initial rearing. Well water can be diverted to the abandoned nursery building re-use system and is also separately piped into the spring box building. The river, well and Bailey spring water supplies can also be directed to the hatchery truck fill station. Average water use for fish propagation during 2003 ranged from 5,286 gpm in April to 19,294 gpm in May. All water, with the exception of the pumped well, is gravity fed.

River rearing water at Willard NFH enters the hatchery through a 36-inch steel pipeline that eventually branches into smaller lines supplying 50 outdoor raceways. These raceways are composed of 3 decks, the upper two decks consist of 20 raceways each and the lower deck contains the remaining 10 raceways. The upper two decks have the capability for serial reuse, occasionally used during drought situations or during extremely turbid river conditions. Serial reuse conserves water during drought situations and reduces the draw at the intake during times of high turbidity ultimately reducing the amount of silt deposition in hatchery facilities. This reuse capability is used sparingly due to concerns for disease transmission and poorer water quality in the lowermost deck. Well #1 and #3 are piped to the hatchery building containing concrete nursery tanks (52 total) and incubators. River water and the newly accessible spring water (treated drinking water overflow) supply are accessible in this area as well. Average water use for fish propagation during 2003 ranged from 7,800 gpm in April to 21,000 gpm in June. All water, with the exception of the pumped well, is gravity fed.

3.2.4 Effluent Treatment and Monitoring At Little White Salmon NFH, effluent from raceway cleaning, spawning and settleable solids collected in the adult holding ponds is piped directly to the hatchery pollution abatement pond (clarifier) where solids are allowed to settle and are removed weekly. Solids removed from the pollution abatement pond are placed in a holding area located on the hatchery grounds and allowed to naturally compost. Effluent water during cleaning and during normal operations is monitored weekly and reported quarterly for suspended and settleable solids under the guidelines of the hatchery NPDES Permit (#000021-3) issued by the Environmental Protection Agency (EPA).

On November 16, 1998, the EPA determined that Willard NFH was exempt from the NPDES permit requirement. Formerly operating under permit number WA-000019-1, the hatchery's current permit was deactivated since it was determined that the hatchery effluent did not enter the waters of the Little White Salmon River. While investigating a complaint of illegal chemical dumping at the USGS Laboratory, EPA Special Agent Sandy Smith and Service Special Agent Ed Wickersham discovered that overflow from the hatchery pollution abatement pond drained underground into the porous basalt outcropping located downstream of the pond rather than into

the Little White Salmon River. As a non-point discharge the hatchery is exempt from NPDES regulation.

3.3 Brood Stock Management

Little White Salmon NFH manages two species of salmon, spring and upriver bright fall Chinook. Coho salmon broodstock were collected up to the 2004 return year for Willard NFH, however, funding shortfalls necessitated the termination of coho adult collection and spawning. The Complex coho program is now reliant on shipment of eggs originating from fish collected and spawned from outside the Little White Salmon River watershed. Brood collection for spring and fall Chinook at the hatchery is managed to maintain the genetic integrity of both stocks. The Service ensures that adult brood stock is randomly collected across the spawning run in proportion to their return. The hatchery escapement goal is 1,175 spring Chinook and 1,856 upriver bright fall Chinook adults to assure a 1:1 spawning ratio (females: males).

On high adult return years, not all adults are allowed to enter the hatchery. Rather adults are collected by pulsing the ladder openings through the spectrum of the run until escapements are met. Tribal requests for adult salmon are filled by additional ladder openings. Fish brought into the hatchery that exceed escapement goals are returned to the river. Fish that enter the hatchery are visually counted and guided to one of two holding ponds.

Adult spring Chinook return to the hatchery beginning mid-May through early July with the majority returning in June. Adults retained for spawning are injected with erythromycin under INAD-6430 to help prevent bacterial kidney disease (BKD) morbidity and mortality, caused by *Renibacterium salmoninarum.* Adults are injected at a dosage rate of 15 mg/kg body weight approximately 30-days prior to spawning (early July) when final counts and sex are determined. Due to the length of holding time for spring Chinook (3 months), formalin treatments are administered three to five times weekly at a rate of 167 ppm to control fungal growth. Spawning begins the first week of August and continues weekly for four to five weeks.

Adult upriver bright fall Chinook collection begins early October and continues through spawning. Erythromycin and formalin treatments are not needed for this stock. Spawning begins approximately the last week in October and continues almost daily for two to three weeks.

At the start of the spawning process, adults are crowded out of the ponds and into a transfer channel leading to the spawning building. Fish are then crowded into the anesthetic tower where they are lifted into a bath of anesthesia (MS 222 or tricaine methanesulfanate) that includes polyvinylpyrollidine at 0.1% to alleviate stress and replace “slime”. The fish never leave water except for a very brief period of de-watering. Once the fish are anesthetized they are sorted for ripeness. “Green” or unripe fish are returned to the holding pond and held until the following week before being crowded and checked again for ripeness. Ripe fish are euthanized and females bled by tail cutting prior to spawning to maximize the fertilization process. Details of the spawning process can be found in section 3.3.3.

3.3.1 Upstream Passage A barrier dam at Little White Salmon NFH prevents upstream

passage approximately one mile above the confluence with the Columbia River to enhance adult collection and to prevent adult fish from entering the hatchery water supply. Additionally, a natural barrier, Spirit Falls, prevents fish passage approximately 1.75 miles above the Columbia River. During an early survey of the Columbia River and its tributaries, Bryant (1949) noted that impassable falls located above the hatchery prevented fish passage. The backwater from Bonneville Dam extended to within 0.5 miles of these falls, and covers all of the area that was originally suitable for salmon spawning. Today this barrier is known in the kayaking community as Spirit Falls, a 30-foot waterfall attempted by only the most experienced kayakers.

3.3.2 Surplus Adult Returns In most years, more fish return to the hatchery than are needed for brood stock. Considering the ESA-related restrictions necessary to help recover listed stocks throughout the Columbia Basin, the public has become increasingly alarmed over what is perceived as the senseless killing of excess adult hatchery fish. To help meet Service tribal trust obligations, some spring Chinook salmon excess to hatchery needs were provided to the YN to support the tribe's nutrition program. For all other fish, the absence of wild and ESA-listed stocks in the Little White Salmon watershed allows management flexibility regarding the disposition of salmon excess to hatchery needs. Whenever possible, excess hatchery fish will be left in the Little White Salmon River to allow for natural spawning, consumption by wildlife, and stream nutrient enhancement from carcass decomposition. The waterfall creating a historic barrier to anadromous fish passage in the upper watershed limits the options available for natural spawning activity. While agency managers agree that spawning habitat on the Little White Salmon River is marginal at best, small pockets of spawning gravel exist below the barrier. In addition, the hatchery (433 acres) is the site of an active bald eagle roost and is intensively used by wintering bald eagles. Allowing carcasses to remain in the Little White Salmon River and Drano Lake is extremely beneficial to local wildlife and the Columbia River ecosystem. As a result, the hatchery has become a popular wildlife viewing area.

3.3.3 Spawning Protocol Adults are crowded from holding ponds and anesthetized using carbon dioxide or MS-222. Anesthetized adults are then sexed and checked for ripeness. Ripe adults are selected and euthanized. Tails of all ripe females spawned are cut to allow bleeding for approximately 3-5 minutes. Eggs are then removed using a spawning knife and collected in iodophor-disinfected colanders to drain ovarian fluid. The eggs are then transferred to iodophor-disinfected buckets and sperm is added directly to the eggs. A 1:1 (female:male) random spawning ratio is maintained and male jacks are used proportionally to their percentage of the run to a maximum of five percent. Sperm activation is done by adding a 0.9% saline solution to each bucket of eggs which are then allowed to rest for one half to one minute. Initiated with the former Brood Year 2002 coho program (spawned during October 2002), sperm activation with saline solution is now a standard procedure for all fish spawned at the hatchery. The buckets containing the now fertilized eggs of individual (paired) fish are then transferred to the Little White Salmon NFH nursery building (0.5 mile away).

Genetic integrity of the Little White Salmon NFH populations is maintained by random collection of brood stock (Attachment 5 – Don Campton, Abernathy Fish Technology Center Protocol). When possible, a strict 1:1 spawning ratio (females:males) is used. Jacks are randomly included in the spawning population and comprise up to 5% of the male spawning population. The hatchery goal is to maintain stock integrity and genetic diversity of each unique

stock through proper management of genetic resources. To achieve production goals, 1,762 upriver bright fall Chinook and 1,175 spring Chinook salmon brood stock are needed for all programs as shown in Table 7.

Table 7. Little White Salmon/Willard NFH Complex brood stock and hatchery escapement goals.

	Spring Chinook	Fall Chinook	Coho[2]
Release to LWS R.	1,000,000	2,000,000	0
Transfers	210,000 to Umatilla R.[1]	1,700,000 to Yakama R.	650,000
# Females Spawned	290	872	685
Fecundity	4,000	4,800	2,600
Prespawn Mortality	2%	2%	2%
Percent Survival			
Egg to Eye	>92%	>95%	>90%
Egg to Fry	98.5%	99%	98.5%
Fry to Smolt	95%	99%	95%

[1]Eggs for this program are brought in from other facilities.
[2]Historic data. Spawning of this stock at Little White Salmon NFH was discontinued in 2004.

Included in the assumptions is that approximately 27% of spring Chinook salmon eggs are culled due to high levels of BKD in the adult females. Since all female spring Chinook salmon are sampled for an incidence of *Renibacterium salmoninarum*, the causative agent of BKD, this level of culling assumes that all fish with a detectable level of bacteria are removed from the population. This assures the production of fish with no signs of the disease. The 210,000 fish transferred to Umatilla are brought in as eggs from another station. Coho salmon are expected to return to the Little White Salmon River in the fall of 2004 and 2005. Current plans do not currently include taking any eggs from these fish. Due to budget shortfalls the on station release of these fish has been terminated. Coho eggs originating from the Wenatchee River Basin are now transferred to Willard NFH to initiate production.

3.3.4 Other Acceptable Stocks

Upriver Bright Fall Chinook

The "mid-Columbia Bright" brood stock was developed in 1977 when upriver bright fall Chinook were trapped from the Bonneville Dam fish ladder and spawned at Bonneville Hatchery (TAC 1997). Replacement stocks became necessary during 1998 to meet production shortfalls due to a mechanical-caused loss of progeny from the fish that had returned to the Complex. No adverse genetic effects to listed species have been documented from the upriver bright fall Chinook brood stock replacement process for that year. The following lists all the upriver bright fall Chinook stocks that have been transferred to the Little White Salmon/Willard NFH Complex in the past, and can be considered acceptable sources for replacement stock.

- 1,213,000 upriver bright fall Chinook from Klickitat SFH, WA
- 3,168 upriver bright fall Chinook from Lyons Ferry SFH, WA (Klickitat SFH strays

collected from the Lower Granite Dam fish ladder).

- 2,054,000 upriver bright fall Chinook from Bonneville SFH, OR
- 600,000 upriver bright fall Chinook from Priest Rapids SFH, WA
- 200,000 upriver bright fall Chinook from Umatilla SFH, OR

Spring Chinook

The spawning of spring Chinook salmon at the Complex first occurred in 1967 when fish of unknown origin were collected from the Little White Salmon River (Nelson and Bodle, 1990). These fish could have been strays or descendants from previous attempts to rear spring Chinook from the McKenzie River (1916 brood), Salmon River (Idaho; 1925 brood), or Carson stock reared at Willard NFH during the 1964 brood year. Since 1967, fish have been released into the Little White Salmon River from Willamette stock (Eagle Creek NFH), South Santiam SFH, Klickitat River stock, Ringold Springs stock, and Carson stock. Part of the 1995 brood included adult fish trapped on the White Salmon River (progeny of Carson stock reared and released at Big White Salmon Ponds). All stocks of spring Chinook were chosen due to their availability..

