COMPREHENSIVE HATCHERY MANAGEMENT PLAN

Spring Creek National Fish Hatchery

Planning Report: Number 4
February 2004 – Final Draft

U.S. Fish & Wildlife Service

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Prepared by:

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U.S. Fish & Wildlife Service, Region One
February 2004

Explanation of Purpose

Spring Creek National Fish Hatchery - Comprehensive Hatchery Management Plan

This Comprehensive Hatchery Management Plan (CHMP) for the Spring Creek National Fish Hatchery (NFH) 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 Spring Creek NFH. These documents are the Biological Assessment and Biological Opinion on Artificial Production in the Columbia River Basin (NMFS 1999a and NMFS 1999b), the Federal Columbia River Power System Biological Opinion (NMFS 2000), the Spring Creek NFH Hatchery and Genetic Management Plan (2003b) and the *United States v. Oregon* Columbia River Fisheries Management Plan.

The correct citation for this plan is: U.S. Fish and Wildlife Service (USFWS). 2004. Comprehensive Hatchery Management Plan for the Spring Creek National Fish Hatchery. Planning Report: Number 4, U.S. Fish and Wildlife Service, Spring Creek National Fish Hatchery, Underwood, Washington.

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This Comprehensive Hatchery Management Plan for the Spring Creek National Fish Hatchery (Planning Report: Number 4) 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, Spring Creek NFH	Date
Project Leader, Columbia River FPO	Date
Project Leader, Lower Columbia River FHC	Date

Approved:

Assistant Regional Director, Fisheries	Date

Approved:

Regional Director, Pacific Region	Date

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Dan Diggs and Doug DeHart coordinated the initial development of this plan, along with Chuck Dunn, Lee Hillwig, Ed Forner, Kate Benkert, Bob Semple, Larry Marchant, Ed LaMotte, Bob Wunderlich, Ron Wong, Ray Jones, Thomas Trock, Brian Cates, and Rich Johnson. NOAA-Fisheries and the U.S. Army Corps of Engineers provide funding to operate Spring Creek National Fish Hatchery. The U.S. Army Corps of Engineers also provided funding to develop this plan and the 2003 Hatchery and Genetic Management Plan for Spring Creek NFH.

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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 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 plan recognizes and complies with all management plans and Biological Opinions affecting the Columbia River Basin.

Hatchery Purpose

Spring Creek NFH was authorized by Special Act 24 Stat.523, March 03, 1887 and Special Act 30 Stat. 612, July 01, 1898 and placed into operation in September 1901 to support the commercial fishing industry. 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. The hatchery was remodeled in 1948 to prevent inundation by Bonneville Dam. The hatchery was again remodeled in 1970 to expand operations to meet commitments under the John Day Mitigation Act. The hatchery is currently producing tule fall Chinook salmon and is used for adult collection, egg incubation and rearing. The tule fall Chinook stock is indigenous to the White Salmon River and the hatchery has reared this stock since 1901.

The following Hatchery Management Goals were adapted from the Mitchell Act, John Day Mitigation Act, Endangered Species Act (ESA) Biological Opinions, *United States 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: Conserve Columbia River tule fall Chinook salmon in the area upstream of Bonneville Dam (as defined in the Mitchell Act of 1937).

Goal 2: Assure that hatchery operations support Columbia River Fish Management Plan (*United States v. Oregon*) production and harvest objectives.

Goal 3: Minimize impacts to ESA listed and other native fish and wildlife species, their habitat, and the environment.

Goal 4: Develop outreach to enhance public understanding, participation and support of Service and Spring Creek NFH programs.

Planning Issues

Several federal, state and tribal entities share responsibilities for development of sub-basin plans, hatchery production, harvest management, and ESA considerations. Recent actions have centered around the possibility of the removal of Condit Dam on the White Salmon River and the role Spring Creek will play in subsequent salmon restoration. The agencies involved include the U.S. Forest Service, U.S. Fish and Wildlife Service, National Marine Fisheries Service, U.S. Geological Survey, Bonneville Power Administration, the Washington Department of Fish and Wildlife, Underwood Conservation District, and the Yakama Nation.

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.

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

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 a large portion of the hatchery produced fish be marked. Mass marking of 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. Mass marking at Spring Creek NFH will be logistically difficult due to the large number of fish produced.

- Columbia River Treaty Tribes generally disagree with the need for mass marking and selective fisheries.

- The Service has not made any unilateral decisions on marking. The Service will continue to coordinate our actions with the states and tribes through *United States v. Oregon* and National Oceanic and Atmospheric Administration (NOAA)-Fisheries to comply with ESA actions and coordinate with the Pacific States Marine Fisheries Commission (PSMFC) 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-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 *United States v. Oregon*, Pacific States Marine Fisheries Commission and U.S. - Canada forums

Juvenile salmon distribution and production numbers

- Juvenile salmon are released from the Spring Creek National Fish Hatchery in three release groups (March, April and May) as sub-yearling smolts to promote quick downstream migration from the hatchery, through the Columbia River to the estuary and ocean. This release strategy is agreed to by the Service, Tribes, NOAA-Fisheries,

Army Corps of Engineers (COE), and Washington Department of Fish and Wildlife (WDFW).

- In addition to this release strategy, the Service is evaluating unfed fry releases for brood years 1999, 2001, and 2002.

Water Shortage (Drought)

- A contingency plan needs to be developed to address potential water shortages at the hatchery. The hatchery is designed as a 90% recirculating system based on 3000 gallons per minute spring water supply. During drought years, the spring water supply can drop below 2000 gallons per minute. The system can still be operated at these low flows but water quality will likely deteriorate, stressing the fish and leading to serious health problems.

- Early releases or lowered production during drought years may be necessary after consultation with all co-managers.

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 Yakama Nation or other tribes as requested. For the past several years, surplus fish have also been given to the Federal Prisons for food.

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

Fish Passage and Ladder Management

- The Service, NOAA-Fisheries, COE, WDFW and Yakama Nation agreed on a strategy for ladder management. The ladder remains open until all fish have entered the hatchery. During 2003, an assessment in ladder operation was performed with the permission of the co-managers and NOAA-Fisheries. Future ladder operation plans will be negotiated and ecological risks and benefits to native ESA listed salmon will be evaluated as well as the impact on US-Canada Pacific Salmon Treaty stock assessment.

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

All hatcheries must consider their potential for adversely affecting the aquatic community. Of particular concern at Spring Creek NFH is the potential impact to Upper Columbia River Ecologically Significant Unit (ESU) of federally threatened salmon that might stray up the hatchery ladder in the fall.

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

- The Service has also developed a Hatchery and Genetic Management Plan (HGMP) to help assess impacts from hatchery operations. In 2002, the Service completed the Spring Creek HGMP.

- The Service needs to take Hatchery Reform actions to help recover listed and depressed populations.

- Developing an updated HGMP and 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 could occur. The Service is currently working with NOAA Fisheries and other co-managers to address current budget shortfalls.

Harvest Contribution

- The tule fall Chinook salmon from Spring Creek NFH have been a very successful stock in supporting the commercial, sport and tribal fisheries along the coast of Washington as far north as the west coast on Vancouver Island, BC (Pastor 2000). The stock has also has been a large component of the sport and tribal fisheries in the Columbia River. For example, in 2002, one half of the commercial and sport Chinook catch off the coast of Washington was Spring Creek tules and over 140,000 Spring Creek adults entered the Columbia River.

Economic Benefit

- The role of a federal mitigation hatchery is to compensate for natural habitat lost to federal hydro-projects and other impacts caused by Basin development. It follows then, that the economic benefit of the mitigation hatchery is interwoven into the economic benefit of the development projects being mitigated for and that the hatchery can be characterized as an operating expense of these development projects. 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 (FY) 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 Spring Creek NFH are listed in Chapter 4, under ESA compliance.

- Funding for Spring Creek NFH operations and support services are provided to the U.S. Fish and Wildlife Service through the Corps of Engineers, John Day mitigation, and the Mitchell Act as administered by the NOAA-Fisheries. 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.

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CHAPTER 1. INTRODUCTION/BACKGROUND

The Spring Creek National Fish Hatchery (NFH) was placed in operation in September 1901 with the intent to supplement the commercial fishing industry. The hatchery's role expanded in the late 1930's under the Mitchell Act to one of mitigation for the loss of habitat from the developing hydro system. Over the years, the Spring Creek NFH production program has included a variety of fish species: rainbow trout, Yellowstone cutthroat trout, brook trout, and fall Chinook. Since 1901, Spring Creek NFH's main focus was almost exclusively on tule fall Chinook indigenous to the White Salmon River. The resulting program has emerged as one of the most successful hatchery programs in the Pacific Northwest. In the past, hatchery programs were allowed to evolve based on perceived needs and the capabilities of the facility. Today, hatchery programs are still dynamic and the origin of change is driven by public appeal, legislative mandates, judicial decrees, international agreements, treaty trust responsibilities and ESA. The need to develop thoughtful planning processes based on sound policy and scientific information has never been greater. Today, the trend for hatcheries is to rear stocks that are native to the area. Spring Creek NFH has been successful in this practice.

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 with the following:

1. Integration of Service objectives and priorities with those of co-managers, other agencies, and resource programs.
2. Fulfill our obligations under the Endangered Species Act and relevant fisheries conservation, mitigation, and management programs.
3. Identify and define in specifics what hatchery reforms we are implementing to achieve our objectives.
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 of the Nation.

1.2 Description of Planning Process

The planning process began in July 2002 with establishment of the Spring Creek CHMP Team, the core group responsible for drafting and revising the CHMP as it progressed towards its anticipated completion in October 2003. 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 (USFWS 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 Spring Creek CHMP to ensure consistency with both the approved format and other CHMPs under development in the Region, and ensured consistency with Regional and National goals of the Service's Fisheries Program.

1.3 Composition of Planning Team

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

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- Ed LaMotte, Plan Co-Lead (retired - Spring Creek NFH)
- Larry Marchant (Spring Creek NFH)
- Bill Thorson (Carson NFH)
- Mark Ahrens (Spring Creek NFH)
- Bill Gale (Spring Creek NFH)
- Travis Anderson (Spring Creek NFH)
- Debbie Hogberg (Spring Creek NFH)

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- Doug Olson, Plan Co-Lead (CRFPO)
- Rod Engle (CRFPO)
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1.4 Review and Update of Plan

Because the biological, sociological, economic, and political environment is constantly changing, the role and responsibilities of Spring Creek NFH 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 at least once 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 2003a). 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 a 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 Fisheries 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 spawners 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 Region 1 (Note: Region 1 is the Pacific Region and includes Washington, Oregon, Idaho, California, Nevada, Hawaii and the Pacific Territories). Since the establishment of the first salmon hatchery on the McCloud River, 67 hatcheries or fish facilities have been established in California, Idaho, 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 Endangered Species Act (ESA).

The Region 1 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 salmonid and sturgeon culture, 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 (INAD) 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 to 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.

1.7.2 Implementing Comprehensive Hatchery Management Plans. Implementation of the Comprehensive Hatchery Management Plan 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. To foster and enhance communication in the hatchery production and evaluation process, active participation in Hatchery Evaluation Teams 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. The Fisheries Program promotes and initiates actions that ensure all Fisheries Stations in the Pacific Region are in compliance with the Endangered Species Act.

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 a coordinated fashion.

1.7.13 Make Full Use of Computer and Database Technology. An ongoing effort is to strengthen our 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, Endangered Species Act and subsequent Biological Opinions, Treaty of 1855 with Columbia River Tribes, *United States 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 Spring Creek National Fish Hatchery.

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CHAPTER 2. HATCHERY AND RESOURCE DESCRIPTIONS

2.1 Hatchery Overview

Spring Creek NFH is located 20 miles upstream from Bonneville Dam on the Columbia River, at river mile 167, on 60.21 acres. The hatchery is on the north side of the Columbia River near Hwy 14 in Skamania County, Washington (Figure 1). The hatchery is bounded by the Columbia River on the south and by 500ft high basalt cliffs to the north.

Spring Creek NFH also operates a sub-station on the White Salmon River. Known as the Big White Salmon Ponds, this facility is located on 42 acres about one and a quarter miles from the mouth of the White Salmon River. Constructed in the early 1950's, the Big White Salmon ponds were used as an adult trapping and egg collection facility. The ponds have been used to rear spring Chinook but the facility has not been used recently and will not be used until ESA screening concerns are met and the removal of Condit Dam is decided.

Currently Spring Creek NFH operates with a staff of eleven personnel. This includes the Hatchery Manager, Assistant Hatchery Manager, a Fishery Biologist, a Lead Fish Culturist, three additional Fish Culturists, two Maintenance Mechanics, a Program Assistant and an Information and Education Assistant. Additionally, volunteers are utilized to assist with outreach activities and station operations when available.

2.2 Facility and Site Descriptions

The hatchery has eight buildings involved in fish production and four residences (Table 1). Currently, there are no plans for new buildings; however, the hatchery would like to construct a multi use Salmon Forum/outreach/visitor center on the grassy area near the parking lot. Except for the residences, all structures are the property of the Corps of Engineers.

The hatchery facilities and rearing units are described in Table 2. The physical layout of the hatchery is diagramed in Attachment 3.

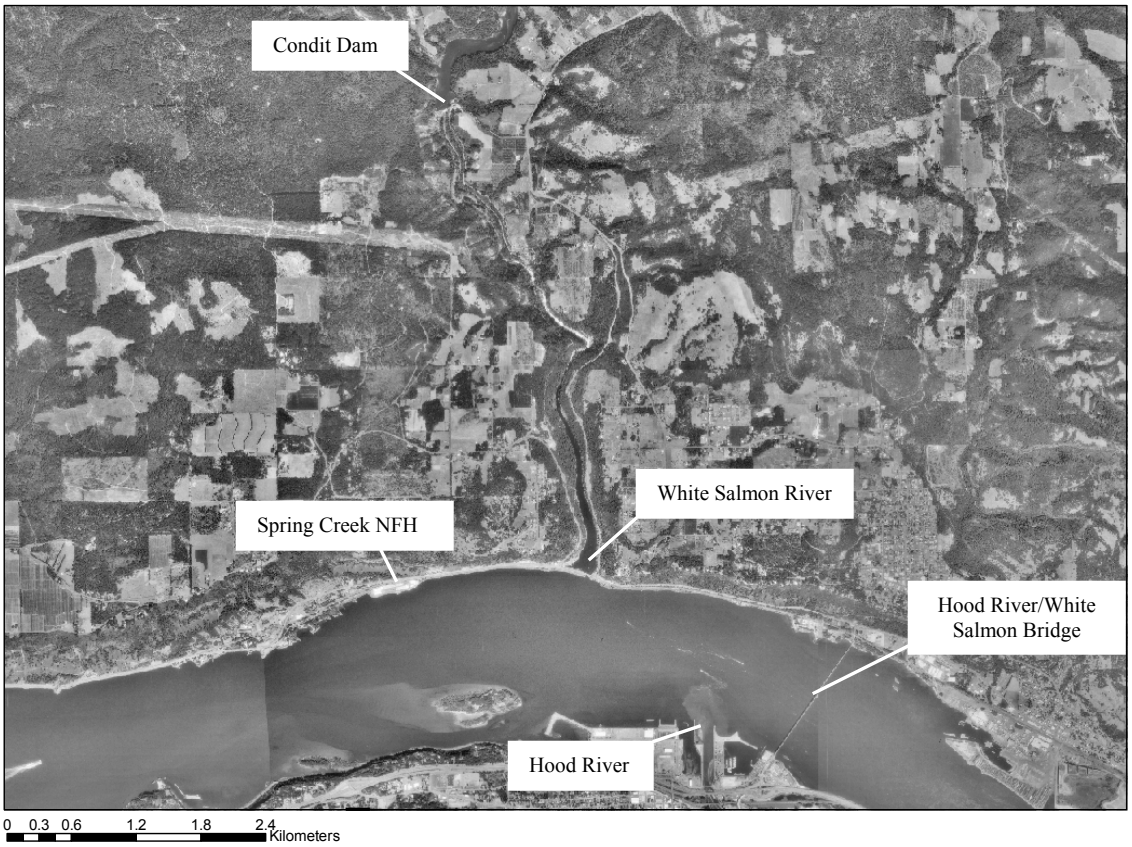

Figure 1. Aerial photograph of the Columbia River showing the location of Spring Creek National Fish Hatchery. Spring Creek National Fish Hatchery, the mouth of the White Salmon River, Condit Dam, the mouth of Hood River and the Hood River/White Salmon Bridge are identified.