Coho

Initial attempts to rear coho salmon with the native, late running stock were made in 1919 and 1922 (Nelson and Bodle, 1990). Attempts during the period 1930-1950 included the use of early run stock from the Quinault, Quilcene, Dungeness, and Toutle Rivers. The Toutle River stock was considered responsible for establishing a successful run in 1956. The following list contains facilities (brood source) that provided early-run coho eggs and/or fish for rearing at Willard NFH. Though Speelyai coho from a Washington State facility on the Toutle River were transferred in 1993, these fish subsequently developed epizootic levels of bacterial kidney disease (BKD). Therefore, the LCRFHC has recommended against transferring this stock of fish into Willard NFH in the future. All stocks were selected because of their availability, and would be considered an acceptable stock should replacement become necessary. Stocks of coho previously imported to the Little White Salmon/Willard NFH Complex include:

- Lower Kalama Hatchery, WA
- Cascade Hatchery, OR
- Bonneville Hatchery, OR
- Eagle Creek NFH, OR
- Klaskanine Hatchery, OR

3.4 Incubation Strategies and Procedures

Fertilized eggs are washed and then water hardened for one half hour in a 75 ppm active iodine solution in individual incubator trays. The eggs are incubated using single pass spring or well water. Aseptic procedures are followed to assure the disinfection of equipment throughout the egg handling process.

At the eyed stage, eggs are shocked and picked to remove the dead eggs, then placed back into the incubators, at approximately 5,000 eggs per tray. There are 132 stacks of incubation trays

that have the capacity to incubate up to a total of 9.9 million eggs. Nonviable embryos are removed from each incubator tray at least two times during incubation with a cumulative record maintained for each take of eggs. All eggs are treated with formalin three to five times a week at a rate of approximately 1,667 ppm. Formalin treatments are used to reduce fungus related mortality and are terminated once hatching has begun. Incubation takes place in a mix of spring, river and well water to control temperature. Temperatures normally are between 42°F and 48°F. Swim-up fry are placed directly into the raceways or into the nursery tanks, depending on program goals.

Production at Willard NFH is initiated with the receipt of eyed eggs from incubation facilities located within the Wenatchee River basin, WA. After these coho salmon egg shipments begin arriving during the months of December and January, they are disinfected in a 100 ppm active iodophor solution for 10 minutes, then loaded into Heath incubation trays at approximately 5,000 eggs per tray. Under each water inlet are a maximum of 15 trays; the nursery water source consists of a 500 gallon per minute (gpm) well and a 1,000 gpm well each powered by a turbine pump and supplying a constant 41.7^{o} F temperature flow. The water is supplied at 3 gpm until hatching (at 842 temperature units), at which time flow is increased to 4 gpm for final incubation at the completion of yolk sac absorption. The eggs are picked regularly and as a result, formalin treatments are not required at Willard NFH. Incubation occurs until swim-up when fry are placed into one of 52 concrete nursery tanks.

3.5 Rearing Strategies

Little White Salmon NFH

Spring Chinook fry are initially transferred from incubation trays to nursery tanks to establish initial feeding with water flows set at 30 gpm. Due to consecutive weekly takes at spawning, tank rearing occurs for only one to two weeks. From tanks, fish are transferred to nine 8 foot x 80 foot lower raceways with water flows ranging from 233 to 466 gpm (flow rates are increased as fish size increases). Fish remain in these raceways until release of the previous brood year from seventeen upper hatchery raceways. Once these raceways are emptied and disinfected, final transfer is made to fifteen 10-foot x 110-foot raceways and two 10-foot x 214-foot upper raceways at water flow rates of 670 gpm and 900 gpm respectively. Fish are held in baffled raceways until release during mid-April of the following year. Fall Chinook are transferred directly from incubation trays to seven remaining un-baffled 10-foot x 110-foot upper raceways. Water used for fall Chinook rearing is a combination of the warmer Bailey spring water which is diverted from the lower hatchery spring box building and river water. After transfer of 1.7 million fall Chinook to the YN acclimation site located at Prosser, WA, final thinning occurs and raceway baffles are set in place. One month prior to release in late June the Bailey spring water supply is turned off to allow fish an opportunity to acclimate on water derived from the Little White Salmon River.

Fish are fed Bio-Oregon™ (Warrenton, OR) Starter #2, #3, Bio-Moist Grower 1.0mm, 1.3mm, 1.5mm and Bio-Moist Feed 2.5mm and 3.0mm feeds. Fish, initially fed by hand, are fed once an hour, eight times per day and those fed by automatic tank feeders receive feed every half hour. As fish grow and feed size increased, feeding frequency is reduced. At the time of release fish

are fed 2 to 3 times a day. Daily feed rations are determined by water temperature and fish size, and are adjusted when feed waste is observed. Once final loadings are achieved, all spring Chinook undergo a prophylactic medicated feed treatment with erythromycin thiocyanate for a minimum of 21 days. The treatment is designed as a preventive measure to reduce the incidence of BKD and is applied at a dosage rate of 100 mg/kg body weight. A second medicated feed treatment is completed during the fall for fish destined for future transfer to the Umatilla River, Oregon as specified in the Umatilla Hatchery and Basin Operation Plan. If deemed necessary by fish pathologists, a second treatment may also be given to the other spring Chinook. The treatments are covered under provisions of section 512 of Federal Food, Drug and Cosmetic Act, INAD 4333.

Raceway cleaning is performed full length for un-baffled raceways while baffled raceway cleaning involves flushing of the lower compartment. All waste from cleaning operations is diverted to the pollution abatement circular clarifier. Fish mortalities are removed and recorded daily and equipment is disinfected between individual fish lots. Water temperatures are monitored daily and any unusual fish behavior or culture incidents are reported to hatchery supervision.

Fish are sampled approximately every two weeks to determine growth and feed rates during early rearing and then once a month after reaching approximately 100 fish per pound. Condition factors (K) are taken once a month and again prior to release. Density at time of release is programmed not to exceed a 0.20 density index for spring Chinook and 0.30 density index for upriver bright fall Chinook.

Willard NFH

At approximately 1,278 temperature units, yolk sac absorption has been completed and the coho salmon are transferred into nursery tanks (92.8 cubic feet of rearing space) to initiate feeding. Nursery tank feeding is done using automatic feeders, set to feed every half hour over the course of a 12 hour day. Feeds used in the nursery are all manufactured by Bio-Oregon, and feeding is done using Bio-Oregon's established guidelines based on the rate for a given percentage of their body weight and water temperature. Feeds used during nursery rearing include BioDiet Starter #2 and #3 followed by BioMoist Grower 1.0 and 1.3mm. Feed size changes are made using the recommendations provided by Bio-Oregon and feeding at least to, and usually somewhat beyond, the largest size of the suggested range. The feeding level is adjusted upwards every 3 days, and sample counts in the nursery are taken 3 times per month from representative tanks for each egg source and take. Since all fish reared at Willard NFH receive a CWT, feeding is performed to ensure a uniform size at the time of tagging. Uniformity of size during the time of tagging is necessary to assure that fish will fit the headmolds used in the tagging process. Properly sized headmolds on tagging machines is necessary for proper tag placement and to achieve optimum tag retention.

The nursery is evenly divided into 26 tanks on the northerly half of the nursery, and another 26 on the southerly side. Each tank is coated with a dark grey colored polyurethane rubberized coating. Cleaning and removal of mortalities are performed by working one side of the nursery one day and the next side the following day. Nursery tanks inflows are initially set at 20 gpm

and increased to 45 gpm as fish grow and increase feeding rate. Each nursery tank contains approximately 15,000 to 20,000 fish depending on the size of the egg take. Density indices are usually in the area of 0.25 at the time the fish are transferred to the outdoor raceways in early May at a rate of 2 tanks per raceway (40 tanks into 20 raceways).

Following distribution of smolts in late March through early April, the 8-foot x 80-foot (1,525 cubic feet of rearing space) concrete raceways are cleaned using a fire hose followed by a 200 ppm chlorine disinfection. Each raceway is capable of using screens perforated with either a ½-inch X 3/32-inch or ½-inch X 3/16-inch slot size. Screens are switched to the larger slot size when fish reach a size of 50 fish per pound. Fish in nursery tanks are taken off feed before transfer to outdoor raceways. Fish resume feeding the day after transfer, and are initially fed 4 times per day, dropping to 3 times per day after they reach a size of 150 – 175 fish per pound. Feeding is further reduced to twice a day once a size of 90 fish per pound is achieved. Feeding rates are again derived from Bio-Oregon's feeding guide, where feeding level is based on a percentage of the body weight in relation to fish size and temperature. However, departure from the chart is made during the fall and winter as photoperiod and water temperatures decline. For the last half of October, fish are fed ¾ of the prescribed amount, dropping to 2/3 the prescribed amount from November through January, and rising to a ¾ rate again the first half of February, and returning to a full prescribed ration from mid-February through final distribution. Feeds utilized during raceway rearing include BioMoist Grower 1.3 and 1.5mm, and BioMoist Feed 2.5 and 3.0mm, and fed at least to, and somewhat beyond, the largest size of the recommended range. All feeds are stored frozen prior to feeding.

Raceway water flows are adjusted to 600 gpm per raceway supplied from the Little White Salmon River. River water temperatures for the period 1958 – 2002 ranged from an average monthly high temperature of 45.2^{o} F in July to an average monthly low of 39.9^{o} F in January. Raceways are cleaned once a week, and cleaning effluent is discharged to a pollution abatement pond. Mortalities are removed daily from all 20 raceways. Barrels containing a chlorine solution are used to disinfect pond brooms and mortality nets between raceways. In early 2004, new steel-framed shade structures constructed of 3-inch diameter steel tube were erected and covered with shade cloth. Willard NFH coho have a history of increased sensitivity to sunburn, a malady that causes sloughing of skin and subsequent infection along the dorsal surface of the fish. The new shade structures have prevented any deterioration in fish health resulting from sunburn.

3.6 Release Strategies

Spring Chinook (1.0 million) are released into the Little White Salmon River as yearlings in mid-April and upriver bright fall Chinook (2.0 million) as sub-yearlings in late June. Releases are made directly into the Little White Salmon River less than a half mile from the Columbia River and coincide with a number of other hatchery releases within the basin. Both spring and fall Chinook destined for off-site release are loaded onto distribution trucks using a hydraulic fish pump and dewatering tower. At time of release, all rearing units are sampled and length frequency data collected. Salt water challenges are performed on individual lots of fish for a

period of 24 hrs at a salinity of 3%. This test is used to determine the degree of smoltification and readiness to out-migrate following release. Raceway tail screens are removed a day prior to release allowing a limited volitional release. The day of release, fish are liberated one raceway at a time by slowly flushing fish out of the raceway to minimize injury as fish move through the effluent channel to the river. After final release, numbers, size, tagging data and other pertinent information are recorded.

Coho salmon at Willard NFH reach a target transfer size of 20-22 fish per pound during late March and early April. Raceway density indices approach 0.17 at the time of transfer. Fish are not fed for two full days prior to the morning of actual loading, and then pumped from the raceways via a fish pump and loaded onto distribution trucks for transport to a variety of acclimation and release sites.

3.7 Fish Health Management Program

The primary objective of fish health management programs at Service facilities 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.

3.7.1 Fish Health Policy

The Lower Columbia River Fish Health Center in Underwood, WA provides fish health care for Little White Salmon NFH under the auspices of the published policy 713 FW in the Service Manual. In addition to this policy, the 1994 annual report "Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries", chapter 5, (IHOT 1995) provides further fish health guidelines as approved by Northwestern state, federal, and tribal entities. The directives of these two documents more than meet the requirements of the Washington State and tribal fish health entities who follow the Co-Managers' Salmonid Disease Control Policy of 1998. All of these documents provide guidance for preventing or minimizing diseases within and outside of the hatchery. In general, movements of live fish into or out of the hatchery must be approved in the U.S. *v* Oregon Production Advisory Committee forum and be noted on the State of Washington Brood Document for the hatchery. If a fish transfer or release is not on the State of Washington Brood Document, permits from the Service, the WDFW, and any other states through which the fish travel must be obtained and approved by co-managers. Fish health exam and certification must be done prior to any releases or transfers from the hatchery to minimize risks from possible disease transmittance.

3.7.2 Fish Health Examinations at Little White Salmon NFH and Willard NFH

Monthly examination: A pathologist from the LCRFHC visits at least monthly after fry are placed in ponds. Based on pathological signs, age of fish, concerns of hatchery personnel, and the history of the facility, the examining pathologist determines the appropriate tests. This usually includes a necropsy with an external and internal exam of skin, gills, and internal organs and can include other tests for bacteria, virus and parasites. Kidneys, gills and other tissues are checked for common bacterial pathogens by culture. Blood is checked for signs of anemia or

other infections, including viral anemia. Additional tests for virus or parasites are done if warranted. The pathologist examines the healthy and moribund/freshly dead fish to ascertain potential disease problems in the stock.

Diagnostic Examination: This is done on an as-needed basis as determined by the pathologist or requested by hatchery personnel. Moribund, freshly dead fish or fish with unusual signs or behavior are examined for disease using necropsy and appropriate diagnostic tests. A pathologist will normally check symptomatic fish during a monthly examination.

Ponding Examination: The first health exam of newly hatched fish occurs when approximately 50% of the animals are beyond the yolk sac stage and begin feeding. Sixty fish will be sampled and tested for virus.

Pre-release Examination: At two to four weeks prior to a release or transfer from the hatchery, 60 fish from the stock are necropsies and tissues are taken for testing of listed pathogens. The listed pathogens, defined in USFWS policy 713 FW (Aquatic Animal Health Policy, Service Manual) include infectious hematopoietic necrosis virus (IHNV), infectious pancreatic necrosis virus (IPNV), viral hemorrhagic septicemia virus (VHSV), *Renibacterium salmoninarum, Aeromonas salmonicida,* and *Yersinia ruckeri*. The LCRFHC tests for *Myxobolus cerebralis,* another listed pathogen upon request.

Adult Certification Examination: At spawning, tissues from adult fish are collected to assay viral, bacterial and parasite infections and to provide a health profile. The LCRFHC tests for all of the listed pathogens, except *Myxobolus cerebralis* (unless requested), and *Ceratomyxa shasta*. The minimum number of samples collected is defined by 713 FW. At Little White Salmon NFH, all brood spring Chinook adult females are tested for *Renibacterium salmoninarum* (causative agent of bacterial kidney disease, BKD), and their eggs identified by a fish health number corresponding to each female. This allows tracking of the eggs so that selective culling and/or segregation is possible. If not needed to make production goals, progeny from females with high levels of BKD are culled. Otherwise, these are segregated from progeny at lower risk of disease. This level of sampling is not required for the upriver bright fall Chinook salmon which have a low incidence of BKD.

Other Stocks: The Little White Salmon/Willard NFH Complex coordinates with tribes and states to help achieve supplementation and restoration goals, as appropriate to U.S. *v* Oregon contractual agreements. In so doing, stocks external to the Little White Salmon watershed are often received on station. Prior to import to the station, fish health policy must be met as described in Section 3.7.1. While on station, each stock undergoes fish health sampling as detailed above. Furthermore, any eggs received at the hatchery must be disinfected as described in 713 FW Policy before they are allowed to come in contact with the station's water, rearing units or equipment.

3.7.3 Chemotherapeutant Use

The upriver bright fall Chinook salmon stock is generally healthy and hasn't required chemotherapeutant use. The adult brood stock does not require formalin treatments for fungus

and other external pathogens. The level of vertically transmitted pathogens, primarily infectious hematopoietic necrosis virus and *Renibacterium salmoninarum*, is relatively low in the upriver bright fall Chinook adults which reduces the risk of these diseases in the fry. Transmission of virus and other pathogens found in the ovarian fluid are prevented by water-hardening of eggs with a polyvinyl-pyrrolidone iodine compound (approximately 1% iodine), required by 713 FW policy to minimize/prevent transmittance of viral and bacterial pathogens. The eggs are disinfected in 75 ppm iodine in water buffered by sodium bicarbonate (at 0.01%) for 30 minutes during the water-hardening process. BKD becomes a major concern when fish are kept beyond their normal release time in the spring; however, the Little White Salmon NFH has never required a late release and no chemotherapeutants have been mandated for their stock.

The spring Chinook salmon adults are taken into the hatchery beginning mid-May and due to the lengthy holding time of three months, require formalin treatment three to five times weekly at a rate of 167 ppm to control external fungus. In early July, about 30 days prior to spawning, adults are injected with erythromycin at 15 mg/kg body weight to control the vertical and horizontal transmission of BKD. Except for fish arriving too close to the time of spawning for safe handling and injection, all spring Chinook salmon adults are injected. Injections have been done under the INAD 6430 (Investigational New Animal Drug regulation) and thus did not require a prescription from a veterinarian. The injected drug is Erythro-200 or Erythro-100 (200 mg/ml or 100 mg/ml, respectively, of active erythromycin base in polyethylene glycol, ethyl acetate and ethyl alcohol), to be injected in the dorsal sinus at 15-20 mg drug/kg of body weight. In 2004, the manufacturer suspended production of erythromycin so modifications of drug, acquisition, and application may apply in future dates.

As for the upriver bright fall Chinook salmon, the spring Chinook eggs are water-hardened in a solution of polyvinylpyrrolidone iodine compound at 75 ppm iodine in water buffered by sodium bicarbonate (at 0.01%) for 30 minutes during the water-hardening process. To prevent/reduce BKD, the spring Chinook juveniles are fed erythromycin in June at a daily dosage of 100 mg/kg of fish for a minimum of 21 days. Unless deemed otherwise by fish pathologists, the feeding of erythromycin to the Little White Salmon stock is limited to early summer because drug toxicity, as noted by tetani and mortality, becomes more enhanced in the fall. The CTUIR fish do receive a second feeding in the fall as requested in the Umatilla Hatchery and Basin Operation Plan. As of 2001, there is a temporary INAD 4333 that allows feeding of Aquamycin 100 (erythromycin thiocyanate in a wheat flour base) and prescription by a veterinarian is not required.

Formalin is used on the eggs of all species to prevent losses due to fungus growth. The formalin is metered into stacks of eggs for fifteen minutes in a diluted solution (ten parts filtered water to one part formalin) to achieve a treatment concentration of 1,667 ppm formalin. This is accomplished using a formalin treatment system (installed in 2000) that automatically times the treatment and a subsequent 30 minute flush to assure that all stacks being treated receive a full fifteen minute treatment and to clear the distribution system of formalin. Treatments are performed three to five times a week and are discontinued once hatching begins. Formalin is not used at Willard NFH.

3.7.4 Other Fish Health Precautions

Unless knowledge regarding vertical transmittance of BKD proves otherwise, eggs from female brood stock with high levels of BKD will not be used in production unless egg production is low. The enzyme-linked immunosorbent assay or ELISA is used to measure BKD levels in 100% of the spring Chinook adult females. Returning adult numbers permitting, eggs from females measuring greater than 0.199 optical density (O.D.) in this test will be culled to reduce/control BKD. If the number of brood females is low, progeny from highly infected females shall be segregated into rearing units apart from the rest of the production and absolute fastidiousness maintained as to using equipment that is disinfected and/or dedicated to these rearing units.

The Little White Salmon/Willard NFH Complex coordinates with tribes and states to help achieve supplementation and restoration goals, as appropriate to U.S. *v* Oregon contractual agreements. In so doing, stocks external to the Little White Salmon watershed are often received on station and can be a health risk. Prior to import to the station, fish health policy must be met as described in Section 3.7.1. Any eggs received at the hatchery must be disinfected as described in 713 FW Policy before they are allowed to come in contact with the station's water, rearing units or equipment. While on station, each stock undergoes fish health sampling as detailed above.

Little White Salmon NFH rears spring Chinook salmon for the CTUIR. In coordination with the ODFW and the CTUIR, the brood adults returning to the Umatilla Hatchery are screened for BKD and other pathogens in accordance to the Umatilla Basin Annual Operations Plan (reference in bibliography) which follows the dictates of 713 FW Policy and IHOT. Eggs intended for rearing at Little White Salmon NFH must be from females individually screened for BKD with the caveat to prevent receipt of eggs from females with medium to high BKD (greater than 0.499 O.D.), as measured by the ELISA.

Although fish health policy applies to all fish coming into Little White Salmon/Willard NFH Complex, this does not necessarily prevent disease outbreaks that occur on station due to a particular stock's disease ancestry or poor husbandry prior to arrival. Therefore, it is to the best advantage of the hatchery to reject stocks whose condition may compromise the overall health of on-station stocks, even though they may meet the fish health policy.

The ladder barrier at Little White Salmon NFH prevents passage of anadromous salmon and steelhead into the water supply, which would otherwise be a source of disease for juveniles. Adult salmon carcasses leftover from spawning are removed and rendered to prevent possible contamination of the water supply. However, many adult salmon die in Drano Lake, a popular fishing site, either from natural causes or from fishing mortality. It is quite possible that the common practice of fishermen's gutting fish and discarding of entrails into the lake may be a source of virus and other pathogens, whether through the water or scavenger animals which access the lake.

It is necessary to continue a vigilance of the upriver Little White Salmon River to prevent/reduce the horizontal dissemination of pathogens through the water or through predators like great blue herons, eagles and otters. Located five river miles above Little White Salmon NFH, the Willard NFH and the Columbia River Fisheries Research Center of the U.S. Geological Service (CRRL) raise fish and use water from the Little White Salmon River. As for Little White Salmon NFH,

the fish of the Willard NFH are cared for by the LCRFHC under the auspices of the same fish health policies. In addition, the LCRFHC maintains good communication with the CRRL to assess health of incoming fish and to periodically examine fish as needed to prevent or treat any disease which might infect salmon at Little White Salmon/Willard NFH complex. The CRRL also uses ozone and chlorine to disinfect all effluent water which is channeled down to an abatement pond. Under less control of the Service are the fisheries activities of the WDFW which periodically plants rainbow trout above Willard NFH, a possible source of disease.

Decontamination of all holding and rearing units is necessary after release, transfer or spawning of the occupying fish. Disinfection of the brood pond after completion of spring Chinook salmon spawning is especially important to prevent carryover of pathogens to the upriver bright fall Chinook salmon adults. Units should be dewatered, pressure washed (where feasible), and dried to reduce problems caused by fungus, bacteria and parasites. If necessary, a formalin treatment may be applied to the surface.

Tank trucks or tagging trailers are disinfected before being brought onto the station.

Abernathy Fish Technology Center (AFTC) provides quarterly feed quality analyses to meet nutritional requirements and prevent nutritional diseases.

3.8 Monitoring, Evaluation, and Coordination

The Columbia River Fisheries Program Office provides monitoring, evaluation, and coordination services concerning Little White Salmon/Willard NFH Complex production. The CRFPO staff monitors hatchery returns, biological characteristics of the hatchery stock, fish marking, tag recovery, and other aspects of the hatchery program. The CRFPO maintains the database that stores this information and serves as a link to databases maintained by other agencies (ODFW, WDFW, CRITFC, NOAA-Fisheries, Fish Passage Center, PSMFC-Regional Mark Information System, StreamNet and other Service offices). The CRFPO also cooperates with the Complex, LCRFHC, AFTC, and co-managers to evaluate fish culture practices, assess impacts to native species, and coordinate hatchery programs both locally and regionally. These activities are described in the following section:

3.8.1 Database Management The Fisheries Information System (FIS) is a national database system for the Service Fisheries Program. The FIS consists of five different databases, two of which, the Fish and Egg Distribution Databases, document production accomplishments from all NFHs. Each Service field office contributes to this database. The FIS database is discussed further in Chapter 4.