Table 1. Hatchery buildings, primary use of buildings, size (sq. feet) and construction type. Further information can be found within the Spring Creek NFH station guide.

Building	Square Footage (ft^2)	Construction type
Incubation Bldg	9,994	Concrete & Brick , constructed 1953, remodeled 1972. Used to incubate eggs and fry.
Shop/Garage	4,196	Brick wall, constructed 1950. Expanded 1972.
Spawning/ Office/Visitor Center	5,329	Cement/Brick, constructed 1972.
Mechanical building	10,000	Cement/Brick, constructed 1972. Water recirculating plant and biological filtration are housed within this building
Fish Food Storage/Crew Break Room	3,577	Cement/Brick and Aluminum constructed in 1972
Storage Building	1,500	Brick, constructed 1990. Covers variable speed pump.
Well House	120	Cement/Brick, constructed in1972.
Chlorination Bldg.	168	Cement/Brick, constructed in1972.
Quarters #1	1,087	Wood frame, constructed 1947.
Quarters #2	1,176	Brick, constructed 1952.
Quarters #3	1,228	Wood frame, constructed 1950.
Quarters #4	3,000	Wood frame, constructed 1950. Converted to Lower Columbia River Fish Health Laboratory
Quarters #5	1,176	Brick, constructed 1952.

Table 2. Spring Creek NFH physical description of incubation, biological filters and rearing units.

Unit type	Length (ft)	Width (ft)	Depth (ft)	Volume (ft^3)	No.	Material	Age	Condition
Burrows pond	75	17	4	5,100	44	concrete	30	Good
Circular	30 (diam.)		3	283	1	concrete	56	Good
White Raceways	232	12	4	11,136	2	concrete	50	poor
Biological Filters	75	23	8	12,600	18	concrete	30	Good
Incubator troughs	20	1.5	1.5	45	30	fiberglass	20	good
Vertical stack incubators				7	288	fiberglass	32	Fair
Settling lagoons				470,000	2	earthen	30	good

2.3 Hatchery Purpose

Spring Creek NFH was placed into operation in 1901 to provide fish to supplement the commercial fishing industry. Spring Creek NFH was authorized by Appropriation Act , 24 Stat. 523, March 3, 1887, and Appropriation Act, 30 Stat. 612, July 7, 1898. 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. The hatchery was remodeled in 1948 to mitigate for Bonneville Dam (Mitchell Act). Another remodeling was completed in 1972 as part of the COE's mitigation for John Day Dam, Flood Control Act of 1950. The hatchery is used for tule fall Chinook salmon adult collection, egg incubation and rearing.

FINAL DRAFT

The following Hatchery Management Goals were adapted from the Mitchell Act, Endangered Species Act (ESA) Biological Opinions, *United States 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: Conserve Columbia River tule fall Chinook salmon in the area upstream of Bonneville Dam (as defined in the Mitchell Act of 1937).

Goal 2: Assure that hatchery operations support Columbia River Fish Management Plan (*United States v. Oregon* and U.S.-Canada Pacific Salmon Treaty) production and harvest objectives.

Goal 3: Minimize impacts to listed (ESA) and other native species, their habitat, and the environment.

Goal 4: Develop outreach to enhance public understanding, participation, and support of Service and Spring Creek NFH programs.

To achieve these goals, 7,000 tule fall Chinook adult brood stock are collected, spawned, eggs incubated and reared at the hatchery to produce 15.1 million sub-yearling smolts for release into the Columbia River. Objectives, tasks, and current practices to achieve these goals are described in Chapter 3 and in Spring Creek NFH's Operational Plan, Goals and Standards (Attachment 4).

2.4 Archeology/Cultural Resources

The Spring Creek National Fish Hatchery was established in 1901 as mitigation for the decreasing salmon population in the Columbia River due to over-fishing and destruction of fish habitat. The original hatchery was flooded in 1938 after completion of the Bonneville Dam. After several years of modifications, the hatchery was then rebuilt in 1972 at its current location. Hatchery employee housing, located on the north side of the highway, was built in the 1940s and 50s. Some of these structures may be considered eligible for the national Register of historic places, yet have never been formally evaluated for eligibility.

Tule fall Chinook salmon are native to this part of the Columbia River and historically were an important resource for people living along the Columbia River. The hatchery is located in the traditional territory of the Upper Chinookan Cascade Indians (French 1998). Due to the area's popularity for salmon procurement it was also frequently visited by other Native American groups including the Columbia River Sahaptins (Hunn and French 1998). The mouth of the White Salmon River, less than a mile east of Spring Creek Hatchery, was a heavily utilized fishing area. Lewis and Clark mention this area in their journal dated April 14, 1806 (Moulton 1991), describing the semi-subterranean houses found near the modern day town of White Salmon as typical of Columbia Plateau peoples' winter houses. They also mention a spot called *ilk'i'lak* which is translated to mean "dried pulverized salmon." This village site was used by both the Upper Chinook and the Klickitat. On the western banks of the White Salmon River was a Chinookan village called *nánšuit* or *námni* (French 1998), and the Klickitat referred to the area as *láwli pamí* (Schuster 1998).

During hatchery construction in the 1970's, fill dirt was brought in to build the holding tanks upon, reducing the possibility of encountering remains of Native American settlement in this area. However, Native American artifacts have been reported in the vicinity of the hatchery. One archaeological site is recorded within hatchery boundaries and two other sites occur within a mile of the hatchery. Site number 45SA384 is located below a scree slope just west of a water collection structure associated with the hatchery. This site is described as a single panel pictograph on a basalt boulder. Site number 45SA408 is located north of the hatchery, off Underwood road. Described as a historic period site containing architectural artifacts and associated domestic materials, there was also a single piece of obsidian found here which may indicate prehistoric use as well. Site number 45SA22 is located on the west bank of the White Salmon River. The site is described as several petroglyphs, badly eroded and hard to decipher. The site record states that these boulders are located just upstream from the Indian Fishing area set aside for Native American use. There are no other archaeological sites recorded in the area; however, occupants of the hatchery employee housing on the north side of the highway have reported finding Native American artifacts in their yards (Edward LaMotte personal communication October 2002).

This region of the Columbia River is rich in cultural history as indicated by historical accounts and recent archaeological investigations. The location of the Spring Creek National Fish Hatchery undoubtedly saw much historic and prehistoric fishing activity.

2.5 Watershed/Ecosystem Setting

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). Spring Creek NFH is located on the banks of the Columbia River within the Columbia River Gorge National Scenic Area upstream from 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 near 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. Springs supplying water to the hatchery issue from beneath a talus slope above and north of the hatchery. Cliffs rise 400-500 feet above the springs and merge with gentle slopes of Underwood Mountain. The geology of the area is characterized by basalt flows of Pleistocene and Miocene age (Hinkle 1996). These basalt flows lie approximately in a horizontal plane, but have been subjected to considerable faulting. There are three main geologic units affecting the land base: Grand Ronde Basalt, Frenchman Springs Member of the Wanapum Basalt, and Basalt of Underwood Mountain. The hatchery springs discharge from the Frenchman Springs Member (Hinkle 1996).

2.5.2 Climate and Hydrology. The annual average precipitation at the hatchery is about 40 inches a year. Approximately 80% of the precipitation occurs between October and April. The average ambient air temperature is 76°F during the summer and 40°F in the winter.

Spring flow has varied over the years coinciding with regional drought cycles. Flows have been as low as 1,800 gallons per minute to over 4,000 gallons per minute, with an average of about 3,000 gallons per minute. The U.S. Geological Survey Water-Resources Investigations Report 95-4272 (Hinkle 1996), suggest that water discharging at the hatchery springs appears to contain a mixture of modern and old water, where old water is defined as water

recharge prior to 1944. Water from the hatchery well, drilled in 1991, appears to contain little or no modern water and to have an overall age of thousands of years (Hinkle 1996).

2.5.3 Vegetation. Presently, vegetation around the hatchery is Douglas fir, western cedar, blackberries and grassland. Listed and candidate species which may occur in the area of the hatchery are included in Attachment 5.

2.5.4 Fish and Wildlife. There are no anadromous salmonids that historically ascended the hatchery springs. The Spring Creek hatchery run can arguably be the first man-made anadromous salmon run established in the Pacific Northwest. Pacific lamprey may have ascended the springs, but there is no documented evidence to verify this claim. The Spring Creek tule stock is part of the lower Columbia River fall Chinook Ecologically Significant Unit (ESU).

Spring Creek tule fall Chinook are indigenous to local watersheds. In most years, spawning ground surveys have shown that the number of natural spawning fall Chinook in local tributaries is relatively small (Eric Olsen ODFW, personal communication). Today, there are on average less than 100 spawning tule fall Chinook salmon in the Wind River below Shepard Falls, and about 200 in the White Salmon River (WDFW and ODFW 2002). Listed and candidate species which may occur in the area of the hatchery are included in Attachment 5.

2.5.5 Habitat Condition. Tule fall Chinook spawned in the lower reaches of the Wind, Little White Salmon, White Salmon, and Klickitat rivers. After the construction of Bonneville Dam in 1938, spawning grounds were inundated and little of the historical spawning grounds of tule fall Chinook remained. Restoring the tule fall Chinook run into the White Salmon River, where the Spring Creek NFH stock originated, may be a reality if Condit Dam is removed. With the removal of Condit Dam, 18 miles of river will be available for all anadromous fish, including tule fall Chinook salmon.

2.5.6 Current and Future Development. Removal of Condit Dam would restore the ecosystem in the White Salmon watershed. Spring Creek NFH would have a role in returning tule fall Chinook salmon to the White Salmon River. Production at Spring Creek NFH will continue to mitigate for lost habitat as a result of John Day and Bonneville dams.

2.6 History of Hatchery Stocks

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. At this time, major reconstruction took place at the Underwood Station under the Mitchell Act. The station was renamed the Spring Creek Hatchery. 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 NOAA-Fisheries which provides part of the funding to the Service for operation and maintenance of the hatchery.

In 1970, a major expansion of the hatchery occurred under the Flood Control Act of 1950 for mitigation of the John Day Dam. The Corps of Engineers configured the hatchery into its present state during this time. The Corps of Engineers funds approximately 50% of facility operational costs.

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;
United States v. Oregon (*Sohappy v. Smith*, Belloni decision: Case 899), 07/08/1969;
Flood Control Act of 1950;
Tule fall Chinook - Listed as a Significant Stock-Endangered Species Act of 1973, 87 STAT. 884, 12/28/1973;
Salmon and Steelhead Conservation and Enhancement Act, 94 STAT. 3299, 12/22/1980; and
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. The Columbia River was the largest producer of salmon in the world. Cannery records reveal that catches in the late 1800's and early 1900's were in the millions. This extraordinary harvest could not last, and it was recognized in the late 1800's that something must be done to preserve the salmon. The commercial

fishing industry in 1880's attempted to supplement the commercial harvest with a hatchery on the Clackamas River, Oregon.

After a few years of failed results, the industry asked the U.S. Fish and Fisheries Commission to take over the operation of the facility. In 1896, a team was sent to the Columbia River Basin to search for a hatchery site to supplement the Clackamas River hatchery. A number of streams were evaluated during August and September. Salmon in significant numbers were found in the White Salmon and Little White Salmon rivers (USFWS 2003b). Hatchery sites on the Little White Salmon and Wind rivers were selected and in operation by 1899. These sites were authorized under the Appropriation Act, 24 Stat. 523, 03/03/1887 and Appropriation Act, 30 Stat. 612, 07/01/1898.

Fall Chinook eggs were collected from both the Little White Salmon and White Salmon Rivers, these were incubated at the Little White Salmon site and most were transferred to the Clackamas Station but some were hatched and released back into the rivers. While transporting eggs from the White Salmon collection site back to the Little White Salmon Station, an employee suggested that spring water cascading over basalt cliffs into the Columbia River might be a water source to incubate eggs. This suggestion was accepted and incubation boxes were placed at the springs in 1901. Some of the eggs and, possibly, fry escaped and entered the Columbia River. After a couple of years, adults were trying to swim up into the springs. These fish were captured and eggs taken. The facility was named White Substation.

As years passed, more adults returned to the springs and more eggs were collected. The site was eventually developed with an adult holding pond and an incubation building. Eggs were incubated and sent to the Clackamas Station; fry were released on site and back into the White Salmon River. Sometime in the 1920's the facility name was changed to the Underwood Station.

From 1901 to 1938, tule fall Chinook adults were trapped by seining the mouth of the White Salmon River. Collected eggs were transferred to the Spring Creek site. As the eggs hatched, those not shipped to other locations were released both at the Spring Creek site and the White Salmon River.

The average number of eggs taken during the 1901 to 1938 time period was 9.1 million, of which nearly 1.4 million (15%) were transferred to other locations (Attachment 6). Two feeding channels were constructed in the two main springs at the Spring Creek site. Fish food diets were developed and fish feeding began. During this time period, fish were fed for a short time, reaching the size of 1 to 2 inches, and then released. The larger fish were held until May. As food formulas and feeding techniques improved, more fish were held longer and size at release increased to 3 inches for the largest fish. Still, the majority of fish released were as unfed fry and small fingerlings fed only for two or three weeks.

After the construction of Bonneville Dam in 1938, egg collections on the White Salmon River were impossible. Egg collection was moved up river about 0.5 miles. Despite this move, egg collections on the White Salmon River started to decrease. A permanent facility (White sub-station) was then constructed an additional 0.75 mi. upstream in the early 1950's to trap adult tule fall Chinook for egg collection. This facility also was used sporadically during 1950's to rear and release additional species into the White Salmon River, including 130,000 Brook Trout from Washington Department of Fisheries, 400,000 chum salmon during 1956 provided by Quilcene NFH, and an average release of 175,000 coho salmon from 1957-59 and 1961 from multiple egg sources, but including coho salmon collected at the White sub-station (Spring Creek NFH historical records).

Due to an increase in adults returning to Spring Creek NFH, a decision was made to discontinue adult trapping at the White sub-station in 1964. The facility was then used to raise additional tule fall Chinook fry and fingerling for release into the White Salmon River. Attempts to raise additional species besides tule fall Chinook occurred in 1969, 1972 and 1973. An average of 900,000 coho salmon were reared and released from the White sub-station during those years (Spring Creek NFH records).

From 1938 to 1970, the average egg take was 31.1 million with 43% of these tule fall Chinook eggs transferred to other locations (Attachment 7). A record tule fall Chinook egg take took place in 1958 when the hatchery took 90.3 million, shipping 64.8 million to other hatcheries.

From 1939 to 1970, large releases of tule fall Chinook unfed fry and small fingerlings occurred. As the hatchery expanded and food nutrition improved, feeding and holding fish longer became the management practice. These changes in management practices coincided with the first mention of disease problems at Spring Creek NFH including coagulated yolk problems, bacterial infections and mysterious fish losses. Despite disease issues, in the mid 1950's through the 1960's adult returns increased dramatically. Size of fish released increased and some studies showed that larger fish contributed to harvest at a higher rate. Large numbers of eggs were supplied to any hatchery who requested them. During this time, the Spring Creek NFH tule stock was the source for eggs to almost all lower Columbia River hatcheries.

2.6.3 Reuse System Era 1971 to Present. In 1970, major reconstruction by the Corps of Engineers took place by making the hatchery into a new modern reuse system with heated water capabilities. This reconstruction was done to mitigate for the loss of habitat resulting from the construction of the John Day Dam (USFWS 1982).