Information from and about Little White Salmon NFH is connected to the broader fisheries community of the west coast of the North American Continent through the Service's Columbia River (information) System (CRiS). The following information is recorded in files that are components of the CRiS database: returns to the hatchery; age, sex, length, mark and coded-wire tag information for returning fish that are sampled; egg development and disposition; the origin of fish raised at the hatchery; and fish transfers and releases. Little White Salmon NFH maintains files containing information generated at the hatchery (brood stock management, incubation,

rearing, and release). Staff from the CRFPO maintain files containing information on marked juvenile fish and on sampled adult fish (adult bio-samples).

Use of CRiS database files and programs achieves the following purposes:
1) Reduces the amount of effort expended to meet reporting requirements.
2) Increases the quality and consistency of data.
3) Facilitates development of software usable at all stations.
4) Provides a platform on which to build effective evaluation tools which can be used by hatcheries, fisheries management and regional offices.
5) Facilitates the exchange of information with other agencies.
For example, release and recovery information is reported to both the Regional Mark Information Center and the StreamNet databases.

Computer programs that are components of the CRiS database are used to transform data into formats required by other agencies. These formats can be either electronic or printed. Other CRiS programs combine data from the hatchery, CRFPO, and from databases maintained by other agencies into other formats to accomplish reporting, monitoring, and evaluation.

3.8.2 Marking/Tagging Program Juvenile fish are fin clipped and coded-wire tagged by CRFPO to monitor and evaluate fish cultural techniques, survival and fishery contribution. To assess survival and evaluate harvest potential under normal production, the current marking strategy is that all of the Little Salmon NFH 1.0 million spring Chinook salmon are adipose fin clipped with 75,000 receiving CWTs. Umatilla program spring Chinook also receive an adipose clip except for 40,000 that receive CWTs and a left/right ventral fin clip. The station release of 2.0 million upriver bright fall Chinook receive 200,000 CWTs as with the 1.7 million upriver bright fall Chinook that are transferred to the Yakima River, Prosser Hatchery. The coho transferred to the YN are marked with CWTs as well. Starting with brood year 2004, fall Chinook released on station will be mass marked with an adipose fin clip, adipose fin clip plus CWT, or CWT only.

This is in compliance with recommendations of the Biological Opinions of NOAA-Fisheries 1999 Artificial Propagation in the Columbia River Basin (NMFS 1999) and the 2000 Reinitiating of Consultation on Operation of the Federal Columbia River Power System, under the ESA-Section 7 Consultation. Future mass-marking is planned and may be implemented as early as 2005.

3.8.3 Bio-sampling and Reporting Sampling of hatchery returns provides data that is combined with other information collected by agencies and tribes to evaluate the relative success of individual broods and compare performance between years and hatcheries. This information is used by salmon harvest managers to develop plans allowing harvest of hatchery fish while protecting threatened, endangered, or other stocks of concern.

All fish are checked for CWTs. All coded-wire tagged fish are sampled, their heads are removed, and CWTs are read for year of hatchery release. A percentage of untagged fish are also sampled. For all sampled fish, length and sex are recorded and scales are collected to determine average size, sex ratios, and age composition of returning fish. At least 600 adults are

sampled throughout the spawning year and additional sampling occurs when adults are excessed. Coded wire tag history, based on the CRiS database, is summarized below:

Tule Fall Chinook	-brood year 1976, 1977, 1978, 1979 1980, 1981
Upriver Bright Fall Chinook	-Age 0 vs. Age 1 releases for brood year 1983, 1984, 1985 -Stock Assessment marking brood year 1989 to present
Spring Chinook	-Age 0 vs. Age 1 releases for brood year 1983, 1984, 1985 -Stock Assessment marking brood year 1988 to present
Coho Salmon	-brood year 1975 -Density study evaluation brood year 1981, 1982 -Stock Assessment marking brood year 1988 to present

3.8.4 Hatchery Evaluation Studies Hatchery evaluation is the use of replicable, statistically defensible studies to guide management decisions. The hatchery evaluation vision action plan developed in 1993 for Region 1 Fisheries Program describes hatchery evaluation in greater detail (USFWS 1993). The purpose of hatchery evaluation is to evaluate and improve fisheries management decisions through planning, implementing, documenting, monitoring, analyzing, and reporting.

Little White Salmon NFH, with assistance from the CRFPO and LCRFHC, is presently evaluating the rearing of spring Chinook salmon in baffled and. un-baffled raceways. Baffles, or raised partitions spaced equally along the length of a hatchery raceway, increase velocities along the floor of the raceway while providing resting areas higher in the water column. This diversity in water flow simulates a more natural rearing environment and makes the raceway self-cleaning. The increased floor velocity moves solids generated by fish to the tail end of the raceway allowing easy removal during cleaning. A study is being conducted to evaluate the performance of fish reared in baffled raceways to a group reared in conventional, unbaffled raceways. Growth rates and fish health are being closely monitored in each group. In addition, both study groups contain 75,000 coded wire tagged fish that will allow biologists to determine if use of raceway baffles during hatchery rearing has an effect on adult fish return rates in subsequent years. This study will evaluate adult return, production parameters, baffled raceway flow profiles and fish behavior between the two groups. The study was initiated with brood year 2002 stock and will be replicated with 2003 stock. As in the past, both Little White Salmon and Willard NFH will continue to perform on station studies and investigations to improve hatchery operations and fish quality.

3.8.5 Stock Assessment and Contribution to Fisheries Coded-wire tagging of spring Chinook salmon production at Little White Salmon NFH began in 1989. Currently, a release group of 75,000 are adipose fin clipped and coded-wire tagged to assess survival and fisheries contribution. The remaining 925,000 fish are adipose fin clipped to comply with selective fisheries management practices now instituted for hatchery production of spring Chinook salmon released from Columbia River hatcheries. Table 8 summarizes harvest and hatchery escapement data for Little White Salmon spring Chinook. For brood years 2002 - 2004 an additional 75,000 spring Chinook salmon are being adipose fin clipped and coded-wire tagged to assess the use of raceway-baffles during the rearing of these fish. For the Umatilla Basin program, 40,000 spring Chinook salmon are adipose fin clipped, ventral fin clipped and coded-wire tagged, and 170,000

are adipose fin clipped. These two groups are transferred to the tribal Imeques acclimation facility located on the Umatilla River.

The 2004 Annual Stock Assessment Report (Pastor 2004), includes CWT recovery information for on-station releases for brood years 1988 through 1998. Average percent survival for these brood years is estimated to be 0.3520 +/- 0.3048 standard deviation. The minimum percent survival was 0.0155 for brood year 1990, and the maximum was 1.0458 for brood year 1988. Table 8 summarizes harvest and hatchery escapement data for Little White Salmon spring Chinook. .

Coded-wire tagging of upriver bright fall Chinook salmon production at Little White Salmon NFH began in 1990. Currently, a release group of 200,000 are adipose fin clipped and coded-wire tagged to access survival and fisheries contribution. An additional 1.8 million were previously released unmarked, however, beginning in 2005 all upriver bright fall Chinook released into the Little White Salmon River received an adipose fin clip. In cooperation with the YN, 200,000 upriver bright fall Chinook salmon are being adipose fin clipped, coded-wire tagged and 1.5 million unmarked fish are transferred to tribal facilities. On-station releases for brood years 1989 through 1996 indicate an estimated average adult percent survival to be 0.2949 +/- 0.2071 standard deviation. The minimum percent survival was 0.0826% for brood year 1994, and the maximum was 0.7550% for brood year 1993. Table 9 summarizes harvest and hatchery escapement data for Little White Salmon upriver bright fall Chinook.

Coded-wire tagging of coho salmon production at Willard NFH began in 1988. Currently all of Willard NFH production including 650,000 coho salmon are coded-wire tagged only and transferred to Winthrop NFH and the Wenatchee River facilities for subsequent release. Beginning in 2005 no production coho will be released into the Little White Salmon River. Estimates of overall adult percent survival of on-station releases for brood years 1988 through 1998 is 0.4758 +/- 0.5200 standard deviation. The minimum percent survival was 0.0720 for brood year 1991, and the maximum was 1.6976 for brood year 1988. Table 10 summarizes harvest and hatchery escapement data for Willard NFH coho.

All Little White Salmon NFH release and recovery information is reported to the PSMFC via the CRiS database, CRFPO, and the Western Washington Fisheries Office. Coded-wire tags recovered are reported to PSMFC via the appropriate state, provincial, and tribal organizations.

The following tables (Tables 8-10) describe the various stock assessment and contribution to fisheries for species produced at the Little White Salmon/Willard NFH Complex. Category definitions listed by brood year are as follows: hatchery escapement includes all fish collected at the hatchery rack; Columbia River harvest includes all freshwater sport, commercial and tribal harvest; ocean harvest includes all saltwater sport, commercial and tribal harvest; and spawning ground recoveries include fish that were not collected in the hatchery and remained in the Little White Salmon River, Drano Lake, and other tributaries.

Table 8. Hatchery escapement, Columbia River harvest, ocean harvest and total production for Little White Salmon NFH spring Chinook salmon brood years 1988-1995. The total adult production number given includes all estimated sport, tribal, and commercial harvest of Little

White Salmon NFH fish. This table is partially reproduced from the Little White Salmon NFH – HGMP. Data presented in this table are calculated from the 2002 Annual Stock Assessment Report (Stephen M. Pastor).

Brood Year	Hatchery Escapement	Columbia River Harvest	Ocean Harvest	Spawning Ground Recoveries
1988	2,441	2385	0	0
1989	1,019	1,274	0	0
1990	260	0	0	0
1991	232	0	0	0
1992	2,895	1,924	0	[1] 607
1993	1,246	1,055	0	0
1994	352	18	0	0
1995	2,381	317	0	11
1996	3,459	1,139	0	44
1997	576	2,974	0	24
1998	3,221	3,198	0	0
Mean	**1,644**	**1,299**	**0**	**62**

[1] Estimated number of hatchery fish that navigated the damaged barrier dam, during unusually high water and escaped above the hatchery and were observed below the falls, near the hatchery water intake supply.

Table 9. Hatchery escapement, Columbia River harvest, ocean harvest and total production for Little White Salmon NFH upriver bright Chinook salmon brood years 1989-1995. The total adult production number given includes all estimated sport, tribal, and commercial harvest of Little White Salmon NFH fish. This table is partially reproduced from the Little White Salmon NFH – HGMP. Data presented in this table are calculated from the 2002 Annual Stock Assessment Report (Stephen M. Pastor).

Brood Year	Hatchery Escapement	Columbia River Harvest	Ocean Harvest	Spawning Ground Recoveries

1989	995	161	1,734	642
1990	7,142	1,041	4,005	1,047
1991	2,461	1,148	1,426	802
1992	3,892	1,455	905	511
1993	6,678	1,581	3,341	1,975
1994	708	309	319	299
1995	2,634	493	1,213	739
1996	1,329	568	808	283
Mean	**3,230**	**845**	**1,618**	**752**

Table 10. Hatchery escapement, Columbia River harvest, ocean harvest and total production for Willard NFH coho salmon brood years 1988-1997. The total adult production number given includes all estimated sport, tribal, and commercial harvest of Willard NFH fish. This table is partially reproduced from the Little White Salmon NFH – HGMP. Data presented in this table are calculated from the 2002 Annual Stock Assessment Report (Stephen M. Pastor).

Brood Year	Hatchery Escapement	Columbia River Harvest	Ocean Harvest	Spawning Ground Recoveries
1988	12,436	8,780	28,296	0
1989	2,264	1,240	4,905	0
1990	417	129	1,079	97
1991	1,657	550	0	0
1992	1,486	161	360	0
1993	762	85	28	0
1994	4,558	285	759	0
1995	9,026	1,431	928	113
1996	2,328	306	72	18
1997	16,344	113	51	0
1998	3,162	129	2,041	0
Mean	**4,949**	**1,201**	**3,056**	**21**

3.8.6 Juvenile Monitoring Juvenile fish at the Little White Salmon/Willard NFH Complex are monitored on a routine basis by the hatchery staff to determine the condition factor of fry, fingerlings and smolts. Samples are taken by the LCRFHC to determine the health condition of fry, fingerling and smolts. Sampling of fingerlings for tag retention and fin mark quality, prior to release, is conducted by CRFPO. Salt water challenges are conducted before each release to assess smolting. The results from the 24-hour saltwater test are entered into the hatchery's database and noted in the Columbia River Information System.

3.8.7 ESA Assessments, Ecological Interactions, and Natural Production Studies The Service completes Biological Assessments and HGMPs to comply with the ESA. These assessments and plans help guide production, considering the potential impacts on the biological community.

Specific evaluations are conducted as funding allows. For example, during fall 2004, an assessment was initiated to verify that current brood stock collection activities were representative of the hatchery return and to document behavior of individual fish not allowed access to the hatchery.

Additional monitoring is needed to evaluate releases and transfers, possible interactions with wild stocks in the migration corridor, and to identify potential hatchery reform measures. Currently, staff from the Complex, CRFPO, LCRFHC, and AFTC are working to identify critical study questions to evaluate these topics. Shared project proposals will be submitted to the Services' FONS database for funding.

3.8.8 Environmental Monitoring Environmental monitoring is conducted at Service facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System (NPDES) permit and is also used in managing fish health. On a short-term basis, environmental monitoring helps identify when changes to hatchery practices are required. The following parameters are currently monitored at Little White Salmon NFH:

- Total Suspended Solids (TSS) – one sample per week from composite upper and lower effluent discharge, pollution abatement clarifier effluent discharge, and upper and lower intake inflow.

- Settleable Solids (SS) – one sample per week from the upper and lower effluent discharge points and for the pollution abatement clarifier effluent discharge.

The hatchery environmental monitoring program is described in detail in the Little White Salmon NFH Pollution Prevention Plan. The hatchery has been a leader in demonstrating environmental stewardship among Service facilities and was nationally recognized when awarded the Service's Environmental Leadership Award during 2002.

Willard NFH is exempt from the requirements of the NPDES permit. During 1998, the Environmental Protection Agency (EPA) determined that the outfall from the Willard NFH pollution abatement pond is a non-point discharge. No effluent water is released into the Little White Salmon River. As a result, environmental monitoring of Willard NFH effluent is not required.

3.8.9 Coordination/Communication The hatchery holds meetings as needed to discuss special issues of concern. These meetings include representatives from the Little White Salmon/Willard NFH Complex, CRFPO, LCRFHC, and AFTC. Topics of concern generally include proposed changes to the production program, serious fish health concerns, ongoing or proposed evaluations, or other issues requiring multi-office coordination. In addition, separate coordination meetings are held as needed with the WDFW to discuss issues of concern relative to the Drano Lake sport and tribal fisheries. Hatchery staff attend annual coordination meetings with the CTUIR and ODFW to discuss the Umatilla Basin fisheries program and to assist with the development of an annual operation plan. Also, staff attend annual meetings to coordinate YN and Service fishery efforts.

3.8.10 Fish and Egg Transfers All fish and egg requests or transfers are coordinated through the Complex, LCRFHC, and CRFPO. Any request for fish or eggs, either in or out of Little White Salmon or Willard NFH, will be documented and approved using a NFH planned release or transfer schedule to secure the appropriate State fish transfer permits, or included on the approved Future Brood Document. All transfers of fish and eggs require a fish health certification from LCRFHC prior to transfer. All fish and egg transfers are made in accordance with co-manager fish disease policies and Service fish health policy. If the fish or eggs are determined to be healthy, the LCRFHC arranges for all appropriate state permits involving the transport. The transfer schedule is signed by the Little White Salmon/Willard NFH Complex Manager and LCRFHC Project Leader. The document and permits are sent to the CRFPO for approval and the requests and permits are kept on file at the CRFPO.

3.8.11 Interagency Coordination/Communication As part of the U.S. *v* Oregon Columbia River Fish Management Plan, the Technical Advisory Committee (TAC) and Production Advisory Committee (PAC) are comprised of harvest and production assessment biologists including representatives from the Service, Tribes, NOAA-Fisheries, and states of Oregon, Washington and Idaho. These groups provide management direction used in establishing hatchery fish production goals and harvest rates.

The Integrated Hatchery Operations Team (IHOT), comprised of representatives from fish management agencies, developed a series of regional hatchery policies and operational plans. The IHOT group has since been replaced by the Artificial Production Review and Evaluation process funded by the Northwest Power and Conservation Council. The Service is represented by Regional office staff.

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

3.8.12 Ocean Fisheries Management The upriver bright fall Chinook and coho salmon at the Complex contribute to ocean fisheries. Spring Chinook are not recovered in ocean fisheries in significant numbers and do not influence ocean fishery management decisions. The elimination of the Complex coho program during 2004 precludes any direct future contribution to ocean fisheries or impact on ocean fisheries management for this particular stock of fish. See section 2.7.10, 2.8.2, and 3.8.5 for further information on commercial fishery contributions.

3.8.13 Freshwater Fisheries Management Washington, Oregon, and the four treaty tribes (Yakama, Warm Springs, Umatilla and Nez Perce), that are parties to the Columbia River Fish Management Plan (U.S. *v* Oregon), prepare harvest strategies based on run size predictions made by their respective fishery agencies. They then jointly present their findings to the Columbia River Compact (Compact) through the TAC. The Compact, created by Congress, has the authority to approve or reject sport and commercial fishery proposals for the Columbia River. In their deliberations, the Compact will consider the findings of the TAC. If those findings are in compliance with the management plan, brood stock goals and ESA guidelines, and the run size

prediction shows a harvestable surplus, the Compact will set seasons for non-tribal and/or tribal fisheries in the Columbia River. In addition, the YN exercises management authority within the boundaries of their traditional fishing areas to regulate tribal gill net fisheries in Drano Lake.

Both upriver bright fall Chinook, spring Chinook and coho salmon returning to the Complex are a major contributor to the sport fisheries in the Columbia River and Drano Lake as well as the commercial gill net fishery below Bonneville Dam. These stocks are also a major contributor in the tribal zone 6 fishery above Bonneville Dam.

3.9 Public Outreach Activities

The goal of the outreach program is to increase public understanding of the role hatcheries play in supplementing and restoring fisheries within the Columbia River Basin. The diverse, multi-species production program and close proximity of the hatchery to the Portland/Vancouver metro area places both hatcheries in an ideal situation to describe the positive contributions of the hatchery program. Hatchery staff meet with visitors to share information and answer questions. Visitor center displays and an underwater adult fish viewing area are major attractions used to promote the visibility of the hatchery complex in the Columbia River Gorge and to provide information about Service programs to internal and external audiences.

Recognizing the importance of all Service staff to be involved in gaining or retaining public support for our programs, the hatchery outreach program will strive to insure that staff are well-informed about policies, procedures, and issues; and that staff are willing and able to interact with the public. Program efforts will include providing information to staff, partners, and volunteers and, through them, to members of the community and other publics. Outreach will be used as a management tool to maintain the health and survival of our hatcheries, and the Service as a natural resource agency.

Information about Little White Salmon NFH can be found online at http://gorgefish.fws.gov/littlewhite, and for Willard NFH at http://gorgefish.fws.gov/willard. In addition, the underwater viewing webcam in the Little White Salmon River can be viewed over the internet at http://pacific.fws.gov/webcam.

3.9.1 On Station On station activities include tours of the facility to schools and special interest groups. Late summer and fall spawning seasons are the most popular tour times. Hatchery staff take advantage of these opportunities to give the visiting public a better understanding of hatchery operations and salmon life cycle. The hatchery, visitor center and underwater viewing area are open to the public seven days per week.

3.9.2 Off Station Off station outreach efforts focus primarily on formal presentations to special interest groups. A majority of these presentations describe Basin-wide fishery restoration and enhancement efforts where the use of hatcheries is integrated with the more global issues of Columbia River water management, habitat restoration, harvest management and operation of the hydropower system. Other off station outreach efforts support tribal celebrations like the CTUIR Salmon Walk, or to increase the visibility of the hatchery in the local area by participating in annual July 4th parade.

3.9.3 Partnerships/Cooperators with the Complex

Partnerships/Cooperators

- Bonneville Power Administration
- Cold Springs Conservancy
- Columbia River Inter-Tribal Fish Commission
- Confederated Tribes of the Umatilla Indian Reservation
- NOAA-Fisheries
- Private land owners in Little White Salmon River watershed.
- Skamania County Parks and Recreation Department and Road Department
- U.S. Army – Corps of Engineers
- U.S. Environmental Protection Agency
- U.S. Geological Survey – Biological Resources Division
- U.S. *v* Oregon parties - co-managers of Columbia River fisheries, including Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, Confederated Tribes of the Warm Springs Reservation of Oregon, Washington Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, Idaho Fish and Game, NOAA-Fisheries and U.S. Fish and Wildlife Service.
- Washington Department of Ecology
- Washington Department of Fish and Wildlife
- Yakama Nation

3.10 Special Concerns

3.10.1 Planning Issues Federal, state and tribal entities share responsibilities for development of Subbasin plans, hatchery production, harvest management, and ESA considerations. Planning issues center around correcting factors contributing to the decline of Columbia River aquatic resources. The agencies involved include the Service, USFS, NOAA-Fisheries, COE, USGS, BPA, WDFW, ODFW, Underwood Conservation District, and the YN.

This Comprehensive Hatchery Management Plan will recognize and comply with all management plans and Biological Opinions affecting the Columbia River Basin. Operations at the Complex center around marking, juvenile releases and production numbers, surplus adult distribution, impacts to aquatic resources, actions being taken to help recover listed and depressed populations, and funding for operations, maintenance and evaluation.

3.10.2 Marking To help protect wild and naturally produced fish, the states of Washington, Oregon and Idaho are implementing selective sport and commercial fisheries (non-tribal) on marked hatchery fish. These selective fisheries require that hatchery produced fish be marked. Mass marking (100% adipose fin clipped) of hatchery fish is being implemented for steelhead trout, spring Chinook and coho salmon. Under recent congressional legislation in 2004, all federally funded hatchery fish will be mass marked, including fall Chinook, except for special conservation purposes. Depending on sufficient funding and equipment availability, mass marking all on-station releases is scheduled for 2005.

Tribal managers generally disagree with the management strategy for mass marking and selective fisheries. The Service will continue to coordinate actions with the states and tribes through U.S. *v* Oregon and NOAA-Fisheries to comply with ESA actions and coordinate with the PSMFC mark committee. In addition, federal agencies are beginning discussion of a comprehensive marking strategy for the Columbia River Basin as identified by Action 174-1in the Federal Columbia River Power System Biological Opinion. Federal agencies (NOAA-Fisheries lead) are meeting with the states and tribes to begin this effort.

This comprehensive marking plan should:

- Improve our ability to assess and monitor the status of naturally-producing (especially ESA listed) populations.
- Monitor and evaluate hatchery programs, including hatchery reforms and stray rates.
- Maintain critical harvest management and stock assessment information.
- Monitor mark-selective fishery regimes established by the states.
- Improve regional and watershed based marking decisions.
- Be consistent with recovery plan goals.
- Be coordinated through U.S. *v* Oregon, PSMFC, and U.S. - Canada forums.

3.10.3 Juvenile Salmon Distribution and Production Numbers Juvenile salmon are transferred and/or released from Little White Salmon and Willard NFH in March, April and June as both yearling and sub-yearling smolts. Release and transfer strategies are in agreement with WDFW, ODFW, YN, CTUIR, the Service and NOAA-Fisheries. The on-station release of coho salmon into the Little White Salmon River was terminated during 2004 due to shortfalls in Mitchell Act operational funding. Also during 2004, the fishery co-managers have reached agreement in the U.S. *v* Oregon forum to discuss a major program change involving the reprogramming of 4.2 million ODFW Bonneville Hatchery upriver bright fall Chinook to the Little White Salmon/Willard NFH Complex. The reprogramming proposal also includes the transfer of rearing responsibility of up to 5.0 million Spring Creek NFH tule fall Chinook to Bonneville Hatchery. Reprogramming is being explored to eliminate the early spring (March) release of Spring Creek NFH tule fall Chinook and subsequent spill requests from the Service to the BPA to spill water at Bonneville Dam to enhance the survival of this release group, more

than one month premature to mandated Biological Opinion spill. In addition, reprogramming would result in a reduction in the number of returning adult tule fall Chinook to the Columbia River Zone 6 tribal fishery and an increase in the more economically valuable upriver bright fall Chinook to the Zone 6 tribal fishery.