Hatchery expansion, improvements in fish culture, and feed resulted in fish being released at a larger size. Fish releases occurred in March, April, and May with some fish released in

early February. Unfed fry and pre-smolt releases were discontinued after 1980, until the mid 1990's when an unfed fry evaluation study was initiated (see Chapter 3-Hatchery Evaluation Studies). Smolt size increased from 3 inches to over 4 inches for the mid May release during this time. The hatchery reared the same number of fish as before but was able to hold them longer thus the larger size. During the early 1970's the hatchery released some fish in early February to make room for growth on the remaining fish. This practice was curtailed when coded wire tag programs were implemented and evaluating the fishery for harvest was important.

Throughout the 70's fishing pressure increased, especially with Treaty fishing above Bonneville Dam. The hatchery managed to get enough escapement for full production and supply other hatchery shortfalls but during 1986-88, 1990, 1993 and 1994, additional adult collections were made from traps located at Bonneville Dam and below Bonneville Dam at Bonneville Fish Hatchery and Abernathy Fish Technology Center where Spring Creek stock had been a large component of their stock history (CRiS database, Stephen M. Pastor 3/19/2003, see also Attachment 8 for detailed numbers). The release goal at Spring Creek NFH continues to be 7.6 million in March, 4.2 million in April, and 3.3 million in May (15.1 million annually) at 120, 90, and 60 fish/lb, respectively. The average annual hatchery release has been 14.47 million between 1989 to 2001 (USFWS 2003b).

2.7 Biological Risks and Ecological Interactions between Hatchery fall Chinook 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 for National Fish Hatcheries in the lower Columbia River, including Spring Creek NFH. These HGMPs are being drafted to assess our program and meet Endangered Species Act requirements identified by NOAA-Fisheries. It is anticipated that these plans will be updated regularly and re-submitted to NOAA-Fisheries and the Service.

In the 2003 HGMP (USFWS 2003b), 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 Spring Creek NFH will not jeopardize listed fish populations (NMFS 1999b). 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 Dam mitigation as well as meet our Tribal Trust and *United States 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 our Spring Creek NFH Hatchery and Genetic Management Plan (USFWS 2003b) and the Total Dissolved Gas Waiver Request for Bonneville Dam Spill memo of November 30, 2001 (included in the HGMP). Both of these documents discuss biological risks and ecological interactions between hatchery fall Chinook salmon and wild (listed) salmon.

The Spring Creek NFH's fall Chinook program 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. A discussion of ecological interactions and biological risks relative to the Spring Creek's fall Chinook program follows:

2.7.1 Hatchery Water Intake and Use. Hatchery rearing water is primarily derived from several springs emerging from a basalt cliff located on hatchery property. Anadromous fish do not have access to the springs. Flows between 2000-3000 gpm are collected from springs when fish are on station and pumped to a de-aeration tower and packed coke ring column to remove excess nitrogen. Within the de-aeration pit, warm water from a hatchery well is mixed with the spring water. This mixing of cold spring water and warm well water allows hatchery staff to control growth and developmental rates of fish on station. Production water (water exiting from rearing ponds) is recirculated through the biological filters to the aeration chamber and back to the rearing ponds. The hatchery recirculating system contains 3 million gallons of water and at full capacity circulates 30,000 gpm. The system is designed as a 90 percent reuse system and discharges only 10% of the total available water to the wastewater treatment lagoon located 0.5 miles from the biological filters. The wastewater treatment lagoon consists of a series of two settling ponds that eventually drain into the Columbia River. Hatchery effluents from the settling ponds meet established water quality standards and are diluted by the flow in the Columbia River. Attachment 9 provides a diagram of the hatchery reuse system.

2.7.2 Brood Stock Collection. Returning fall Chinook are collected for brood stock at the hatchery rack. Hatchery fish volitionally return to the hatchery using the hatchery's fish ladder, homing into the spring water. Over 99% of the fish entering the hatchery are tule fall Chinook. There may be a small number of naturally spawning tules that enter the hatchery but there is no way of distinguishing these fish from the hatchery stock.

The hatchery also gets a small number of Bright fall Chinook, these potentially could be strays from the Mid-Columbia Bright program or Up-River Brights that may include listed stocks, but most likely are from the Little White Salmon NFH. These fish are returned to the river to resume their journey. Additionally, any other salmonid or non-salmonid species is returned to the Columbia River.

2.7.3 Genetic Introgression. The Spring Creek NFH stock originated from native brood stock collected from the White Salmon River and has developed over many generations without major transfers of other stocks of fish into its program. It is thought that the hatchery stock is virtually the same as the naturally spawning stock. Over the past 100 years, the hatchery has stocked many smolts into the local waters and the concern of straying in either direction is not a major concern. Genetic testing would provide better information on the hatchery and natural spawning tule fall Chinook in the local watersheds.

Straying of Spring Creek tule fall Chinook is not considered a major problem for local watersheds. This stock is part of the listed lower Columbia River Chinook ESU, although the hatchery stock is not currently listed. Therefore, genetic introgression of tule fall Chinook released from Spring Creek NFH with naturally spawning tule fall Chinook stocks is not considered a significant problem. The Service analyzed data to quantify the degree of straying of fish from our National Fish Hatcheries. For Spring Creek National Fish Hatchery, data indicates that 98% of the estimated adult recoveries are either on route to or at the hatchery (Stephen Pastor, USFWS Vancouver, WA, unpublished data on hatchery strays, 2003).

2.7.4 Hatchery Production. Spring Creek NFH tule fall Chinook releases are some of the largest in magnitude relative to other production programs. Spring Creek releases, in most years, are made during three separate time periods. About 7.6 million smolts are released in mid-March, 4.2 million in mid-April and final release 3.3 million in May.

2.7.5 Disease. The Spring Creek tule fall Chinook salmon are a remarkably healthy stock with a very low incidence of the listed pathogens that plague other hatcheries (Fish Health Inspection Reports, 1982 to present, Lower Columbia River Fish Health Center). Adults return with no virus and low levels of two bacterial pathogens and there is no vertical transmission of disease to their offspring. Relative to this, the Spring Creek NFH fish have never suffered the decimating and uncontrollable losses caused by virus and have therefore never posed a viral threat to wild/native fish. Over the years, improvements to the handling of fish and to the recirculation system have significantly reduced disease. The juveniles still face challenges from pathogens external to the hatchery and common to the Columbia River; however, timely release of the juveniles reduces health risks. Spring Creek tule fall Chinook salmon are released directly into the Columbia River at the hatchery site and pass only Bonneville Dam on route to the ocean, so there is reduced potential for transmission of

pathogens to other populations. In comparison, upriver programs are subjected to the high density impacts and stresses of collection for transport and/or diversion through multiple bypass systems where stress can trigger disease transmission. As a consequence, direct infection of other fish by Spring Creek fish is considered minimal.

Many of the disease concerns related to hatchery fish are based on old management styles that emphasized the release of large numbers of fish regardless of their health status. Since that time. The desire to improve fish health and prevent disease outbreaks has resulted in better husbandry. This includes decreases in rearing densities to reduce the crowding and stress that affects the resistance of salmonids to disease (Salonius and Iwama 1993; Schreck et al. 1993). Along with decreased densities and improved animal husbandry, advances in fish health care and adherence to federal and interagency fish health policies have significantly decreased the possibility of disease transmission from hatchery fish to wild/native fish. The policy requirements are especially appropriate to this facility where the recirculation system does not allow isolation of fish to prevent transmission of water-borne infections. In addition, the Lower Columbia River Fish Health Center is located nearby so fish health sampling, diagnosis, and treatment are readily available as fish health issues arise. Spring Creek NFH, as do all federal hatcheries in the Columbia River Basin, takes extensive measures to control disease and release healthy fish. Chapter 4 provides more detail on Fish Health practices.

While fish managers largely understand the epidemiology of pathogens at each hatchery, the same cannot be said of local wild fish populations. Recent studies suggest that the incidence of some pathogens in naturally spawning populations may be higher than in hatchery populations (Elliot and Pascho 1994). *Renibacterium salmoninarum*, the causative agent of bacterial kidney disease (BKD), appears, in general, to be significantly more prevalent among wild smolts of spring/summer Chinook salmon than hatchery smolts (Congleton et al. 1995; Elliot et al. 1997). Many biologists believe disease-related losses in naturally spawning populations often go undetected, and that the impact of disease is underestimated (Goede 1986; Steward and Bjornn 1990). In addition, although pathogens may cause significant post-release mortality in fish from some hatcheries, there is little evidence that hatchery origin fish routinely infect naturally produced salmon and steelhead in the Pacific Northwest (Enhancement Planning Team 1986; Foott et al. 2000; Steward and Bjornn 1990). Additional information on wild fish health has been collected since 1997 by the USFWS Fish Health Centers through the National Wild Fish Health Survey which is being conducted to better understand the health status of wild fish and to address the issues of disease interactions (http://wildfishsurvey.fws.gov).

2.7.6 Competition. The potential 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 et al.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 upstream of the Columbia River estuary, few studies have been conducted to evaluate 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. Spring Creek tule fall Chinook are released into the Columbia River at the hatchery site and migrate quickly past Bonneville Dam en route to the ocean based on juvenile out-migrant trapping, reducing potential competitive interactions within the lower Columbia River basin. Because Spring Creek tule fall Chinook releases occur in the lower Columbia Basin system and earlier than the migration period for most wild listed stocks, there is reduced opportunity for competitive interactions.

2.7.7 Predation. The Service presented information that salmonid predators are generally thought to prey on fish approximately one-third or less than their size (USFWS 1994). Depending on species and population, hatchery smolts are often released at a size that is

greater than their naturally-produced counterparts. For species that typically smolt as sub-yearlings (e.g. fall 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).

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). However, virtually no information exists regarding the potential for such interactions in the marine environment.

Based on time of their release and the travel time taken by Spring Creek fish to exit the river, there is little potential for Spring Creek tule fall Chinook to prey on natural fry in the Columbia River. In addition, much of the spawning and early rearing areas for natural production are in the tributaries and upper basin areas.

Spring Creek tule fall Chinook releases may contribute to indirect predation effects on listed stocks by attracting predators (birds, fish, pinnipeds) and/or by providing a large forage base to sustain predator populations. Releasing large numbers of hatchery fish may 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 (NMFS 1997) can be significant predators of hatchery fish immediately below dams and in estuaries (Bayer 1986; Ruggerone 1986; Beamish et al. 1992; Park 1993; Collis et al. 2001). 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. Spring Creek tule fall Chinook releases are not known to residualize in the Columbia River. Available out-migrant sampling information indicates a rapid exit of Spring Creek tule fall Chinook from the hatchery (see Chapter 4 - Monitoring and Evaluation discussion).

2.7.9 Migration Corridor/Ocean. The Columbia River 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. Spring Creek releases one half of its production in March before the beginning of the normal hatchery and natural stock out-migration season. The total number of hatchery fish released in the Columbia River basin has declined by about 26 percent 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 northern 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).

Alternatively, the hatchery program may be filling an ecological niche in the freshwater and marine ecosystem. A large number of species are known to utilize juvenile and adult salmon as a nutrient and food base (Groot and Margolis 1991, McNeil and Himsworth 1980). Pacific salmon carcasses are also important for nutrient input back to freshwater streams (Cederholm et al. 1999). Reductions and extinctions of wild populations of salmon could reduce overall ecosystem productivity. Because of this, hatchery production has the potential for playing an important role in population dynamics of predator-prey relationships and community

ecology. The Service speculates that these relationships may be particularly important (as either ecological risks or benefits) in years of low productivity and shifting climatic cycles.

2.7.10 Harvest. A large portion of Spring Creek fish are caught under the United States/Canada treaty allocations. Spring Creek fish are also very important to near shore fisheries off the Washington and northern Oregon coast and local fisheries in the Columbia River (see section 3.8.5 for more information). Fisheries management of the Spring Creek NFH stock provides protection to the listed Snake River populations and other stocks of Chinook salmon, because the Canadian ocean fisheries are managed under harvest rate quota, time, and area regulations. Both the Spring Creek NFH stock and many other listed Columbia River stocks of salmon occur off the west coast of Vancouver Island. Fishery management constraints are in lace for all west coast and Columbia River fisheries to provide appropriate protection of listed stocks at all levels of hatchery fish abundance. Biological Assessments and Biological Opinions are completed by the fishery management agencies to ensure listed species are not jeopardized.

2.8 Beneficial Uses (historic and present cultural and public uses, fishery benefits, harvest contribution, economic value)

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. Historically, visitation to Spring Creek NFH has been limited. Although visitors were welcomed, no record of any real effort to encourage visitation or to enhance the visitor's experience can be found until 1994 when a full time Information and Education Specialist was hired. Upgrades in the visitor center have been made and additional interpretive projects are planned. The hatchery celebrated its Centennial year in 2001 and has become associated with a friends group, Friends of Northwest Hatcheries, in 1999. In addition, the Spring Creek hatchery site has become a world famous wind surfing access location. Washington State Parks and Recreation has entered into a long term lease with the Corps of Engineers making the front section of the hatchery's entrance road into the Spring Creek Hatchery State Park an access point for windsurfers. Several thousand wind surf enthusiasts and spectators visit the site each year. The hatchery is also located on the official Lewis and Clark Trail for Washington State (State Route 14) which provides additional visitors to the hatchery each year.

2.8.2 Harvest Contribution. Tule fall Chinook salmon from Spring Creek NFH have, over the years, been the largest contributor to the commercial, sport and tribal fishery both in the ocean and Columbia River of any Columbia River Hatchery (Stephen Pastor – USFWS, CRiS database January 2003). Fisheries occur along the coast of Washington as far north as the west coast of Vancouver Island and in the Columbia River from Buoy 10 to above Bonneville Dam in the tribal zone 6 fishery. Historically, Spring Creek fish have contributed up to 9% of the catch in the fishery off the west coast of Vancouver Island, B.C., and 27% of

the catch off the Washington and northern Oregon coasts. See section 3.8.5 of this document for more information on Spring Creek NFH contributions to ocean and freshwater harvest.

2.8.3 Economic Benefit. Spring Creek NFH is an economically efficient producer of smolts in addition to being one of the major contributors to the commercial, sports and tribal fishery both in the ocean and in river. Studying the economic benefits of hatcheries until recently has not been undertaken in a comprehensive way. Recently, the Northwest Power Planning Council has initiated an economic analysis of hatcheries. In some preliminary research they stated that Spring Creek was one of the more efficient producers of smolts, about $0.06 six cents per fish.

Spring Creek NFH tule fall Chinook production benefits the economy of international, commercial, tribal, and sport fisheries. As stated previously, Spring Creek NFH tule fall Chinook have historically contributed up to 9% of the Chinook catch in the West Coast Vancouver Island fisheries and 27% of the Chinook catch off the Washington and northern Oregon Coasts. From 1980 – 1995, Spring Creek NFH production fish produced an average Columbia River harvest of 14,784 fish annually between sport fisherman and commercial and tribal gill net fisheries on the Columbia River (Table 4, USFWS 2003b). For that same time period, an average of 15,621 fish were captured for commercial, tribal and sport fisherman in ocean fisheries.

2.8.4 Cultural Values. The Columbia River Treaty Tribes (Yakama, Warm Springs, Nez Perce, and Umatilla) share the in-river harvest of tule fall Chinook salmon returning to Spring Creek NFH and are one of the primary beneficiaries of tule fall Chinook salmon, which enter the hatchery holding ponds. 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.

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"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.

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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, Endangered Species Act (ESA) Biological Opinions, *United States 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). Additionally, a Hatchery and Genetic Management Plan for Spring Creek NFH (USFWS 2003b) was submitted to NOAA-Fisheries in December 2002. After co-manager and public review, a final HGMP will be completed in 2004. Within the HGMP, specific Performance Standards and Indicators (PSI's) that have been established will be adhered to by the Service during operation of Spring Creek NFH.

Goal 1: Conserve Columbia River fall Chinook salmon in the area upstream of Bonneville Dam as defined in the Mitchell Act of 1937.

Objective 1: Successfully maintain a brood stock of tule fall Chinook salmon at Spring Creek National Fish Hatchery without the need for out-of-basin egg or fish transfers to the hatchery (achieve a minimum 0.05% smolt to adult return back to the hatchery).

Task 1:Implement measures to efficiently manage and conserve water use at the hatchery.

Task 2:Implement measures for brood stock management to maintain integrity and genetic diversity of the Spring Creek tule hatchery stock, as identified in the Hatchery and Genetic Management Plan (HGMP).

Task 3:Implement management practices for incubation strategies and procedures at the hatchery.

Task 4:Implement management practices for hatchery rearing strategies making sure the biological filter system is operating as efficiently as possible.

Task 5:Implement management practices for release strategies at the hatchery.

Task 6:Maximize survival at all life stages using disease control and prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

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

Task 7:Maintain genetic integrity for possible reintroduction of stock back into its native White Salmon River pending Condit Dam removal.

Objective 2: Conduct monitoring and evaluation to ensure Goal 1 is achieved.

Task 1:Conduct hatchery evaluation studies 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 (unfunded), and other Columbia River projects.

Task 2:Collect information to monitor life history characteristics such as length, age sex composition, and run timing.

Task 3: Hold Hatchery Evaluation Team (HET) meetings each winter and summer to review progress.

Task 4:Complete a Station Development Plan (Engineering) to identify facility needs in addressing the needs of hatchery conservation goals (unfunded).

Task 5:Monitor health and disease status of fish, following the Service Fish Health Policy and Pacific Northwest Fish Health Committee and Integrated Hatchery Operation Team (IHOT) guidelines.

Related Spring Creek HGMP Performance Standards and Indicators to Goal 1, Objectives and Tasks:
Benefit PSI 1. - Program contributes to mitigation requirements.
Benefit PSI 4. - Communicate effectively with other salmon producers and co-managers.
Benefit PSI 7. - Fish collected for brood stock are taken throughout the return and in proportions approximating the timing and age distribution of the population from which brood stock is taken.
Risk PSI 2. - Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread, or amplification of fish pathogens.
Risk PSI 3. - Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Goal 2: Assure that hatchery operations support Columbia River Fish Management Plan (*United States v. Oregon*) and US/Canada Pacific Salmon Treaty production and harvest objectives.

Objective 1: Collect sufficient brood stock to produce 15.1 million smolts for on-station release into the Columbia River.

Task 1: Collect 7000 brood stock, of which 4000 are females.

Task 2: Work with co-managers to manage for fisheries, food, stream enrichment, outplanting, or rendering purposes.

Objective 2: Contribute to a meaningful harvest for sport, tribal and commercial fisheries both in the ocean and in-river (achieve a 10-year average of ≥ 0.5% smolt to adult survival, harvest plus escapement).

Task 1: Work with states, tribes, and Foreign governments to establish meaningful fisheries (through *United States v. Oregon*, U.S./Canada, Pacific Fishery Management Council forums).

Task 2: Index mark juvenile hatchery fish prior to release to facilitate harvest and related conservation and assessment efforts for hatchery, wild, and Endangered Species Act (ESA) listed stocks.

Objective 3: Meet tribal trust responsibilities.

Task 1: Follow pertinent Laws, Agreements, Policies and Executive Orders on Consultation and Coordination with Native American Tribal Governments.

Task 2: As requested, present Spring Creek NFH production information and issues at Columbia River Inter-Tribal Fish Commission meetings.

Task 3: Meet with individual treaty tribes (Umatilla, Nez Perce, Yakama, and Warm Springs) as requested.

Objective 4: Communicate and coordinate effectively with co-managers in the Columbia River Basin.

Task 1: Participate in *United States v. Oregon* Production Advisory Committee (PAC) and Technical Advisory Committee (TAC) meetings.

Task 2: Develop technical reports for PAC and TAC.

Task 3: Discuss management issues for Spring Creek NFH at annual coordination meeting each February between the Service, WDFW, NOAA, Fisheries, COE and the Columbia River treaty tribes.

Objective 5: Conduct monitoring and evaluation to ensure goal #2 is achieved.

Task 1:Coded-Wire-Tag representative release groups annually.

Task 2:Produce an annual report on stock assessment and contribution to fisheries.

Task 3:Compare and evaluate survival, life history, fisheries contribution, and fish health parameters between brood years in order to improve fish culture techniques.

Related Spring Creek HGMP Performance Standard and Indicator to Goal 2, Objectives and Tasks:
Benefit PSI 2. - Implement spawning and rearing practices to achieve production goal.
Benefit PSI 3. - Maintain stock integrity and genetic diversity of each unique stock through proper management of genetic resources.
Benefit PSI 4. - Communicate effectively with other salmon producers and co-managers.
Benefit PSI 5. - Program contributes to fulfilling tribal trust responsibility, mandates and treaty rights, as described in *United States v. Oregon*.
Risk PSI 5. - Release groups are sufficiently marked in a manner consistent with information needs and protocols to enable determination of impacts to natural and hatchery-origin fish in fisheries.

Goal 3: Minimize impacts to listed (ESA) and other native species, their habitat, and the environment.

Objective 1: Minimize harmful interactions with other fish and wildlife populations.

Task 1:Implement the Spring Creek NFH Hatchery and Genetic Management Plan (USFWS 2003b).

Task 2:Release juvenile fish (smolts) ready to migrate downstream.

Task 3:Return any ESA listed or wild fish into the river that enter hatchery ladder during brood stock collection.

Objective 2: Conduct monitoring and evaluation to ensure Goal 3 is achieved.

Task 1:Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.

Task 2:Investigate ways to improve the efficiency of biological filters to improve water quality, fish health and smolt quality.

Task 3:Develop a study plan to assess physiological status of juveniles prior to release (unfunded) and determine downstream migration rates.

Task 4:Assess straying rates and recovery location of fish from Spring Creek NFH.

Task 5:Monitor health and disease status of fish, following the Service Fish Health Policy, continue Geodes index reading for each release group.

Related Spring Creek HGMP Performance Standard and Indicator to Goal 3, Objectives and Tasks:
Risk PSI 1. – Minimize interactions with other fish populations through proper rearing and release strategies.
Risk PSI 3. – Conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health.
Risk PSI 4. – Hatchery program addresses ESA responsibility.

Goal 4: Develop outreach to enhance public understanding, participation and support of Service and Spring Creek NFH programs.

Objective 1: Increase public awareness of Spring Creek NFH.

Task 1:Coordinate with other federal, state, and local information/public affairs offices to incorporate information about Spring Creek NFH.

Task 2:Facilitate interagency cooperation with existing and new programs in the Columbia River Gorge.

Task 3:Coordinate with Service, NOAA-Fisheries and COE-Fisheries to host special events, such as National Fishing and Boating Week and National Wildlife Refuge Week activities, and open houses at the hatchery.

Task 4:Interact with Service, NOAA and COE Fisheries outreach coordinators and actively seek to integrate Lower Columbia River fisheries outreach activities with the Regional and National Outreach Strategies.

Task 5:Increase public use of the hatchery facilities by inviting special interest groups to tour the hatchery.

Objective 2: Provide information and education about Service programs and Spring Creek NFH to internal and external audiences.

Task 1:Develop new cooperative agreements and partnerships with public, private and home school groups. Expand relationships with Friends Group, Friends of Northwest Hatcheries.

Task 2:Maintain website for the Spring Creek NFH to inform cyber-visitors of the Spring Creek NFH programs, history and general information.

Task 3:Staff the hatchery on weekends with Information and Education assistance during peak adult fish returns (September) to give tours, answer questions, and disseminate general information.

Task 4:Develop a strong working relationship with the local media (newspaper, radio, and other Columbia River Gorge publications) and provide regular news releases and articles regarding agency issues and station activities.

Objective 3: Develop forums for public participation (or input) into Spring Creek NFH issues.

Task 1:Regularly participate in White Salmon River Watershed Technical Advisory and Council meetings.

Task 2:Hold an annual meeting with local conservation groups each spring to discuss Spring Creek NFH's program and other issues of concern.

Objective 4: Conduct monitoring and evaluation to ensure Goal 4 is achieved.

Task 1: Evaluate use and/or exposure of program materials and exhibits as they help support goals of the Information and Education program.

Task 2: Distribute teacher evaluations of our education programs to assure education goals are met.

3.2 Current Practices to Achieve Goals, Objectives, and Tasks

3.2.1 Water Use and Management.

Table 3. Certificates of water right held by Spring Creek NFH.

Source	Certificate No.	Date	Flow (cfs)	Use
Unnamed Creek	8398	Feb. 9, 1955	0.01	Domestic Supply
Hatchery Springs	6716	Nov. 4 1953	12.0	Fish Propagation Domestic Supply
Unnamed Creek	10424	Feb. 4, 1957	1.5	Fish Propagation
White Salmon River	9029	May 11, 1956	30.0	Fish Propagation
Well	Pending	Sept. 1991	2.22	Fish Propagation
Columbia River	12045	Nov. 20, 1959	11.2	Fish Propagation

The main water source for the hatchery is spring water upwelling from basalt cliffs and which is collected at several locations. Spring water is piped into the Mechanical Building where it is pumped into the recirculating system. Domestic water for onsite hatchery housing is also provided by these springs. Water flow has fluctuated from a low of 1,800 gpm to over 4,000 gpm, but supply 3,000 gpm on average. The recirculating system is designed as a 90% reuse system, circulating 30,000 gpm at maximum loading. During power outages and possible failure of the standby generator to operate, water can be supplied by gravity flow to the incubation building keeping eggs and fish alive.

In 1990, the hatchery drilled an additional well that supplies warm water (66^0F) which is mixed with the spring water to increase incubation temperature from 47^0F to 52^0F. The well can supply up to 800 gpm and is used to increase the production water temperature if the hatchery is experiencing extremely cold weather. This well allowed the hatchery to remove and surplus three large chillers and heat exchangers used to heat the spring water, saving a considerable amount of hatchery operational costs.
The hatchery also has rights to 11.2 cfs Columbia River water. This water was used on an emergency basis for fish culture before the hatchery was remodeled in 1970 and then used as heat source water for the heat exchangers before the well was established in 1990.

When operated, the Big White Salmon Ponds is supplied with a 30 cfs water right from the White Salmon River.

All domestic water is collected and tested monthly at the point where it enters the hatchery's closed circulation system. Test results conform to Washington Department of Health (WDOH) fecal coliform standards. Water quality of the spring water is taken yearly with major analysis done every five years. The only suspected pathogen in this water source is the causative agent for Enteric Redmouth, *Yersinia ruckeri*.

3.2.2 Screening. Fish do not exist at or within hatchery water supply collection area therefore, screening is unnecessary**.** Water is immediately collected and piped into the recirculating system. The White Salmon Sub-station water intake screening system is not in compliance with NOAA Fisheries screening criteria. This facility is not currently in use and will not be used until the proper screens are installed. At this time, there are no plans to replace the intake structure to comply with ESA screening criteria.

3.2.3 Conveyance System to Hatchery and Ponds. Spring water is collected via a series of small dams and connecting pipes. The water is piped under State Highway 14 into a distribution box where it can be diverted into the incubation building, down the fish ladder or sent to the mechanical buildings to be pumped into the system.

The recirculating system consists of 18 biological filter beds and 44 Burrows ponds. A total of 3 million gallons of water is needed to fill the system.

3.2.4 Effluent Treatment and Monitoring. Raceway cleaning and biological filter bed effluent from back washing is sent to two pollution abatement ponds where solids are removed prior to discharge to the Columbia River. Effluent during cleaning and normal operations is monitored weekly for suspended and settleable solids. Spring Creek NFH complies with Environmental Protection Agency standards.

Ponds may be cleaned or flushed weekly and the filter bed back-washed every other week. Organic loads are kept low by controlling feeding level and use of organic consuming bacteria.

3.3 Brood Stock Management

Spring Creek NFH is a single species facility rearing only tule fall Chinook salmon. Brood stock collection at the hatchery is managed to maintain the genetic integrity of the stock. The Service ensures that adult brood stock is randomly collected across the spawning run in proportion to the rate at which they return. The hatchery escapement goal is 7,000 adults of which 4,000 need to be females, but all fish returning are allowed to enter the hatchery. Fish exceeding the escapement goal are distributed meeting tribal requests as a first priority.

When return numbers are in excess of escapement goals, surplus fish are randomly selected throughout the spectrum of the run. Fish enter the hatchery daily, are visually counted and sexed, and guided to one of 17 Burrows ponds. One Burrows pond is filled at a time before another pond is opened, with each pond receiving between 400 and 1,000 fish, depending on the size of the run.

Adult tule fall Chinook return to the hatchery from late August through September with 70% of the return entering the hatchery between September 4th and September 20th. Traditionally, the hatchery starts the spawning process around the 15th of September and is generally finished by the 5th of October. Spawning takes place daily with an average daily egg take of 1.75 million although it's possible to have daily takes of over 5 million eggs.

At the start of the spawning process, adults are crowded out of the ponds and into a central channel leading to the spawning building. Fish are then crowded down the channel to the building where a portion is lifted with elevators into a bath of anesthesia. Once the fish are anesthetized they are sorted for ripeness. "Green" or unripe fish are returned to the holding pond and held for two days before being crowded and checked again for ripeness. Ripe fish are euthenized and bled prior to spawning to maximize the fertilization process.

3.3.1 Upstream Passage. There is no upstream passage at Spring Creek NFH that concerns the hatchery's water supply. Non-hatchery fish species incidentally caught within the ladder, including wild and ESA listed fish, are released back into the Columbia River. For hatchery fish that enter the ladder, Spring Creek NFH is a terminal fish culture facility.

3.3.2 Surplus Adult Returns. In most years, more fish enter the hatchery than are needed for brood stock. Fish beyond hatchery needs are distributed to the Yakama Nation for Ceremonial and Subsistence (C&S) and other tribes as requested. Additional fish are transferred to the Bureau of Federal Prisons for inmate rations. Any fish anesthetized using Tricaine Methanesulfonate (MS-222) is considered unfit for human consumption by the Food and Drug Administration. Surplus or spawned carcasses are available for stream enrichment directly or can be processed into bio-cubes for future enrichment programs. All other surplus fish will be rendered through a Service-approved rendering company.

3.3.3 Spawning Protocol. Genetic integrity of the Spring Creek NFH population is maintained by random collection of brood stock (Attachment 10 – Don Campton, Abernathy Fish Technology Center Protocol). When possible, a strict 1:1 spawning ratio is used, however the sex ratio of returning adults is typically skewed toward females. The actual ratio attained is usually 1.0 males : 1.4 females (i.e. some males are used more than once). Jacks are randomly included in the spawning population and comprise 2% of the male spawning population. The hatchery goal is to maintain an effective population size of greater than 5,000.

To achieve production goals, 7,000 tule fall Chinook brood stock are needed based on the following assumptions:

1. 15.1 million smolt release goal
2. 4,000 of the 7,000 are females
3. Fecundity of 5,000 eggs per female
4. Less than 5% pre-spawning mortality
5. ≥ 95% survival egg to eye-up
6. ≥ 90% survival egg to fry
7. ≥ 97% survival fry to smolt

3.3.4 Other Acceptable Stocks. If brood stock numbers are insufficient to meet hatchery production objectives, the hatchery will rear fewer fish. At present there is no other hatchery rearing the Spring Creek stock and therefore there is no other acceptable tule fall Chinook hatchery stock to rear at Spring Creek NFH. Historically, tule fall Chinook returning to the White Salmon River were used for brood stock in years of insufficient return.

3.3.5 Special Concerns of Brood Stock Management. Co-managers are involved in brood stock management decisions through participation in Hatchery Evaluation Team meetings, direct contact with the Columbia River Fisheries Program Office, or other regional forums. For example, during the late 1980's and early 1990's when Spring Creek runs were depressed, both ocean commercial and river tribal fisheries were impacted with closures and restricted catches to increase hatchery returns. The hatchery has a 0.5 mi. upstream and a 1.5 mi. downstream fishing sanctuary from the location of the ladder. The sanctuary can be opened or closed to tribal fishing depending on run size.