3.10.4 Water Use (Drought) During recent drought years, river water flow has not dropped low enough to negatively impact water quality within the hatchery. The decommissioning of the Broughton Lumber Flume in 1985 and subsequent addition of the Flume diversion water right to the Little White Salmon River has made drought restrictions non-existent. Although unlikely, if a premature release is required due to drought, all proper approvals will be obtained prior to a drought related release.

3.10.5 Emergency Releases A protocol for emergency releases will be developed by hatchery staff. It is unlikely that this will occur for non-smolted fish due to potential ecological interactions with fish listed under the ESA. Concurrence from NOAA-Fisheries is required to assure that an emergency release would not jeopardize ESA listed fish.

3.10.6 Surplus Adult Salmon Distribution In most years, more fish return to the hatchery than are needed for brood stock. Most of these surplus fish are in good condition upon entry into the hatchery and are distributed to the YN as needed for ceremonial and subsistence use and for use in the tribal nutrition program. Fish anesthetized with MS-222 or injected with erythromycin (spring Chinook adults) are typically rendered or buried on site. Whenever possible, excess hatchery fish will be left in the Little White Salmon River to allow for natural spawning, consumption by wildlife, and stream nutrient enhancement from carcass decomposition. The waterfall creating a historic barrier to anadromous fish passage in the upper watershed limits the options available for natural spawning activity. While agency managers agree that spawning habitat on the Little White Salmon River is marginal at best, small pockets of spawning gravel exist below the barrier. In addition, the hatchery (433 acres) is the site of an active bald eagle roost and is intensively used by wintering bald eagles. Allowing carcasses to remain in the River and Drano Lake is extremely beneficial to local wildlife and the Columbia River ecosystem. As a result, the hatchery has become a popular watchable wildlife viewing area.

3.10.7 Hatchery Fish Ladder Management The hatchery fish ladder is operated for both spring Chinook, upriver bright fall Chinook and coho salmon to assure adult fish for brood stock are collected from a spectrum of the run. This assures a genetically diverse brood stock by eliminating any potential bias toward run timing. Ladder management is slightly more complicated during the collection of upriver bright fall Chinook due to the simultaneous collection of adult coho salmon. The excess of one species must be returned to the river to assure collection of adequate numbers of the other species. This often results in the collection and handling of an excess adult fish (normally coho salmon) more than one time. The ladder is closed once the hatchery escapement goal is met and excess fish beyond the needs of the YN are left in the river to spawning naturally, provide nutrients to the watershed, and to feed local populations of wildlife. Ladder operations and migration behavior of fall Chinook salmon will be evaluated further starting in 2004.

3.10.8 Negative Impacts to Listed and Other Aquatic Resources and What Actions are Taken to Help Recover Listed and Depressed Populations All hatcheries must consider their potential for adversely affecting the aquatic community and both Little White Salmon and Willard NFH are no exception. Of most concern are potential ecological interactions with ESA listed stocks in the migration corridor since there are no resident ESA listed stocks in the Little White Salmon River watershed. To meet our ESA obligations, the Service is proceeding with actions to comply with the March 1999 Biological Opinion on hatcheries and the 2001 Biological Opinion on the Columbia River Federal Power System. An update of the Biological Opinion on hatcheries is expected in 2004. Actions in compliance with Biological Opinions are identified in Chapter 4 of this document. The Service has developed HGMPs to help assess the impacts from hatchery operations. The Service will work toward going beyond the assessment stage and taking actions which help recover listed and depressed populations, including appropriate or innovative hatchery reforms. Chapter 4 identifies potential projects and funding needs.

3.10.9 Insufficient Operations and Maintenance Funding Through the Mitchell Act Increased demands on hatchery programs, as required by ESA Biological Opinions, have strained hatchery budgets. Without increases in Mitchell Act funding, reductions in production programs will continue to be made. While reducing hatchery production may allow the hatchery and the Service to meet some ESA requirements, it may not uphold mitigation and tribal trust obligations. The Service is working with NOAA-Fisheries and other co-managers to address current budget shortfalls.

3.10.10 Watershed Management Nearly the entire basin is forested, with timber harvest being the primary land use. The northern 3/4 of the basin is within the Gifford Pinchot National Forest (GPNF). The southern portion is privately owned, with scattered rural residential development and small-scale agriculture. The major population centers are Willard, Cook, and Mill A. The year 2000 population, estimated at 513 persons, is forecasted to increase to 753 by 2020. The southeastern half of the subbasin is within the grand fir/Douglas fir ecological zone; the northwest portion is within the Pacific silver fir zone except for the Big Lava Bed, composed of scattered lodgepole pine, subalpine fir, western white pine, and Douglas fir. Approximately 20% of the basin is in early-seral vegetation. A long history of fire suppression has resulted in no large (>100 acre) fires since the 1930s. Timber harvest has replaced fire as the dominant disturbance agent affecting basin hydrology (NWPCC 2004).

During the 1960's, intensive logging on federal land resulted in the loss of significant riparian habitat along tributaries and the main stem of the Little White Salmon River. Flash flood events and excessive sediment loads were characteristic of the River during the time. The Service wrote numerous letters to the U.S. Forest Service during the 1970's voicing concern over road building, undersized culverts, loss of riparian vegetation, and logging debris in streams, all leading to flooding and excessive sediment that threatened operations at both Little White Salmon and Willard NFH. This lead to a review of forest practices on federal land and initiation of a water quality monitoring program. Gradual improvement in water quality has occurred since a near moratorium on large scale clearcut logging on federal lands during the 1990's. Unfortunately an increase in private land clearcut logging has along riparian areas has jeopardized any gains made in reducing sedimentation within the Little White Salmon River. As

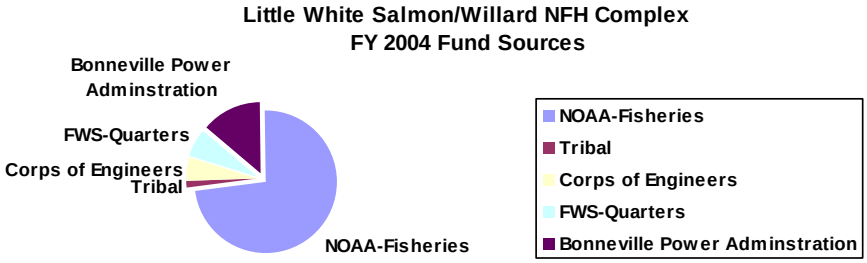
a result, the Service expressed concern to the Washington Department of Natural Resources over the increased riparian area encroachment that recently occurred on Broughton Lumber Company land (Attachment 10). The Service has requested that state foresters consider the importance of water quality and fishery resources when monitoring forest practices compliance on private land.

CHAPTER 4. IMPLEMENTATION

Implementation of the Complex's program requires input to reimbursable and Service budget processes, as well as compliance with Service policies, legal mandates, and other environmental and human resource laws. This chapter outlines these processes and the policy and planning documents which provide guidance to the Complex in regard to policy, budget, safety, grounds and facilities maintenance.

4.1 Budget Overview

The Fiscal Year 2004 budget for the Little White Salmon/Willard NFH Complex totaled $1,054,961 from all fund sources. Reimbursable funds from other agencies accounted for 100% of the budget with a majority of operational funds (77%) coming from the NOAA-Fisheries Mitchell Act appropriation. These funds reimburse the operating agencies (in this case the Service) for fish production to mitigate for fish losses associated with the operation of hydroelectric dams on the Columbia River. Remaining reimbursable funds are for fish reared for specific programs such as the BPA reimbursed Umatilla River and Mid-Columbia coho reintroduction (Wenatchee Basin) programs and the COE John Day mitigation effort. In addition, operation of Willard NFH involves a cost share program between the Service and YN. In this cost-share effort the YN covers 60% of the operational costs of Willard NFH while the Service funds the remaining 40% required for operation. The Complex received no operational funds from the Service during Fiscal Year 2004.



In addition to a complicated hatchery production program, administration of the Complex also includes the management of 14 government residences, the largest government housing program in the National Fish Hatchery System. Rent paid for occupying a government residence is deposited into a dedicated account (subactivity 8610) for use in maintaining residential facilities. Although these funds are shown as a Complex fund source, monies generated from rental receipts are not used to support fish production efforts. A total of $69,218 was spent operating and maintaining government quarters at the Complex during Fiscal Year 2004.

Table 11. Budget by funding source and full time equivalent personnel for the fiscal years 2001-2003.

	2002 Operational Cost	2003 Operational Cost	2004 Operational Cost
NOAA Fisheries	874,575	851,802	822,537
COE	63,974	63,484	61,022
BPA	129,569	103,039	125,989

Tribal	0	0	14,890
Operations	1,068,118	1,018,325	1,024,438
Cyclical	60,868	35,988	25,725
Quarters	81,534	63,280	69,218
Veh./Equipment	8,429	25,467	26,846
MMS project list	319,436	137,013	160,022
Maintenance	470,267	261,748	281,811
FTEs	13.0	12.0	12.0

4.1.2 ESA Compliance The 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin lists a host of measures which either must, in the case of Reasonable and Prudent Alternatives, be complied with or, in the case of Conservation Recommendations, should be implemented.

Reasonable and Prudent Alternatives for the Complex are:

- Manage adult hatchery straying rates to the lowest level achievable. For Little White Salmon NFH stocks, stray rates shall not exceed 5% of the annual natural population size outside the Little White Salmon River.

Conservation Recommendations are:

- Minimize inter-Basin stock transfers
- Emphasize juveniles that are ready to migrate to the ocean and spend a minimum amount of time in the freshwater environment
- Improve homing and reduce straying
- Evaluate "NATURES" type rearing strategies
- Monitor and evaluate ecological interactions
- Assess carrying capacity and density-dependent effects
- Monitor and evaluate predation
- Conduct spawning ground surveys
- Assess use of hatchery carcasses for nutrient input
- Use appropriate brood stock for reintroduction into historic or vacant habitats
- Develop cost-effective externally distinguishable marks to identify hatchery origin fish
- Modify hatchery programs to conservation/enhancement role
- Adopt strategies to separate returning hatchery fish from listed naturally spawning fish
- Continue adaptive management to improve smolt quality
- Continue to coordinate hatchery programs to meet ESA concerns

In addition, the following measures are associated with an Incidental Take Statement:

Reasonable and Prudent Measures are:

- Provide projected hatchery releases to NOAA Fisheries annually

- Manage programs to minimize potential inbreeding of hatchery and listed fish
- Monitor and evaluate artificial propagation programs
- Reduce potential negative impacts to listed salmon and steelhead from hatchery operations

Terms and Conditions include:

- Provide projected hatchery releases and annual report of releases and returns to NOAA-Fisheries
- Mark a representative sample of hatchery salmon released to allow monitoring and evaluation.
- Develop protocols for fishery augmentation/mitigation programs to reduce potential for interbreeding and genetic introgression
- Ensure water intakes are properly screened and comply with NOAA-Fisheries intake structure criteria
- Implement PNFHPC and IHOT guidelines
- Monitor effluent for compliance with NPDES permits

4.1.3 Budgetary Needs and Strategies Funding for construction, program changes, and quarters maintenance is identified through the Maintenance Management System (MMS), the Fisheries Operational Needs System (FONS), and Regional Quarters Overhead funds allocated through a competitive process. Access to FONS and MMS files is through the Fisheries Information System (FIS) database. The FIS database consists of five modules which address future budgeting (FONS), resource oriented accomplishments that occurred over a fiscal year (Accomplishments Module), Congressionally mandated reporting requirements that describe yearly production at NFHs (Fish and Egg Module), activities related to endangered species (Imperiled Species Module), and deferred maintenance needs (MMS).