3.4 Incubation Strategies and Procedures

Each female is individually spawned with one male. After fertilization has occurred, the eggs from three females are combined into one bucket, washed, and split into two Heath incubation trays. At the eyed stage, eggs are shocked and salted to remove the dead eggs, then inventoried back into the incubators, placing approximately 4,000 eggs per tray. There

are 288 stacks of Heath incubation trays that have the capacity to incubate 21.6 million eggs. Each incubator stack is picked for nonviable embryos at least two times during incubation with a cumulative record maintained for each stack. All eggs are treated with iodophor three times a week at a rate of 10 to 15 ppm. These treatments are used to reduce any bacteria related soft shell problems. Incubation takes place in a mix of spring and well water to control temperature between 48°F and 53°F. Swim-up fry are placed directly into the raceways.

3.5 Rearing Strategies

Fry are moved outside to 44 Burrows ponds the first week of December. At full production, 350,000 swim up fry are placed in each of the ponds. Since the early 1980's, starter feeds from the manufacturer Bio-Oregon™ (Astoria, OR), have been used. After a month, feed is switched to dry Abernathy Diet. The manufacturer of Abernathy Diet may vary depending on contract bids. Fish are fed once an hour, eight times a day, for the first four weeks. As the fish grow and the feed size is increased and feeding frequency is reduced. At final release, fish may only be fed 4 or 5 times a day by hatchery staff. Daily feeding rations are controlled to prevent overload of the biological filter system. Past experience has proven that under-feeding by about 10% of recommended feed ration allows the filter system to function efficiently, maintaining water quality and fish growth.

Pond flow rates at the time of ponding are 400 gpm. After three weeks, flow is increased to 550 gpm, and again at seven weeks to a maximum 700 gpm. Fish mortalities are removed and recorded daily. Daily logs are kept that record weather, water temperature and any unusual fish behavior or incidents.

Fish are sampled every two weeks to determine growth rates and target goals. Growth rates are controlled by monitoring growth as it relates to the average water temperature. Feeding rates can be adjusted as need arises. Condition factors (K) are taken at the end of each month to track growth. Water chemistries are conducted weekly, or more frequently, to evaluate the status of the biological filters and water quality. Ammonia output by fish can be controlled by adjusting the feeding level and/or adding commercial bacteria (*Nitrosomonas* and *Nitrobacter* species) to the biofilter system.

Pond cleaning is generally not needed until the last week of February when hatchery density and loading levels are reaching their maximum level. During the past several years, the hatchery has been using a commercial, organic-reducing bacteria with some success. This action has resulted in reduced pond cleaning and back-washing of the biological filter beds. From about the first of March, pond cleaning and back-washing must be done every other week.

Fish are marked with coded-wire tags and adipose fin clips starting the second week of February. Currently, 450,000 are marked, (150,000 for each release group - March, April and May). Soon after the March release, the remaining fish are split into the empty ponds to provide more room for growth of the April and May release groups reducing densities. No other splitting is required.

In the early 1990's a study was conducted and concluded that present rearing densities produced the highest adult recoveries (Banks and LaMotte 2002). Banks and LaMotte (2002) provided data that adult contributions might increase by increasing rearing densities, but the potential for catastrophic losses in a recirculation system was a concern. The Density Index standard established at Spring Creek NFH is not to exceed 0.30.

3.6 Release Strategies.

After Spring Creek was remodeled in 1970, release strategies changed. Before the reuse system, fish were released whenever loads dictated, i.e., weekly releases could have started in February. With the reuse system and the additional space for fish, the hatchery was able to hold fish longer and release fish at a larger size. Releases are dictated by loading factors and half of the production fish are released in March to reduce densities and organic loads on the biological filtration system. Therefore, at full production of 15.1 million smolts, 7.6 million is the release goal for mid-March at a target size ≤125 fish per pound. Fish are released directly into the Columbia River from the hatchery.

Fish remaining after the first release are split into the empty ponds to lessen crowding and allow for more growth. In mid-April, the release goal is 4.2 million smolts at a target size of ≤ 90 fish per pound. The April release group generally migrates quickly past Bonneville Dam to the Columbia River estuary. The final hatchery release occurs during the first week in May, with a release goal of 3.3 million at a target size of ≤ 60 fish per pound. Behavior, coloration, and saltwater challenges indicate that the May release group exhibit smolt characteristics. These fish presumably migrate quickly to the estuary based on weekly and monthly juvenile fish passage information provided by the Fish Passage Center (www.fpc.org).

3.7 Fish Health Management Program

The primary objective of fish health management programs at USFWS hatcheries is to produce healthy smolts that will contribute to the program goals of that particular stock. Equally important is to prevent the introduction, amplification or spread of certain fish pathogens which might negatively affect the health of both hatchery and naturally reproducing stocks.

3.7.1 Fish Health Policy. The Lower Columbia River Fish Health Center (FHC) in

Underwood, WA provides fish health care for Spring Creek NFH under the auspices of the published policy 713 FW in the Fish and Wildlife Service Manual. In addition to this policy, the 1994 annual report "Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries" by the Integrated Hatchery Operations Team (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 *United States 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 Washington Department of Fish & Wildlife, the USFWS, 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 Spring Creek NFH. Monthly examination: A pathologist from the FHC 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 will also examine fish which are moribund or freshly dead 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 necropsied and tissues are taken for testing of listed pathogens. The listed pathogens, defined in USFWS policy 713 FW (Fish and Wildlife 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 FHC tests for *Myxobolus cerebralis,* another listed pathogen upon request, regarding the Spring Creek stock as being at minimal risk of infection.

In addition to the normal pre-release exam, the FHC performs a Geode's exam, a quantitative necropsy of 10 randomly selected fish from each raceway a few days prior to release (Adams et al., 1993; Goede and Barton, 1990, see Attachment 11 for Spring Creek NFH Fish Health Quality Goals 1980-1992). This information is used by hatchery personnel to ascertain general health of the population in relation to their survival and return as adults.

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 FHC tests for all of the listed pathogens, except *Myxobolus cerebralis* (unless requested), and including *Ceratomyxa shasta*.

Eggs received at the hatchery must be disinfected before they are allowed to come in contact with the station's water, rearing units or equipment. Details are provided in the 713 FW policy.

3.7.3 Chemotherapeutant Use. The biological filter component of the recirculation system presents challenges for disease control when outbreaks occur. Most chemotherapeutant treatments that kill pathogens also kill or reduce viability of the biological filter, create the potential for increased ammonia levels and the potential for rapid onset of bacterial gill disease. Bacterial gill disease can cause rapid annihilation of fish within days, and was responsible for a catastrophic loss in 1985 (Talo and LaMotte 1999). The hatchery has used formalin at low concentrations to control some external parasites on juveniles with limited success. The adult brood stock is in the hatchery for only two to three weeks so formalin treatments for fungus and parasites are not used.

Water-hardening of eggs with a polyvinyl-pyrrolidone iodine compound (approximately 1% iodine) is required by 713 FW policy to minimize/prevent transmittance of viral and bacterial pathogens; however, the configuration of the water system, the limited water supply, and large numbers of eggs taken at Spring Creek NFH complicate this process and it has been deemed unnecessary because of the low pathogen incidence in the adult fish.

Eggs are treated three times per week regularly with a low level of Iodophor (10 - 15 ppm), primarily to prevent losses from soft-shell disease. In the past, mortalities from this disease were severe enough to initiate various experimental treatments to control mortalities (Lower Columbia River FHC files) but a series of improvements over the years, including gentler handling of adults and the use of well water with a high sulfur content, have controlled this problem (personal communication, Ed LaMotte, 2002). Fungus has not been a problem so treatments for its control are not routinely used. Losses incurred during and after hatching

are typically less than 3%, and are removed manually by hatchery staff.

The inability to use basic treatments to control pathogens makes it important to prevent disease occurrence and to ensure that regular sanitation of the reuse system is maintained. It has been and will continue to be necessary to protect fish health through approved early releases to reduce fish numbers when environmental conditions dictate. All early releases are done in accordance with the fish health policies of the USFWS and the Washington and Oregon co-managers which prohibit the spread of exotic or listed pathogens. The limitations imposed by the biological filter minimize chemical and drug use which reduces impacts on the local environment, eases compliance with many safety regulations, and reduces risks to employees.

3.7.4 Other Fish Health Precautions. Because of the recirculation system and the risk of horizontal transmission and amplification of pathogens, healthy stocks are important to the successful operation of the Spring Creek NFH. It is critical that regular maintenance and annual sanitation of the hatchery is completed. After spawning of the adults, the oyster bed biological filter is temporarily decommissioned by disinfection with chlorine and allowed to dry for three months prior to the ponding of their offspring. This is not a complete disinfection as some water remains in the beds; however, it does constitute a sanitation protocol that reduces carry-over of pathogens to the offspring that will later be reared in the same system.

The Spring Creek tule fall Chinook adults have a very low incidence of vertically transmitted pathogens, which means their offspring begin life without the burden of inherited infections that could develop into disease. The young tule fall Chinook are thereby only at risk for environmentally-induced pathogens that are natural inhabitants in the water source or carried by aquatic animals/birds. The spring water source is relatively clean, notwithstanding its aquatic residents (frogs, salamanders, other animals) which may contribute pathogens like *Yersinia ruckeri* (enteric redmouth disease), *Aeromonas hydrophila* and *Saprolegnium*. The young hatchery juveniles are at risk when water temperatures enhance the life cycles of pathogens ubiquitous in the springs or the Columbia River. The recirculation of ninety percent of the water also means the recirculation of any pathogens that benefit from environmental conditions conducive to their growth. Unfortunately, abatement of pathogen transmission through the use of chemotherapeutants requires a fine balancing of fish numbers, density, water temperature (limited) and levels of the chemotherapeutant to obtain an effective treatment, while preventing dysfunction of the bio-filter. In reality, even simple formalin treatments for parasites are often ineffective, the levels necessary for killing also being the levels that kill the bio-filter. To prevent disease outbreaks or declines in health, releases of fish must be based on environmental conditions and prompt response to deteriorating changes in water quality and temperature.

Changing or shortcutting important features in the operation of the system results in

disastrous mortalities. In 1985, the addition of a second species (upriver bright fall Chinook salmon) to Spring Creek NFH initiated the onset of bacterial gill disease that killed millions of fish. A report by Talo and LaMotte (1999) summarizes operational errors that led to this event. In short, an increase in fish density, incompatible growth patterns for the two species, semi-functional filter beds and partial utilization of the reuse system facilities led to an estimated loss of up to 50% of the fish. Since that time, numerous improvements have been made and minimal disease-related losses have occurred.

The three releases of the juveniles allow maximum production at the hatchery while reducing potential health concerns since densities are decreased with each release. A second cleaning and drying of the biological filter system occurs after the last release of the juveniles in May. This allows opportunity to clean the system before the adults return.

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

Abernathy Fish Technology Center 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 (CRFPO) provides monitoring, evaluation, and coordination services concerning Spring Creek NFH 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 hatchery, Lower Columbia River Fish Health Center, Abernathy Fish Technology Center, 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 National Fish Hatcheries. Each Service field office contributes to this database. The Fisheries Information System database is discussed further in Chapter 4.

Information from and about Spring Creek NFH is connected to the broader fisheries community of the West Coast of the North American Continent through the U.S. Fish & Wildlife Service 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. Spring Creek 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.

Spring Creek NFH also has developed a database which compares hatchery-developed quality standards, goals and other external parameters to total survival of any brood year back to 1986.

3.8.2 Marking/Tagging Program. Spring Creek is an index stock for the US/Canada Pacific Salmon Treaty. Juvenile fish are fin clipped and coded-wire tagged by CRFPO to monitor and evaluate fish cultural techniques, survival and fishery contribution. Presently, only 450,000 tule fall Chinook salmon are being marked at Spring Creek NFH to access survival and evaluate harvest potential. This is in compliance with recommendations of the Biological Opinions of NOAA-Fisheries 1999 Artificial Propagation in the Columbia River Basin (NMFS 1999b) and the 2000 Reinitiating of Consultation on Operation of the Federal Columbia River Power System, under the Endangered Species Act-Section 7 Consultation. Future mass-marking is being discussed and may be implemented.

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 sampled fish are checked for clipped adipose fins. These marked fish are sampled for coded-wire tags. The heads of the adipose-clipped fish are removed, and recovered coded-wire tags are read for year of hatchery release. A percentage of unmarked fish are also sampled. Length and sex are recorded and scales are collected to determine average size, sex ratios, and age composition of returning fish. At least 500 fish are sampled in this way each year. Coded-wire tagging began at Spring Creek NFH with brood year 1972.

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 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.

To evaluate contribution to the various fisheries, coded wire tag programs were implemented in 1972. With the widespread use of the coded wire tags starting in 1972, information has been obtained about ocean distribution, survival and contribution of Spring Creek NFH tule fall Chinook. One of the many studies worthy of note is Robert Vreeland's (Vreeland 1987) evaluation that compared fisheries contribution rates of fall Chinook hatcheries from the Columbia River for brood years 1978-1981. This study found that Spring Creek production fish were a major contributor to a number of fisheries for brood years 1978 and 1979, but a drop in survival and contribution rates of Spring Creek NFH production occurred in 1980 and 1981. This lower survival and contribution continued until the late 1990's when major increases in survival started to again occur (Pastor 2001).

Past hatchery evaluation studies include NOAA-Fisheries coded-wire tagging of Spring Creek stock during the late 1970's and early 80's. This study evaluated the contribution of Chinook salmon reared at several Columbia River hatcheries to the pacific salmon fisheries (Vreeland 1987). Abernathy Fish Technology Center has also conducted Spring Creek hatchery evaluation studies during brood years 1989 to 1992 involving rearing densities (Banks and LaMotte 2002) and concluded that rearing densities be maintained at the hatchery's current index of ≤ 0.30 with a flow index greater than 1.5. In 2002, a study conducted by hatchery staff determined that AquaMats® impart little improvement in fish quality or behavior prior to release (Gale and LaMotte 2002).

Spring Creek NFH, with assistance from the CRFPO and Abernathy Fish Technology Center, is presently evaluating unfed fry releases using otolithography, an otolith branding process, on three million unfed fry each year (LaMotte et al. 1999). Brood year 1999 was the first year of otolithography and three year old returns are currently being evaluated. In brood year 2000, no unfed fry were marked due to low adult returns, but three million were marked in 2001 and another three million were marked in 2002. The results of this evaluation are forthcoming and the study is ongoing.

3.8.5 Stock Assessment and Contribution to Fisheries. Coded-wire tagging of production fish at Spring Creek NFH began in 1972. In 1985, the Pacific Salmon Commission (PSC) funded "Index Stock" program began. Currently, representative groups of 150,000 fish from each release group are adipose fin clipped and coded-wire tagged to assess survival and fisheries contribution. All Spring Creek 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 most recent Annual Stock Assessment Report (Pastor 2001) includes brood years with "complete" coded-wire tag recovery information, brood years 1980 through 1994. Average survival for these brood years is estimated to be 0.3151%. The standard deviation for those survivals is 0.2425%. The minimal survival was 0.0462% for brood year 1984, and the maximum was 0.9838% for brood year 1982.

On average for brood years 1980 through 1994, the percentage of fish harvested in the Columbia River gill net fishery has been equal to the number of fish returning to the hatchery, approximately 34%. About 13% of Spring Creek fish are harvested in British Columbia sport and commercial fisheries. Washington and Oregon commercial fisheries each take about 6%. Brood years in the 1970's routinely provided over 100,000 fish for harvest in ocean fisheries. Table 4 provides information on escapement and harvest of Spring Creek NFH tule fall Chinook.

Table 4. Hatchery escapement, Columbia River harvest, ocean harvest and total adult production for Spring Creek NFH tule fall Chinook salmon 1980-1995. The total adult production number given includes all estimated sport, tribal, commercial, and international harvest of Spring Creek NFH fish. This table is partially reproduced from the Spring Creek NFH - Hatchery and Genetic Management Plan (USFWS 2003b). Data presented in this table is calculated from the Columbia River Information System or CRiS (Stephen M. Pastor, August 2002).

Brood Year	Hatchery Escapement (Goal: >7000)	Columbia River Harvest	Ocean Harvest	Total Adult Production Number[1]
1980	4634	7433	17021	29088
1981	7366	15838	23347	46551
1982	16268	65631	58928	140827
1983	986	8638	6436	16060
1984	481	2407	3530	6418
1985	785	5330	7593	13708
1986	5812	17824	22414	46050
1987	5244	7388	14694	27326
1988	14331	30548	34223	79102
1989	8368	11646	26779	46793
1990	6251	5420	9642	21313
1991	9693	9995	10253	29941
1992	7771	12139	3578	23488
1993	67	26524	5279	31870
1994	5837	6189	4407	16433
1995	2643	3586	1821	8050
Mean	6034	14784	15621	36439

[1]Includes adult fish captured in tribal, sport and commercial harvest in freshwater or saltwater and escapement to Spring Creek NFH.

3.8.6 Juvenile Monitoring. Juvenile fish at Spring Creek NFH 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 Lower Columbia River Fish Health Center to determine the health condition of fry, fingerling and smolts prior to release. 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. Results are entered into the hatchery's database.

Currently, the only monitoring of juvenile releases from Spring Creek NFH is done by the Fish Passage Center (FPC) located at Bonneville Dam. Shortly after Spring Creek NFH releases, the fish passage center usually notes when Spring Creek NFH juveniles are passing by Bonneville Dam in their weekly report available online (www.fpc.org).

3.8.7 ESA Assessments, Ecological Interactions, and Natural Production Studies. The Service completes Biological Assessments and Hatchery and Genetic Management Plans to comply with the Endangered Species Act. These assessments and plans help guide production, considering the potential impacts on the biological community.

Additional monitoring is needed to evaluate Spring Creek releases, possible interactions with wild stocks in the migration corridor, and to identify potential hatchery reform measures. Currently, staff from Spring Creek NFH, Columbia River FPO, Lower Columbia FHC, and Abernathy Fish Technology Center 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 Spring Creek:

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

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

3.8.9 Coordination/Communication. The hatchery holds Hatchery Evaluation Team (HET) meetings each summer and winter. These meetings include representatives from Spring Creek NFH, CRFPO, and LCRFHC. Topics of concern include reports on current activities and accomplishments, present management programs, and future plans or studies

that might affect, or be affected by hatchery operations. Other aspects include survival, life history, fisheries contribution, and fish health parameters at Spring Creek NFH and how it compares to other National Fish Hatcheries producing fall Chinook salmon in the Columbia River. These meetings have evolved into combination HET/Coordination meetings. Cooperators (NOAA-Fisheries, WDFW, COE, and Yakama Nation) are invited to all HET meetings and are especially encouraged to attend when significant hatchery management decisions are scheduled. The winter HET meeting reviews adult returns, results of hatchery evaluation studies, with emphasis on production decisions for the next year. The summer meeting details last springs releases, fish health quality, production number, predicted adult returns, adult spawning operations and needs, and sampling plans for Bio-sampling. Hatchery production is coordinated with the co-managers through the Production Advisory Committee and with concurrence of the Regional Office, NOAA-Fisheries and Corps of Engineers.

3.8.10 Fish and Egg Transfers. All fish, and/or egg requests and transfers are coordinated through Spring Creek NFH, LCRFHC, and CRFPO. Any request for fish and/or eggs, either in or out of Spring Creek NFH, will be in writing and a National Fish Hatchery Planned Release or Transfer Schedule will be prepared by the requester. All transfers of fish and/or eggs require a fish health certification from LCRFHC prior to transfer. All fish and egg transfers are made in accordance with the fish disease policies of the co-managers and Service fish health policy. If the fish and/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 Spring Creek NFH manager and LCRFHC, in turn the document and permits are sent to the CRFPO for approval. These requests and permits are kept on file at the CRFPO for future reference.

3.8.11 Interagency Coordination/Communication. As part of the *United States v. Oregon* Columbia River Fish Management Plan, the Technical Advisory and Production Advisory Committees 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) was comprised of representatives from fish management agencies, including CRFPO and tribes. IHOT 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 Planning Council. The Service is represented by our 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 heath policies and to discuss current fish health issues in the Pacific Northwest.

3.8.12 Ocean Fisheries Management. Spring Creek NFH tule fall Chinook salmon are a major component in ocean fisheries. This stock influences ocean fishery management decisions. 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 (*United States 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 through the Technical Advisory Committee (TAC). The Columbia River Compact, created by Congress, has the authority to approve or reject commercial fishery proposals for the main stem 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 commercial seasons for non-tribal and/or tribal fisheries in the main stem Columbia River. Sport regulations are set by each state individually. The court adopted 2003 Management Agreement for Upper Columbia River fall Chinook, Steelhead, and Coho (*United States v. Oregon* court proceedings Civil No. 68-513 KI) stated that the escapement objective for Spring Creek NFH would be the program production requirements of 7,000 adult tule fall Chinook, of which 4,000 are females. Ocean and in-river fisheries were managed to help achieve this escapement in accordance with the fishing regimes described within the document.

Spring Creek NFH is a major contributor to the sports fishery at the mouth of the Columbia River as well as the commercial gill net fishery below Bonneville Dam. The Spring Creek stock is also a major contributor in the tribal zone 6 fishery above Bonneville Dam.

3.9 Public Outreach Activities

The Columbia River Gorge Information and Education (I&E) Office services the Spring Creek and Carson National Fish Hatcheries and the Lower Columbia River Fish Health Center. The Office shares/distributes its time and staffing between these stations. The I&E program is mainly funded by the Spring Creek NFH with assistance from the Carson NFH and the Lower Columbia Fish Health Center.

The goal of the Columbia River Gorge I&E Office outreach program is to increase the visibility of the Fish and Wildlife Service (FWS) facilities in the Columbia River Gorge and to provide information about FWS programs to internal and external audiences. FWS staff and volunteers show how FWS programs benefit the public and the environment in keeping with the FWS mission: Working with others, to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

Recognizing the importance of all FWS staff to be involved in gaining or retaining public support for our programs, the I&E 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, providing support to the Service, the public, and our hatchery programs.

Information on Spring Creek NFH can be found online at http://gorgefish.fws.gov/SpringCreek. Additional biological information on tule fall Chinook salmon at the hatchery can be viewed at http://columbiariver.fws.gov.

3.9.1 On Station. On station activities include tours of the facility to schools and special interest groups. On site educational efforts include touring some 800-1000 students through the hatchery during spawning, to gain a better understanding of hatchery operations and salmon life cycle. Information and education staff provide educational materials to schools and set up fish tanks for learning situations. Students from area schools raise tule fall Chinook salmon in their classrooms and annually release their fish into the nearby White Salmon River. Annual festivals include a Visitor's Weekend each September to highlight spawning and hatchery operations for the visiting and local public.

3.9.2 Off Station. Outreach efforts include an array of activities that occur throughout the Pacific Region. Examples include various festivals, classroom participation at local schools, stream adoption, participation in other National Fish Hatchery events, Jewett Creek restoration project and county fairs (Hood River and Skamania counties, and the Trout Lake Community Fair).

3.9.3 Partnerships/Cooperators with Spring Creek National Fish Hatchery.

Partnerships/Cooperators

- Bonneville Power Administration
- Columbia River Inter-Tribal Fish Commission
- Friends of Northwest Hatcheries
- NOAA-Fisheries
- Private land owners in White Salmon River watershed.
- U.S. Army – Corps of Engineers
- U.S. Environmental Protection Agency
- *United States 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
- Washington Trollers Association
- White Salmon River Watershed Council
- White Salmon River Technical Advisory Committee
- Yakama Nation

3.10 Special Concerns

3.10.1 Planning Issues. Federal, state and tribal entities share responsibilities for development of sub-basin 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 U.S. Forest Service, U.S. Fish and Wildlife Service, NOAA-Fisheries, U.S. Army Corps of Engineers, U.S. Geological Survey, Bonneville Power Administration, the Washington Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, Underwood Conservation District, and the Yakama Nation.

This Comprehensive Hatchery Management Plan will recognize and comply with all management plans and Biological Opinions affecting the Columbia River Basin. Operations at Spring Creek NFH 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. To be effective, these selective fisheries require that a high proportion of hatchery produced fish be marked. Mass marking (100% adipose fin clipped) of most hatchery fish is being implemented for steelhead trout and coho salmon, and most recently for spring Chinook salmon. Currently, mass marking of fall Chinook salmon has not yet been implemented except for special cases, but will be looked at in the future. Presently, cost and logistics of marking 15 million smolts are the prohibitive factors for mass marking and could be a future concern if all Spring Creek NFH fish must be marked.

Tribal managers generally disagree with the management strategy for mass marking and selective fisheries. The Service has not made any unilateral decisions on marking and will continue to coordinate actions with the states and tribes through *United States v. Oregon* and NOAA-Fisheries to comply with ESA actions and coordinate with the Pacific States Marine Fisheries Commission mark committee. In addition, federal agencies are beginning discussions on 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 *United States v. Oregon*, PSMFC, and U.S. - Canada forums.

3.10.3 Juvenile Salmon Distribution and Production Numbers. Juvenile salmon are released from Spring Creek NFH in March, April and May as sub-yearling smolts. In some years, unfed fry have also been released during December. These release strategies are in agreement with WDFW, COE, the Service and NOAA-Fisheries.

3.10.4 Water Use (Drought). During drought years spring water flow may drop low enough to negatively impact water quality within the hatchery. Earlier than planned releases may be necessary during those years to reduce fish densities. All proper approvals will be obtained prior to a drought related release.

3.10.5 Emergency Releases. There may be a situation that warrants early or emergency releases caused by factors such as mechanical problems creating disruption of water flow, natural disasters or fish health concerns. The decision to make an early or emergency release will be based on the emergency release plan guidelines that are located in the hatchery's operational plan (Attachment 4). Notification procedures need to be followed to ensure all management agencies affected by an early or emergency release are notified in a timely manner and are aware of the circumstances that initiated the decision for releases outside the normal release periods. Table 5 lists the contact points that will be notified prior to an emergency release. In cases of extreme mechanical failure contacts will be notified as soon as logistically possible of an early or emergency release.

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 either to the Yakama Nation or other tribes as requested. The Federal Prison inmate food program can receive any fish beyond tribal requests. Fish not suitable for food are typically rendered. Plans are underway to determine the number, if any, suitable for stream enrichment via carcass distribution or production of nutrient enrichment pellets.

3.10.7 Hatchery Fish Ladder Management. The Service, NOAA-Fisheries, COE, WDFW and Yakama Nation agreed on a strategy for ladder management; the ladder remains open until all fish have entered the hatchery. Fish other than tule fall Chinook that enter the ladder during hatchery brood stock collection and surplus activities are returned to the river to continue their migration. These fish may include ESA listed species.

In 2003 with the permission of NOAA-Fisheries, COE, WDFW and Yakama Nation, an alternative to the current ladder operation was tested on two separate occasions, one during which ladder operation would be open and closed periodically, or pulsed, for brood stock collection. During a pulsed ladder operation, fish in surplus of brood stock collection will be left in the river for nutrient enhancement, natural spawning, and additional fishing opportunities. Future ladder operational plans will be negotiated and ecological risks and

benefits to native ESA listed salmon will be evaluated through HET meetings and communication with NOAA-Fisheries, COE, WDFW and Yakama Nation.

Table 5. Notification list for emergency or early release. If an emergency or early release occurs during non-workday hours, or the contact person cannot be reached, voicemail messages will be left of the release.

NAME	PHONE	FAX	E-MAIL
NOAA Fisheries			
Rich Turner	503-736-4737	503-872-2737	rich.turner@noaa.gov
Fish Passage Center			
Larry Basham	503-230-4287	503-230-7559	lbasham@fpc.org
Jerry McCann	503-230-4291	503-230-7559	jmccann@fpc.org
PSMFC			
Bonneville SMP Project Leader			
Rick Martinson	541-296-8989	541-296-8717	rickdm@gorge.net
U.S. Army COE			
Bonneville Dam Project Biologist			
Tammy Mackey	541-374-4552	541-374-8761	Tammy.M.Mackey@nwp01.usace.army.mil
Bonneville Dam Operations Manager			
Jim Mahar	541-374-4550	541-374-8073	James.R.Mahar@usace.army.mil
USFWS			
Rich Johnson (RO)	503-872-2763	503-231-2062	rich_r_johnson@r1.fws.gov
Tim Roth (CRFPO)	360-696-7605	360-696-7968	timothy_roth@r1.fws.gov
David Wills (CRFPO)	360-696-7605	360-696-7968	david_wills@r1.fws.gov

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 Spring Creek NFH is no exception. Of particular concern, is potential impact to the Columbia River Ecologically Significant Unit (ESU) of threatened Snake River fall Chinook. To meet our ESA obligations, the Service is proceeding with actions to comply with the March 1999 Biological Opinion on hatcheries and the 2000 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 a Hatchery and Genetic Management Plan for Spring Creek NFH (USFWS 2003b) 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 may need 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 responsibility. The Service is working with NOAA-Fisheries and other co-managers to address current budget shortfalls.

FINAL DRAFT

CHAPTER 4. IMPLEMENTATION

Implementation of the Spring Creek NFH 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 intends to outline these processes and discuss the policy and planning documents which provide guidance to Spring Creek NFH in regards to policy, budget, safety, grounds and facilities maintenance.

4.1 Budget Overview

Spring Creek National Fish Hatchery receives 100% of its operations budget from reimbursable funds, Corps of Engineers(COE) under the John Day Mitigation Act and NOAA Fisheries under the Mitchell Act. The original agreement was for a 50/50 split between the COE and NOAA-Fisheries, but over the years funding has been skewed toward the COE. Presently, the COE provides approximately 70% of operating costs for Spring Creek NFH. Operational budget needs are identified each year and negotiated with the COE and NOAA-Fisheries to determine the final fiscal year allocation (see following section on Mitchell Act). Deferred maintenance and most construction are usually funded by the COE, but projects are also entered into the Service's Maintenance Management System (MMS) for possible funding. Some funding for special studies can also be derived from reimbursable sources. The current budget and the number of full-time personnel at Spring Creek NFH are provided in Table 6. Additional COE and Mitchell Act funding is provided to the CRFPO, LCRFHC, Little White Salmon NFH and Abernathy Fish Technology Center for support services to the hatchery. In past years, Spring Creek NFH received Service operational funds but this was discontinued in the early 1990's.

4.1.1 Fisheries Information System. The Service's Washington Fisheries Office implemented the Fisheries Information System (FIS) in 1989 in order to meet the increasing demands for information to answer inquiries from Congress, other Federal Government and State Government offices and the public. Automation of the data gathering process insured standardization of data and quicker response time. The FIS consists of database modules which address future budgeting needs above base funding - Fishery Operation Needs (FONS) Module, resource oriented accomplishments that occurred over a fiscal year - Accomplishments Module, and Congressionally mandated reporting requirements that describe yearly production at NFH's - Fish Request and Distribution Module and the Egg Request and Distribution Module. The Washington Fisheries Office may add or delete modules as need requires. The FIS originally included a module that compiled a list of a hatchery's deferred maintenance projects – Maintenance Management System (MMS). This database has been transferred temporarily to the Service's National Wildlife Refuge Management Information System until the startup of the Service Asset Maintenance Management System (SAMMS) is brought on line in the near future.

Table 6. Budget by funding source and full time equivalent personnel for the fiscal years 2000-2002. Budget numbers are in thousands of dollars.

	2000 Actual	2001 Actual	2002 Actual
COE	556.7	603.1	640.9
NOAA Fisheries	189.7	315.0	301.0
Operations	746.4	918.1	941.9
Cyclical	148.5	112.0	9.9
Quarters	8.8	15.0	24.9
Veh./Equipment	69.5	0.0	0.0
MMS project list	0.0	0.0	68.0
Maintenance	226.8	127.0	102.5
FTEs	9.38	11.0	10.25

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 Spring Creek NFH are:

- Manage adult hatchery stray rates to the lowest level achievable

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), projects submitted to the COE, and Regional Quarters Overhead funds allocated through a competitive process. Access to FONS and is through the FIS database.