4.1.4 Fisheries Operational Needs System (FONS) FONS was established in 1999 as a planning, budgeting, and communication tool to enhance identification of funding and staffing needs for the fishery program. FONS projects are used in budget requests to the DOI and the Office of Management and Budget (OMB). Table 12 outlines the Regional and National budget formulation, and provides a timeline through the process. Projects are submitted to evaluate hatchery goals and standards (Table 13). Additional projects will be submitted as needs arise. Several other Service field offices support Little White Salmon NFH and include the CRFPO, LCRFHC, and Abernathy Fish Technology Center. Unfortunately, the Service has placed an extremely low priority on FONS projects submitted by reimbursable funded stations.

Table 12. Regional and National calendar for the budget formulation process.

Regional Formulation Process	
November	Project Leaders complete FONS submissions, emphasizing projects related to ecoregion priorities, and forward to the Regional FONS Coordinator. Submissions are reviewed for completeness and clarity. Projects are then submitted to the relevant supervisors for ranking.

	ARD, Fisheries incorporate supervisor rankings and input, plus regional and national priorities to develop regional ranking recommendations. Regional Director reviews and approves/modifies regional ranking recommendations.
National Formulation Process	
February	Regional FONS submission to Service's Washington Office.
March and April	Assistant Director, Fisheries and Habitat Conservation and ARD, Fisheries review regional submissions and identify themes. Themes communicated to ARD, Fisheries, Regional Directors, and Director.
May and June	Regions use themes in the development of regional budget requests. Using FONS, project lists will be developed for each theme to be forwarded in the Regional Request.
June	The Service Budget Committee considers the Regional Requests in setting priorities for the Service's Budget Request to the Department.
June to January	As the Service's Budget Request moves through the approval process (Department of Interior and OMB review), ARD, Fisheries will be consulted to ensure that FONS lists still represent the highest priorities of the regions.
February	President's budget submitted to Congress including FONS projects for Fisheries Program increases.

Table 13. Fisheries Operational Needs System (FONS) projects for the Little White Salmon/Willard NFH Complex. The following projects have been submitted as of fiscal year 2004 and are linked to Little White Salmon/Willard NFH Goals and Objectives (see Section 3.1 of this document for more information).

Goal	Objective	Intended accomplishment	FONS Project #	Cost ($1,000)

Goal	Objective	Intended accomplishment	FONS Project #	Cost ($1,000)
1,3	3,2	Hatchery evaluation stock assessment.	1999-006	884.0
2	3	Evaluate the survival of coho salmon release in Tribal restoration efforts at two different locations to determine suitability for use.	1999-001	429.3
1,3	4,3	Improve habitat by eradicating Eurasian milfoil along USFWS-owned lands on Drano Lake.	2003-101	182.0
4	1,2	Develop Little White Salmon NFH public outreach self-guided tour.	1999-002	46.6
1,3	4,3	Improve recreational fishing areas on USFWS lands to provide safe public access.	2002-001	78.0
2	3	Expand hatchery production capability to increase fish production for off-site restoration programs.	2002-002	447.2
3	1	Evaluate adult salmon straying in the Columbia River.	2003-103	89.4
3	3	Evaluate the use of hatchery fish for establishing self-sustaining populations of salmon.	2003-100	52.0
4	3	Provide law enforcement on intensely visited USFWS lands.	2000-001	26.0
			Total:	679.3

4.1.5 Maintenance Management System (MMS) The MMS is an inventory of deferred maintenance projects, which are maintenance projects that can be put off or do not occur on an annual basis. The MMS is the primary vehicle used to address maintenance requirements above $5,000. The database is updated annually then forwarded to the Washington Office for consolidation and submission into the budgetary process. Projects submitted for consideration are too numerous to list here and can be found in Attachment 6. Recent MMS funding has been directed toward correcting Health and Safety discrepancies.

4.1.6 Five-year Construction Plan Fisheries Construction projects are entered into the Refuge Management Information System (RMIS), the same web-based database, developed for Refuges, as is used for the Real Property Inventory (RPI). Scores and Regional priorities are assigned and the information is used in the WO to develop the Five-year Construction Plan. This plan, after it has been approved by the DOI and OMB, is submitted as part of the Service Budget to Congress. The out-years of this plan are subject to revision each year.

Construction funds are similar to MMS funds but are reserved for new construction and maintenance to existing buildings above $500,000.

4.1.7 Five-year Maintenance Plan The Deferred Maintenance projects entered into the database are prioritized by the WO, at least partially, based on the priority established by the Field Office and Regional Office priorities. This plan is reviewed by the Department and the approved plan is part of the basis of our MMS budget request to Congress (see previous discussion on MMS).

4.1.8 Mitchell Act and Other Reimbursable Funding Processes As stated previously, 100% of Little White Salmon NFH operations are derived through reimbursable funding received from the NOAA-Fisheries, COE and BPA. Funding is negotiated yearly with the Service submitting budget proposals to NOAA-Fisheries, COE and BPA for their consideration. Agreements are signed and are required to be in place by January 1st of the budget year.

The increased demands on hatchery programs, as required by ESA Biological Opinions, are inadequately funded through the Mitchell Act. Either Mitchell Act support needs to be increased or alternative funding sources need to be identified. If additional support is not secured in the near future, hatchery programs may need to reduce production. Reducing production may meet ESA requirements but it does not uphold our federal mitigation or tribal trust responsibility.

4.2 Service and Station Guidance

Little White Salmon NFH operates under a variety of Service guidance and policies. Some of the more significant ones are described in the following section:

4.2.1 Quarters Policy The Service administers a variety of field offices and NFHs. At many of these hatcheries, including the Complex, government owned residences are available to employees on a required occupancy basis. The determination of whether an employee must occupy government furnished quarters as a condition of employment is made on a station-by-station, position-by-position basis. In making a determination, supervisors will consider: the dependability of the water supply, adequacy of the alarm and call back systems, response time needed to take emergency corrective actions, and the adequacy of the security provided to protect fish, facilities, and equipment.

4.2.2 Required On-Station Housing The intent of having personnel living in government quarters at the Complex is to provide station security and operations during non-duty hours. Mechanical systems to regulate and filter water flows must be maintained to prevent loss of fish. Additional protection of government owned property is provided by occupants to protect facilities at both Little White Salmon and Willard NFH that are located in a remote rural area. The Little White Salmon NFH microscreen drum filter, intake drum screens, standby generator and alarm system requires quick response to prevent fish losses. In addition, a minimum of two staff as required occupants of government housing are necessary at both stations due to potential inaccessibility during severe weather storms or events.

4.2.3 Overtime, Compensatory Time, and Standby Regulations governing overtime, compensatory time, and standby are described in the Service's Administrative Manual. Premium pay is discussed in Part 225 FW of the Manual with specific discussions on overtime regulations, callback overtime, compensatory time, and standby.

4.2.4 Surplus Fish and Eggs as Government Property This guidance was provided in a July 2001 memorandum from the Regional Director. The guidance states: "Live fish entering a National Fish Hatchery (Hatchery), whole fish carcasses or their parts, are Government property and cannot be converted for personal use, even temporarily on loan". Misuse of Government property may result in disciplinary action ranging from a written reprimand to removal from the Service.

All possible uses of hatchery fish that are consistent with the Service's mission are considered. See the section titled Surplus Fish Distribution in this chapter or in Chapter 3 of this document for more information.

4.2.5 Drugs and Anesthetics Guidance on the use of anesthetics, drugs and other chemicals was provided in a November 9, 2000 memorandum from the Assistant Regional Director for Fisheries in the Pacific Region (Attachment 7). Hatcheries and other Fisheries offices within the Pacific Region may at times have legitimate and necessary reasons to use certain drugs and chemicals to achieve their goals and complete the mission and objectives of the Service. During the capture, rearing, or monitoring of fish species, several drugs and chemicals are used for anesthesia, disease treatments, or to increase the survival of the animals. Some of these compounds are already registered and labeled for fisheries use. Others may be legally used under the prescription and supervision of a veterinarian, or within the protocols of an existing Investigational New Animal Drug (INAD) exemption permit issued by the Food and Drug Administration (FDA). The Service has existing correspondence from the FDA concerning the use of compounds in the recovery of threatened and endangered species, but there are strict considerations and limits in those situations. The Pacific Region, working closely with the National INAD Office and through appropriate consultation with FDA, will fully comply with all regulations and agreements for the use of aquatic drugs and chemicals. The inappropriate use of compounds on fish or aquatic animals intended for human or animal consumption is prohibited.

4.2.6 Employee Training Regulations governing employee training are described in the Service's Administrative Manual. Career development is discussed starting in Part 230 FW of the Manual.

4.3 Service Required Planning Documents

Daily operations of the Complex are guided by a number of plans and reports designed to promote health and safety, station development, emergency situations, employee training, and other actions. Some of the more significant ones are described in the following sections.

4.3.1 Safety and Health Plan Safety regulations are described in the Service's Administrative Manual. Safety program discussions start in Part 240 FW of the Manual.

4.3.2 Fire Management Plan Department and Service policy require that "every area with burnable vegetation must have an approved Fire Management Plan" and field stations cannot conduct prescribed fire operations, including trash burning, without an approved Fire Management Plan that includes such activities. All Service facilities developed plans and had

them approved in FY2001, but they must be amended before any controlled burning can be conducted.

4.3.3 Integrated Pesticide Management Plan It is Service policy to eliminate unnecessary use of pesticides by implementing integrated pest management techniques and by selecting crops and other vegetation that are beneficial to fish and wildlife but do not require pesticides. The ultimate goal is to eliminate pesticide use on Service lands and facilities and to encourage pest management programs that benefit trust resources and provide long-term, environmentally sound solutions to pest management problems on sites which are off Service lands.

When pesticides are used, they must be part of a pest management program that includes strategies to reduce and eventually eliminate their use. The program must be set forth in an Integrated Pest Management Plan which must include consideration of target specificity of the pesticide (insecticide, fungicide, herbicide, etc.), risk to non-target organisms, incidental reduction of food resources for trust species, persistence, control and prevention of the spread of fish and wildlife diseases, and other environmental hazards.

4.3.4 Station Development Plan The Station Development Plan considers future growth and construction needs of the facility that are necessary to meet goals and objectives. The plan is an opportunity to work with the Service's Engineering Department to thoughtfully lay out a course of action to maintain the facility in proper operating condition. It is also a necessary precursor to get construction projects on the five-year construction list (see previous discussion).

Station Development Plans were completed for many stations in the early to mid-80s. The Little White Salmon/Willard NFH Complex plan was completed in 1986 and requires revision to include current information.

4.3.5 Monitoring and Evaluation Plan Monitoring and evaluation of production programs are outlined in the Little White Salmon and Willard NFH HGMPs (USFWS 2004). A more detailed discussion of monitoring and evaluation can be found earlier in Chapter 3.

4.3.6 Distribution of Surplus Fish The hatchery works cooperatively with the CRFPO, LCRFHC, and co-managers to plan beneficial uses of fish surplus to hatchery needs in years of large adult returns. The plan should consider all possible uses of adult carcasses and live fish in excess of hatchery needs, and will be coordinated with co-managers when necessary to achieve mutually satisfying solutions. The plan will be developed in years where surplus fish are anticipated, and in advance of spawning operations.

4.3.7 Small Water Systems Management Plan (Drinking Water) The Safe Drinking Water Act delegates safe drinking water control to the States. Little White Salmon and Willard NFH must meet state requirements to provide drinking water to the public as well as our employees and their families. OTAK, Inc., a private engineering firm, was awarded a contract to complete a Small Water Systems Management Plan for both hatcheries during 2002 to meet Washington State Department of Health (DOH) requirements. This resulted in an upgrade of the hatchery drinking water system permit from blue (not approved) to green (a DOH approved system).