4.1.4 Fisheries Operational Needs System. Fisheries Operations Needs System, or FONS, was established in 1999 as a planning, budgeting, and communication tool to enhance identification of funding and staffing needs for the Fisheries Program. FONS projects are used in budget requests to the Department of Interior and the Office of Management and Budget. Table 7 outlines the Regional and National budget formulation, and provides a timeline through the process. Projects are submitted to evaluate hatchery goals and standards (Table 8). Additional projects will be submitted as needs arise. Several other Service field offices support Spring Creek NFH, including CRFPO (Vancouver, Washington), Lower Columbia River Fish Health Center, and Abernathy Fish Technology Center.

Table 7. 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 8. Projects submitted for fiscal year 2004 and are linked to Spring Creek NFH Goals and Objectives. See Section 3.1 of this document for more information regarding hatchery goals and objectives.

Goal	Objective	Intended accomplishment	FONS Project #	Proposed by	Cost ($1,000)
3	1,2	Develop cooperative implementation plan and obtain baseline conditions for anadromous fish stocks to the (Big) White Salmon River. Gather data for reintroduction or supplementation of fish populations utilizing Spring Creek NFH program fish.	1999-008	CRFPO	825
3 2	1,2 4	Development of hatchery reform implementation plan for Service operated/administered facilities in the Columbia River Basin.	2004-009	CRFPO	1000
3	1,2	Evaluate ecological interactions between production fish from Little White NFH and Spring Creek NFH, listed wild fish, and other native fish using tagging and tracking methods, instream sampling, habitat, genetics and fish health.	2004-011	CRFPO	300
4	1	Plan, construct a sturgeon fishing platform and access ramp for mobility impaired persons.	2001-001	SCNFH	69
4	1,2,3	Construct Salmon forum Visitor Complex	2002-002	SCNFH	750
3	1,2	Fish passage studies prior to removal of Condit Dam.	2002-004	SCNFH	250
1	2	Evaluate success of unfed fry releases	2003-002	SCNFH	100
3	2	Determine ecological interactions between wild and hatchery fish in the Columbia River Gorge (ladder pulsing study).	2004-001	SCNFH	50
				Total:	3,344

4.1.5 Maintenance Management System (MMS). The Maintenance Management System (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 (WO) for consolidation and submission into the budgetary process. Projects submitted for consideration are too numerous to list here and can be found in Attachment 12. 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 Department and Office of Management and Budget (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. A project to relocate the White Salmon River intake and bring it into compliance with NOAA Fisheries screen criteria is a major project listed.

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). Many maintenance projects are funded with reimbursable funds from the COE Corps of Engineers, as the COE owns most of the facility's structures.

4.1.8 Mitchell Act and Other Reimbursable Funding Processes. As stated previously, 100% of Spring Creek NFH operations are derived through reimbursable funding, COE and NOAA-Fisheries. Resource management funding that comes from the Service's share of the annual U.S./Canada Pacific Salmon Treaty funding process is provided to mark 450,000 fish with a coded-wire tag for stock assessment, as outlined in Chapter 3. Funding is negotiated yearly with the Fish and Wildlife Service submitting budget proposals to COE, NOAA-Fisheries and PFMC for there 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

Spring Creek NFH operates under a variety of Service guidance and policies. Some of the more significant policies are described in the following section:

4.2.1 Quarters Policy. The Service administers a variety of field offices and National Fish Hatcheries. At many of these hatcheries, including Spring Creek NFH, 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 current Quarters Plan for Spring Creek NFH is dated April 10, 1998 (Attachment 13). The intent of having personnel living in government quarters at Spring Creek NFH is to provide station security and operations during non-duty hours. Mechanical systems to regulate water flows must be maintained to prevent loss of fish. Additional protection of government owned property is provided by occupants, especially when anadromous brood stock is present. The Spring Creek NFH water recirculating system, water pumps, standby generator and computerized alarm system requires quick response to prevent fish losses. In addition, staff residency is required 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 U. S. Fish and Wildlife Service Administrative Manual. Premium pay is discussed in Part 225 FW of the Manual with specific discussions on overtime regulations in Chapter 7.8, callback overtime in Chapter 7.13, Compensatory time in Chapter 7.18, and standby in Chapter 7.22.

4.2.4 Surplus Fish and Eggs as Government Property. This guidance was provided in a July 2001 memorandum from the Regional Director (Attachment 14). The guidance states: "Live fish entering a National Fish 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 Mission are only 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 Region 1 (Attachment 15). Hatcheries and other Fisheries offices within Region 1 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. Region 1, 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 U. S. Fish and Wildlife Service Administrative Manual. Career development is discussed starting in Part 230 FW of the Manual.

4.3 Service Required Planning Documents

Daily operations of Spring Creek NFH 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 and safety program discussions are described in the U. S. Fish and Wildlife Service Administrative 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 nontarget 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-1980s. Unfortunately no plan was written for Spring Creek and needs to be completed.

4.3.5 Monitoring and Evaluation Plan. Monitoring and evaluation of production programs are outlined in the Spring Creek Hatchery and Genetic Management Plan (USFWS 2003b). A more detailed discussion of monitoring and evaluation can be found earlier in Chapter 3. Spring Creek has also developed its own database, collecting information as a historical reference for comparison of release groups since 1986.

4.3.6 Distribution of Surplus Fish. The Hatchery works cooperatively with the CRFPO, LCRFHC Lower Columbia River Fish Health Center, 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 (SDWA) delegates safe drinking water control to the States. Spring Creek NFH must meet state requirements to provide drinking water to the public as well as our

employees and their families. The Environmental Protection Agency (EPA) recently indicated that a significant number of the Service's systems do not fully comply with the SDWA. They have requested an audit of compliance with State regulation. This process has started using the services of a contractor. Facilities in the State of Washington have been surveyed. Deficiencies discovered in water systems will be corrected as they are detected.

4.3.8 Continuity of Operation Plan. The Continuity of Operations Plan provides guidance for Spring Creek NFH 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 the Spring Creek 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 Spring Creek NFH due to petroleum fuel storage in above ground tanks greater than 660 gallons. The SPCC for Spring Creek is current (April 1999) and can be located in the hatchery administrative files, or the Fisheries Program Regional Office in Portland, OR.

4.3.10 Outreach Plan. An outreach plan describes the hatchery's strategy for telling the Service's, Spring Creek National Fish Hatchery's, and the Columbia River Basin's resource story to the public. Furthermore, this plan describes outreach tools and facilities needed to implement this strategy. The plan should be cited when describing unmet outreach needs in the FONS database (see Fish and Wildlife Service Budgeting Process).

4.3.11 Watershed/Sub-basin Plan. National attention has been focused on the Columbia River basin with listings of salmon and steelhead, bull trout and other aquatic species. Endangered Species Act 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. The Northwest Power Planning Council (now known as the Northwest Power

and Conservation Council) is leading a major sub-basin 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 sub-basin planning as major building blocks for recovery of listed species. In addition, Implementation Plans have been developed by the COE, BPA, and the Bureau of Reclamation 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 sub-basin 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

4.4.1 Endangered Species Act (ESA). 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. Several Conservation Recommendations (CR) are discussed below. The complete list of measures which may affect Spring Creek NFH can be found in NMFS (1999b).

- CR 6. Monitor and evaluate ecological interaction.
  Little data describing the ecological interaction of hatchery Chinook smolts with Endangered Species Act listed stocks are available. Funding to fill this data gap is being pursued via the FONS system initiated with the FY 2002 FONS submissions. This will be a shared project with the Columbia River Fisheries Program Office.

- CR 10. Assess use of hatchery carcasses for nutrient input.
  Outplanting spawned or excess adult Chinook salmon carcasses for nutrient enrichment has been discussed with co-managers.

4.4.2 National Pollution Discharge Elimination System. Spring Creek NFH is currently in compliance with required National Pollution Discharge Elimination System (NPDES) permit requirements for effluent discharge from the hatchery.

4.4.3 Hazardous Waste. Spring Creek NFH 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.

4.4.4 Investigative New Animal Drugs (INAD). No drugs requiring an Investigative New Animal Drug use permit have been used in recent years. Spring Creek will be testing Aqui-S, an aquatic anesthetic, under a Service INAD, to evaluate its effectiveness and possible future use.

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 Budgetary Needs and Strategies section. 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.

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 the hatchery program and facility layout. The Guide is current and updated annually. Copies can be obtained from the hatchery or the Fisheries Program Regional Office in Portland.

4.5.8 Real Property Inventory. 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 of 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 Maximo/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 4 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 Hatchery files on station.

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

BOR	Bureau of Reclamation
BPA	Bonneville Power Administration
BPH	Bonneville Pool Hatchery (Spring Creek "tules")
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
CWT	Coded-wire tag
DNR	Department of Natural Resources
ESA	Endangered Species Act
ESU	Ecologically Significant Unit
FIS	Fisheries Information System
FONS	Fisheries Operations Needs System
FPC	Fish Passage Center
FTE	Full Time Equivalent
HGMP	Hatchery and Genetic Management Plan
IHOT	Integrated Hatchery Operations Team
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 Pollution Discharge Elimination System
ODFW	Oregon Department of Fish and Wildlife
PAC	Production Advisory Committee
PFMC	Pacific Fishery Management Council
PIT	Passive Integrated Transponder
PNFHPC	Pacific Northwest Fish Health Protection Committee
PSMFC	Pacific States Marine Fisheries Commission
RMIS	Refuge Management Information System
SWDA	Safe Water Drinking Act
TAC	Technical Advisory Committee
TSS	Total Suspended Solids
USFWS	United States Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WDOH	Washington Department of Health

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APPENDIX

Attachment 1. Historical Background of National Fish Hatcheries in Region One.

Attachment 2. Statutory Mandates and Authorities.

Attachment 3. Layout Diagram of Spring Creek National Fish Hatchery.

Attachment 4. Spring Creek NFH – Operational Plan, Goals and Standards, dated May 15, 2000.

Attachment 5. List of Listed and Proposed Endangered and Threatened Species, Candidate Species, and Species of Concern Which May Occur within the Vicinity of the Proposed Master Plan Improvements – Spring Creek NFH dated 8/11/1998.

Attachment 6. Fall Chinook Salmon Spawning and Distribution from the Big White and Spring Creek Stations During Brood Years 1901 to 1937.

Attachment 7. Fall Chinook Salmon Spawning and Distribution from the Big White and Spring Creek Stations During Brood Years 1938-1970.

Attachment 8. Fall Chinook Salmon Spawning and Distribution from the Big White and Spring Creek Stations During Brood Years 1971-2002, Reuse System Era.

Attachment 9. Spring Creek Water Reuse System Diagram.

Attachment 10. Recommended Spawning Protocols for Pacific Salmon and Steelhead at U.S. Fish and Wildlife Service Hatcheries. Donald E. Compton author. Dated 12/1/02.

Attachment 11. Spring Creek NFH Fish Health Quality Goals 1980-1992.

Attachment 12. FIS Deferred Maintenance – Five Year Plan (Fiscal Years 2003-07), Spring Creek NFH Maintenance Projects.

Attachment 13. Memorandum to Employees of Spring Creek NFH – Subject: Occupancy of Government Quarters at Spring Creek NFH.

Attachment 14. Memorandum to Fishery Project Leaders – Subject: Surplus Fish as Government Property. Dated July 10, 2001.

Attachment 15. Memorandum from ARD Fisheries Region 1 – Subject: Guidance on the use of anesthetics, drugs, and other chemicals. Dated 11/9/00.

Attachment 1. Historical Background of National Fish Hatcheries in Region One.

Station	Year Established	Final Year	Disposition
McCloud River, CA	1872	1882	Closed
Crooks Creek,CA	1879	1887	Moved to McCloud River, CA
Baird (formerly McCloud River), CA	1888	1937	Transferred to Bureau Of Reclamation
Clackamas, OR	1888	1943	Transferred to State of Oregon
Fort Gaston, CA	1889	1898	Replaced by Willamette Falls, OR
Korbel, CA	1893	1896	Closed
Redwood Lake, CA	1893	1898	Closed
Sandy River, OR	1895	1925	Closed
Battle Creek, CA	1896	1946	Closed
Olema (Bear Valley), CA	1897	1898	Closed
Salmon River, OR	1897	1900	Transferred to State of Oregon
Upper Clackamas, OR	1897	1931	Transferred to State of Oregon
Roque River, OR	1897	1932	Closed
Mill Creek, CA	1898	1948	Transferred to FWS Division of Research
Little White Salmon, WA	1898	-------	Operating
Willamette Falls, OR	1899	1942	Closed
Baker Lake, WA	1899	1942	Transferred to US Forest Service
Spring Creek, WA	1901	-------	Operating
Grants Pass, OR	1904	1906	Moved to Applegate Creek, OR
Phinney Creek, WA	1907	1918	Closed
Applegate, OR	1907	1959	Transferred to FWS Division of Research
Cazadero, OR	1908	1913	Closed
Illabot Creek, WA	1909	1927	Closed
Duckabush, WA	1911	1943	Transferred to US Forest Service
Quilcene, WA	1911	---------	Operating
Darrington, WA	1912	1919	Closed

Brinnon, WA	1913	1923	Closed - egg collection
Sultan, WA	1913	1933	Closed
Birdsview, WA	1913	1947	Transferred to State of Washington
Day Creek, WA	1914	1919	Closed
Quinault (Old), WA	1914	1947	Transferred to US Forest Service
St. Helens, OR	1917	1919	Closed
Paris, ID	1918	1921	Closed
Washougal River, WA	1919	1923	Closed
Salmon, ID	1921	1946	Transferred to Bureau of Land Management
Phalon, WA	1922	*	Authorized, but never operated
Snake River, OR	1924	1925	Moved to Salmon, ID
Ozette, WA	1926	1927	Closed
Wind River, WA	1926	1936	Transferred to State of Washington
Mt. Rainer, WA	1931	1942	Transferred to National Park Service
Hagerman, ID	1931	----------	Operating
Butte Falls, OR	1932	1943	Transferred ½ to State of Oregon; ½ to Bureau of Reclamation
Deschutes, OR	1932	*	Authorized, but never operated
Spokane, WA	1935	1942	Transferred to State of Washington
Yakima Fish Screen, WA	1935	1986	Closed
Delph Creek (Estacada), OR	1936	1954	Transferred to State of Oregon
Carson, WA	1937	----------	Operating
Leavenworth, WA	1938	----------	Operating
Clark Fork, ID	1939	1942	Transferred to State of Idaho
Sun Valley, ID	1940	1941	Closed
Warm River, ID	1940	1951	Transferred to State of Idaho
Entiat, WA	1940	----------	Operating
Winthrop, WA	1940	----------	Operating
Coleman, CA	1942	----------	Operating
Willard, WA	1951	----------	Operating

Eagle Creek, OR	1953	----------	Operating
Abernathy, WA	1957	1989	Operating
Lahontan, NV	1964	----------	Operating
Tehama-Colusa Spawning Channels, CA	1967	1989	Caretaker Status
Quinault, WA	1969	----------	Operating
Dworshak, ID	1969	----------	Operating
Kooskia, ID	1970	----------	Operating
Marble Bluff Fishway, NV	1974	----------	Operating
Warm Springs, OR	1974	----------	Operating
Makah, WA	1981	----------	Operating
Nisqually, WA	1991	----------	Operating
Livingston Stone, CA	1992	----------	Operating

Attachment 2. Statutory Mandates and Authorities.

Attachment 2.—Statutory Mandates and Authorities.