4.3.8 Continuity of Operation Plan The Continuity of Operations Plan provides guidance for Complex staff to ensure that essential operations and activities continue during, and after, an emergency situation. The plan is developed in accordance with the Department of the Interior MRPS Bulletin 98-01, Continuity of Operations Planning - Guidance and Schedules, dated March 27, 1998, and number 380 DM 6, Vital Records Program. This plan is current and located in the hatchery administrative files.

4.3.9 Spill Prevention, Control and Countermeasure Plan A Spill Prevention, Control, and Countermeasure Plan (SPCC) is prepared in accordance with the provisions of Title 40 of the Code of Federal Regulations, Part 112. An SPCC plan establishes procedures, methods, and equipment used at Little White Salmon and Willard NFH to comply with the EPA oil spill prevention control and countermeasures standards, and inspection reporting, training and record keeping requirements. An SPCC is required at both hatcheries due to several above ground petroleum fuel storage tanks greater than 660 gallons and storage areas for formalin solution. The SPCC for Little White Salmon NFH is current (May 1999) although it requires updating to include the addition of three new hazardous materials storage buildings. The Willard NFH SPCC requires updating to include the addition of a new hazardous materials storage building. These documents can be found in the hatchery administrative files, or the Fisheries Program Regional Office in Portland, OR.

4.3.10 Outreach Plan An outreach plan is used to describe the hatchery strategy for keeping the public informed of significant issues. Furthermore, this plan describes outreach tools and facilities needed to implement this strategy. A formal outreach plan has not been developed although outreach accomplishments are documented annually in the hatchery annual report.

4.3.11 Watershed/Subbasin Plan National attention has been focused on the Columbia River with listings of salmon and steelhead, bull trout and other aquatic species. ESA consultations and recovery planning for listed species are having a major impact on management of fishery resources and the economy and cultural values in the Columbia Basin. Consultations include the operation of the Federal Columbia River Power System, hatchery operations, harvest actions, and habitat planning and project specific activities.

The Pacific Northwest Electric Power Planning and Conservation Act resulted in the establishment of the Northwest Power Planning Council and ultimately the development of its Columbia Basin Fish and Wildlife Program, a comprehensive program to enhance and restore the salmon and steelhead runs and other fish and wildlife resources of the Columbia River Basin. Now known as the Northwest Power and Conservation Council, this organization is leading a major Subbasin assessment and planning effort which will provide key building blocks for aquatic species restoration in the Basin. At the same time, the Service has initiated recovery planning for bull trout and NOAA-Fisheries for salmon and steelhead. Each of these recovery plans will rely on Subbasin planning as major building blocks for recovery of listed species. In addition, Implementation Plans have been developed by the COE, BPA, and the BOR that require implementation of significant habitat actions for listed salmon.

There are over 30 different agencies, Indian tribes, councils or commissions with fisheries responsibilities or interests operating in the Columbia River Basin. The effective management

and restoration of Columbia River Basin salmon and steelhead and other aquatic resources depends to a large extent on the ability of these agencies to communicate effectively, resolve differences, develop unified Subbasin plans, and work together in a spirit of cooperation in various interagency forums to solve regional and river Basin problems.

4.4 Compliance with Service and Other Requirements

The 1999 NOAA-Fisheries Biological Opinion on Artificial Propagation in the Columbia River Basin lists a host of measures which either must, in the case of Reasonable and Prudent Alternatives, be complied with or, in the case of Conservation Recommendations, should be implemented. The complete list of measures which may affect Little White Salmon and Willard NFH can be found in NMFS (1999b). Also see section 4.1.2 of this CHMP.

4.4.1 National Pollution Discharge Elimination System Little White Salmon NFH is currently in compliance with required NPDES permit requirements for discharge from the hatchery. As mentioned in section 3.8.8 of this CHMP, Willard NFH is exempt from NPDES monitoring requirements.

4.4.2 Hazardous Waste The Complex is currently in compliance with all hazardous waste treatment and control regulations. Efforts have been made to reduce dependence on products resulting in hazardous waste to the greatest extent possible.

4.4.3 Investigative New Animal Drugs (INAD) Erythromycin is currently used at Little White Salmon NFH under an INAD to control bacterial kidney disease in spring Chinook salmon. The INAD covers two forms of the drug, an injectable version used for adult fish and as a feed additive to control the disease in yearling and subyearling fish. In addition, oxytetracycline is occasionally used at Willard NFH to control bacterial coldwater disease. Hatchery staff adhere to all regulations and reporting requirements established by the INAD.

4.5 Monitoring and Reporting

4.5.1 Fisheries Information System (FIS) The FIS is a multifaceted database system consisting of five modules which address unmet management needs (out-year budgeting), accomplishments, deferred maintenance, and other national reporting requirements. This system was previously referenced in section 4.1.3 Budgetary Needs and Strategies. The following paragraphs provide a more detailed description of the modules and their reporting requirements.

4.5.2 Fisheries Operational Needs System (FONS) FONS was described earlier in this Chapter under Fish and Wildlife Service Budgeting Process. This database is available through the hatchery or the Fisheries Program Regional Office in Portland, OR.

4.5.3 Accomplishment Module The Fisheries Accomplishment Module was established as a planning, budgeting, and communication tool to enhance identification of Fisheries Program accomplishments. These data are used in budget documents presented to the Department, OMB, and Congress. The data structure is an alternative program of the FONS Module data structure (see previous Fish and Wildlife Service Budgeting Process). This module is used to describe all

accomplishments, regardless of funding source. This database is available through the hatchery or the Fisheries Program Regional Office in Portland.

4.5.4 Fish and Egg Distribution This information is used in the Fish and Egg Distribution Report. The report describes the mission of the National Fish Hatchery System, a component of the Fisheries Program of the Fish and Wildlife Service, and its varied accomplishments. The report contains detailed information regarding species, numbers, and pounds of fish produced. It also describes the general purpose of the production program and if the species being cultured is listed. Copies of the report can be obtained by writing the Division of Fish Hatcheries, U. S. Fish and Wildlife Service, 4401 N. Fairfax Drive, Room 810, Arlington, Virginia 22203.

4.5.5 Imperiled Species Module The Imperiled Species Module was designed to capture and report on imperiled species work performed by any Fisheries office. Reporting occurs annually, generally in November. For the purpose of this database, an imperiled species is any species or population that is:

1) Federally listed under the ESA as threatened or endangered.
2) Petitioned, proposed, or a candidate for Federal listing.
3) A State-listed species or a species of special concern.

4.5.6 Maintenance Management System (MMS) MMS was described earlier in this Chapter under Fish and Wildlife Service Budgeting Process. This database is available through the hatchery or the Fisheries Program Regional Office in Portland.

4.5.7 Station Guides The Station Guide provides an overview of the hatchery program. It describes the station location, layout plan, easements or permits in place, water supply, quarters, office and other buildings. The Guide also provides a brief history of the hatchery. This summary document is useful for providing a quick overview to Service employees and parties interested in the hatchery program and facility layout. Copies can be obtained from the hatchery or the Fisheries Program Regional Office in Portland.

4.5.8 Real Property Inventory (RPI) The RPI provides an annual update on Service real property (anything fixed to the ground or a building). The RPI was maintained by the Realty Branch until automated in the Spring 1999. Pen-and ink changes to a paper file were changed to an automated system using FileMaker Pro software in FY1999. It was converted to a web data base in FY2001. This method of updating the database is expected to continue until it will be converted to Service Asset Maintenance Management System (SAMMS), also a web-based database.

4.5.9 Columbia River Information System (CRiS) Reports This database is used at Columbia River Basin hatcheries to record information related to hatchery operations, marking and tagging, juvenile releases, adult returns, etc. The CRiS also is useful in providing summary reports of this data. The utility and purpose of this database is described in greater detail in Chapter 3 under Monitoring, Evaluation and Coordination.

4.5.10 Energy Use Report This is an annual report that summarizes electricity, heating and cooling energy, and gasoline used at the hatchery and kept in files on station.

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

AFTC	Abernathy Fish Technology Center
BKD	Bacterial Kidney Disease
BOR	Bureau of Reclamation
BPA	Bonneville Power Administration
CHMP	Comprehensive Hatchery Management Plan
COE	Corps of Engineers
CRiS	Columbia River information System
CRITFC	Columbia River Inter-Tribal Fish Commission
CRFPO	Columbia River Fisheries Program Office
CRGNSA	Columbia River Gorge National Scenic Area
CRRL	U.S. Geological Survey Columbia River Research Laboratory
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CWT	Coded-wire tag
DBH	Diameter at Breast Height
DNR	Department of Natural Resources
DOH	Department of Health
DOI	Department of Interior
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Ecologically Significant Unit
FDA	Food and Drug Administration
FIS	Fisheries Information System
FONS	Fisheries Operations Needs System
FPC	Fish Passage Center
FTE	Full Time Equivalent
GPNF	Gifford Pinchot National Forest
HET	Hatchery Evaluation Team
HGMP	Hatchery and Genetic Management Plan
IHN	Infectious Hematopoetic Necrosis
IHOT	Integrated Hatchery Operations Team
INAD	Investigational New Animal Drug
LCRFHC	Lower Columbia River Fish Health Center
MMS	Maintenance Management System
NFH	National Fish Hatchery
NMFS	National Marine Fisheries Service now known as NOAA-Fisheries
NOAA-Fisheries	also known as NMFS or National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce
NPDES	National Pollutant Discharge Elimination System
ODFW	Oregon Department of Fish and Wildlife
OMB	Office of Management and Budget
PAC	Production Advisory Committee

PSMFC	Pacific States Marine Fish Commission
PIT	Passive Integrated Transponder
PNFHPC	Pacific Northwest Fish Health Protection Committee
RMIS	Refuge Management Information System
ROD	Record of Decision, President's Forest Plan
RPI	Real Property Inventory
SAMMS	Service Asset Maintenance Management System
SPCC	Spill Prevention Control and Countermeasure Plan
SS	Suspended Solids
TAC	Technical Advisory Committee
TSS	Total Settleable Solids
USFS	United State Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WDFW	Washington Department of Fish and Wildlife
YN	Yakama Nation
WO	Washington Office

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Appendix

Attachment 1. Historical Background of National Fish Hatcheries in the Pacific Region.

Attachment 2. Statuatory Mandates and Authorities.

Attachment 3. Property Map for Little White Salmon National Fish Hatchery.

Attachment 4. Property Map for Willard National Fish Hatchery.

Attachment 5. Layout Diagram for Little White Salmon and Willard National Fish Hatcheries.

Attachment 6. Recommended Spawning Protocols for Pacific Salmon and Steelhead at U.S. Fish and Wildlife Service Hatcheries. Donald E. Campton author. Dated 12/1/02.

Attachment 7. Deferred Maintenance – Five Year Plan (Fiscal Years 2004-2008), Little White Salmon/Willard National Fish Hatchery Complex.

Attachment 8. Memorandum from the ARD Fisheries Region 1 – Subject: Guidance on the use of anesthetics, drugs, and other chemicals. Dated 11/9/00.

Attachment 9. EPA letter granting NPDES exemption at Willard National Fish Hatchery.

Attachment 10. Memorandum of Agreement between the U.S. Fish & Wildlife Service and Yakama Nation regarding the operational cost share arrangement at Willard National Fish Hatchery.

Attachment 11. Letter from the Complex Manager to the District Manager, Washington State Department of Natural Resources regarding riparian area logging in the Little White Salmon River watershed.

Attachment 12. Ninety Years of Fish Culture at Little White Salmon National Fish Hatchery, published in 1990 by William Nelson and Jack Bodle.

Attachment 13. Little White Salmon River Subbasin Plan, Volume II, K.

Attachment 14. Map of U.S. Fish & Wildlife Service National Fish Hatchery System facilities.