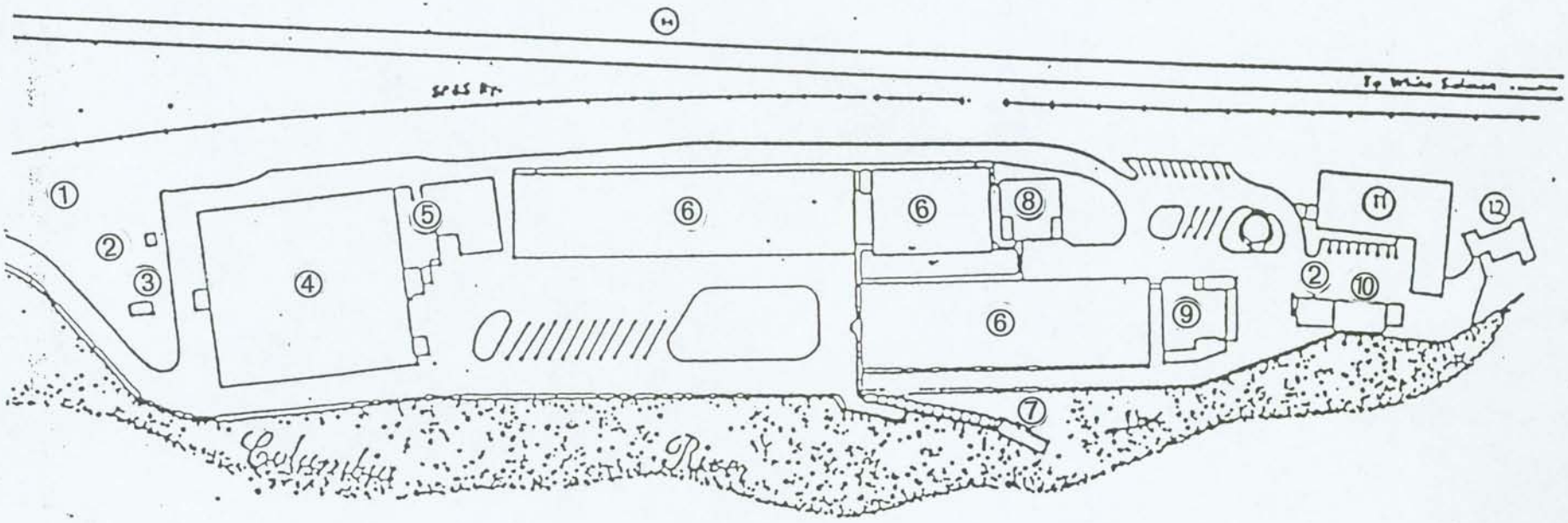
General Authorizations

- Anadromous Fish Conservation Act, as amended (16 U.S.C. 757a-757f).
- Department of Transportation Act (16 U.S.C. 1653f).
- Estuary Protection Act (16 U.S.C. 1221-1226).
- Federal Aid in Sport Fish Restoration Act of August 9, 1950, as amended (16 U.S.C. 777k).
- Federal Water Pollution Control Act Amendments, as amended (33 U.S.C. 1251-1365, 1281-1292, 1311-1328, 1341-1345, 1361-1376).
- Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742a-742j).
- Fish and Wildlife Conservation Act of 1980 (16 U.S.C. 2901-2911).
- Indian Self-Determination and Education Assistance Act of 1976 (25 U.S.C. 450-450n).
- Magnuson Fishery Conservation and Management Act of 1976 (16 U.S.C. 1801-1882).
- National Aquaculture Act of 1980, as amended (16 U.S.C. 2801-2810).
- Reorganization Plan No. 4 of 1970 (5 U.S.C. Appendix).
- Rivers and Harbors Act of 1899, as amended (33 U.S.C. 401 et seq.).
- Recreation Use of Conservation Areas Act (16 U.S.C. 460k-460k-4).
- Sikes Act, as amended (16 U.S.C. 670a-670o).
- Watershed Protection and Flood Prevention Act, as amended (16 U.S.C. 1001-1009).
- Code of Federal Regulation, Wildlife and Fisheries, Title 50, Parts 1 to 199.
- Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 stat. 884) as amended.
- Federal Power Act (16 U.S.C. 791-828c; Chapter 285, June 10, 1920; 41 Stat. 1063) as amended.
- Federal Water Project Recreation Act (16 U.S.C. 460 (L) (12) - 460 (L) (21); P.L. 89-72.
- Fish and Wildlife Coordination Act (16 U.S.C. 661-667e; 48 Stat. 401) as amended.
- Fish and Wildlife Improvement Act (16 U.S.C. 7421; 92 Stat. 3110)
- Lacy Act Amendments of 1981 (P.L. 97-79; 95 Stat. 1073, 16 U.S.C. 3371-3378)
- Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 [Title I of P.L. 101-646 (104 Stat. 4761].
- Oil Pollution Act of 1990 [Public Law 101-380 33 U.S.C. 2701 et seq; 104 Stat. 484].
- Comprehensive Environmental Response Compensation and Liability Act (Superfund) (26 U.S.C. 4611-4682; P.L. 96-510, December 11, 1980; 94 Stat. 2797).
- National Environmental Policy Act of 1969 (P.L. 91-190, 42 U.S.C. 4321-4347, January1, 1970, 83 Stat. 852) as amended by P.L. 94-52.
- National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee) as amended.
- Emergency Relief Appropriations Act (49 Stat. 115).
- Reclamation Laws (54 Stat. 1198, 1199).
- Flood Control Act of 1962 (76 Stat. 1193).
- White Act (46 Stat. 371).
- Flood Control Act of 1944, as amended 1950 (58 Stat. 887).

Area-Specific Authorizations

- U. S. v. Oregon, "Belloni Decision" [302 F. Supp. 899 (1969); affirmed, 529 F. 2d 570 (1976)].
- U. S. v. Washington, "Boldt Decision" [384 F. Supp. 312 (1974); affirmed, 520 F. 2d 676 (1975); cert. denied, 423 U.S. 1086 (1976)].
- Water Resources Development Act of 1976 [Lower Snake River Compensation Plan (90 Stat. 2921)].
- Pacific Salmon Treaty Act of 1985, "U.S./Canada Pacific Salmon Treaty" (P.L. 99-5, 16 U.S.C. 3631, 03/15/1985).
- Salmon and Steelhead Conservation and Enhancement Act (16 U.S.C. 3301-3325).
- Yakima Fishery Enhancement Project (P.L. 98-360, P.L. 98-381, P.L. 98-386).
- Grand Coulee Dam Project (49 Stat. 1028).
- Grand Coulee Fish Management Project [Columbia Basin (Grand Coulee Dam) Act] - April 3, 1937.
- Chief Joseph Dam Project - [Oroville-Tonasket Unit, Washington (76 stat. 761) Section 3 of the Act of October 9, 1962] [Whitestone Coulee Unit, Washington (43 U.S.C. 616uu, 616vv-1-6163; 78 Stat. 704], as amended.
- Columbia Basin Project Act (16 U.S.C. 835 et seq., 57 Stat. 140) as amended.
- Chehalis River Fishery Resources Study and Restoration Act [Public Law 101-454 (104 Stat. 1054].
- Mitchell Act (16 U.S.C. 755-757; 52 Stat. 345).
- Pacific Northwest Electric Power Planning and Conservation (16 U.S.C. 839, P.L. 96-501, 94 Stat. 2697) as amended.
- First Deficiency Appropriation Act, "Central Valley Project" (49 Stat. 1622).
- Reclamation Projects Authorization and Adjustment Act of 1992, "Central Valley Project Improvement Act (106 Stat. 4714-4731).
- Pyramid Lake/Truckee-Carson Water Rights Settlement (P.L. 101-618, 104 Stat. 3289).
- Washoe Project Act (70 Stat. 775-777).

Attachment 3. Layout Diagram of Spring Creek National Fish Hatchery.



SPRING CREEK NATIONAL FISH HATCHERY

1 SEWAGE TREATMENT PLANT AREA
2 SERVICE BUILDING
3 PUMP PLANT
4 FILTER BEDS
5 MECHANICAL BUILDING
6 REARING PONDS
7 FISH LADDER
8 FOOD STORAGE BUILDING
9 SPAWNING BUILDING, VISITOR CENTER, OFFICES
10 STORAGE, GARAGE
11 INCUBATION BUILDING
12 LOWER COLUMBIA RIVER FISH HEALTH CENTER

Attachment 4. Spring Creek NFH – Operational Plan, Goals, and Standards, May 2000.

SPRING CREEK NATIONAL FISH HATCHERY

OPERATIONAL PLAN, GOALS AND STANDARDS

May 15, 2000

Written By:

The Spring Creek National Fish Hatchery Staff

and

The Spring Creek National Fish Hatchery
Evaluation Team

INDEX

I. HATCHERY OBJECTIVES

Mitigation

The Spring Creek National Fish Hatchery is legally mandated to mitigate for fish losses due to the construction of dams on the Columbia River. The Mitchell Act of 1938 and the Flood Control Act of 1950 provided funding for the reconstruction of the hatchery and for fish cultural operations.

Adult Contribution and Survival

In 1901 the U.S. Bureau of Sports Fisheries (now the U.S. Fish and Wildlife Service) began taking eggs from the Tule strain of fall chinook salmon (Oncorhynchus tshawytscha) that were historically spawned in the Big White Salmon River, a tributary of the Columbia River located one mile from the present location of the Spring Creek NFH. The original population of Tule fall chinook salmon has greatly diminished. Hatchery produced adults now contributing significant numbers of fish to the commercial, tribal and sport fisheries in the ocean and the Columbia River. Spring Creek will continue to provide for these fisheries, as well as maintain a target of 7,000 (including 4,000 female) adult escapement to the hatchery in order to maintain its production goals. Historically Spring Creek stock's survival rate was approximately 1.5% of the smolts released. In recent times the stock's survival rate has dropped below 1.0%. A major objective of the hatchery is to restore the stock to its former abundance.

Production

Spring Creek's maximum design capacity is for the production of 15.1 million smolts and production will be maintained at this level. Based on the assumption that raising healthy smolts will result in healthy adults, fish cultural practices will reflect the importance of monitoring fish health, disinfecting equipment and eliminating fish stress. The present practice of establishing improved fish cultural standards will be maintained. In addition, an investigation of alternative water sources and improved rearing techniques will be made.

Public Relations

The public provides Spring Creek with tax monies in order to produce salmon and keeping the public informed of hatchery programs is beneficial in maintaining these programs. An informed public will be more supportive in the future if our program is in jeopardy of losing funding. Spring Creek is especially interested in educating younger people since they are the future voters and will someday provide the support for environmental concerns.

Environmental Impacts

The U.S. Fish and Wildlife Service is accountable to the Endangered Species Act. Hatchery fish and wild fish interact in the marine and freshwater environments and because some of the wild populations are either threatened or endangered, Spring Creek has a responsibility to minimize the effects of hatchery practices on wild populations. We will continue to think about what we are doing that may impact these fish and modify practices that have adverse affects on the environment wild fish populations.

Genetic Integrity

The Tule fall chinook salmon is a unique stock which is indigenous to this area and it needs to be preserved. Present hatchery procedures mandate that every fish returning to the hatchery deserves the opportunity to contribute to the genetics of the stock. For example: jacks, or two year old precocious males, constitute 2% of the male spawning population. Additional measures will be taken to preserve the genetic integrity of this stock as they are developed.

Team Work

Working together, whether it's amongst ourselves as a hatchery crew or with other agencies, will ultimately result in sound biological management of the resource and its environment. The hatchery crew has been working as a4 team to identify standards for hatchery operations and will continue to improve those and write additional ones until all aspects of the operation have been considered. The recently formed Hatchery Evaluation Team will play a vital role in improving existing relations with other fisheries entities: the National Biological Survey (NBS), state fish and wildlife agencies, federal and tribal organizations, and public groups.

II. FIVE YEAR PRODUCTION PLAN AND GOALS

Goals addressed by the Hatchery Evaluation Team:

Production
Stock Integrity and Genetic Diversity
Interactions with Wild Stocks
Smolt Survival
Adult Contribution
Release Strategies
Defining Stock Quality Standards
Stock and Environmental Concerns
Hatchery Processes (Methods), Operations
Significance of Disease
Escapement
Communication and Public Relations
Monitoring and Evaluation

PRODUCTION

Tule Fall Chinook Salmon

Present	5 Year Goal
15.1 million smolts released. 300,000 smolts in lagoon. 1-4 million surplus unfed fry.	15 million smolts released or best numbers based on density study results. Final evaluation of lagoon reared fish for best capacity. Complete unfed fry/otolith mark study.

Spring Chinook Salmon

Present	5 Year Goal
150,000 yearlings released from Big White Salmon ponds. 500,000 "0" age released from Big White Salmon ponds.	Best numbers based on availability of fish and evaluations of fishery needs and rearing capabilities. (Goal of U.S. vs Oregon is 1.45 M smolts)

STOCK INTEGRITY AND GENETIC DIVERSITY

Tule Fall Chinook Salmon

Present	5 Year Goal
Original stock from White Salmon River. Input from Toutle River (1974) and Abernathy...Spring Creek stock. Bonneville SFH (BY87 and BY88), not pure Spring Creek stock. ≤2♀:1♂ for spawning. ≥2% of ♂'s used in spawning are jacks. Fertilize 1♀ with 1♂	Implement special studies suggested by the Regional Geneticist and approved by the team. Keep genetic diversity as wide as allowed. Protect stock integrity. Define effective population. Perform genetic evaluation of stock. Maintain standards on spawning ratio and % jacks used.

Spring Chinook Salmon

Present	5 Year Goal
70 - 100% Carson NFH stock. 0 - 30% Little White Salmon NFH stock. Fish received as swim-up fry.	Protect stock integrity. Define effective population. Implement special studies suggested by the Regional Geneticist and approved by the team.

INTERACTIONS WITH WILD STOCKS

Tule Fall Chinook Salmon

Present	5 Year Goal
Smolt release - no jeopardy with wild stocks (NMFS, 1993). Adult returns - some straying, but these fish are indigenous stocks.	Acquire more data on interactions between wild stocks and tule fall chinook by reviewing current studies. Develop solutions to remedy potential adverse impacts.

Spring Chinook Salmon

Present	5 Year Goal
No viable spring chinook wild stock in White Salmon River (WDF, 1993). Releases - no jeopardy with wild stocks (NMFS, 1993). Evaluation of residualism of fingerling releases with marking study.	Conform to any established wild stock policies and ESA and CRFMP directives. Residualism studies evaluated.

SMOLT SURVIVAL IN THE HATCHERY

Tule Fall Chinook Salmon

Present	5 Year Goal
Egg to eye-up ≥ 94% Eye-up to ponding = 96-97% Ponding to release = 96-97.5%	Egg to eye-up, maintain index. Eye-up to ponding, maintain index. Ponding to release > 97.5% Maintain or improve standards.

Spring Chinook Salmon

Present	5 Year Goal
Ponding to release = 70-80% (disease and high predation).	Ponding to release ≥ 90%.

ADULT CONTRIBUTIONS - TOTAL

Tule Fall Chinook Salmon

Present	5 Year Goal
< 1.0%, varies with tag code.	1.5%, or improving trend.

Spring Chinook Salmon

Present	5 Year Goal
2 years of CWT's (1991 & 1992) and 1 year of ventral clips (1993). FRO coordination with tagging.	Ongoing tagging and evaluation incorporated into station program. Increasing contribution to sport and tribal fisheries.

RELEASE STRATEGIES

Tule Fall Chinook Salmon

Present	5 Year Goal
Pond - 3 scheduled releases: mid-March, mid-April, mid-May. Coordinated with OCRC and Fish Passage Center. Lagoon - May Unfed fry (swim-up stage) - December. Planning contribution study.	Pond - upgrade release equipment/techniques. Factors identified that affect contribution. CWT data used to consider options. Lagoon - finalize release number strategy. Unfed fry - begin evaluation of releases and contribution.

Spring Chinook Salmon

Present	5 Year Goal
August - "0" age Mid-April - yearlings	Factors identified that affect contribution. CWT data used to consider options. Finalize release number and strategy.

QUALITY STANDARDS

Tule Fall Chinook Salmon

Present	5 Year Goal
Hatchery staff has defined quality standards over the past two years.	Maintain, refine, and expand quality standards. Integrate LCRFHC in studies. Fish feeding standards better defined.

Spring Chinook Salmon

Present	5 Year Goal
None	Standards defined by staff and reviewed and approved through HET.

STOCK AND ENVIRONMENTAL CONCERNS

Tule Fall Chinook Salmon

Present	5 Year Goal
EPA samples taken. Rearing water quality checked weekly. Yearly water analysis of springs and well. Chemicals used: iodophor, HTH, freon, formalin, salt, MS-222, Pro-polyaqua.	Meet all present and proposed EPA standards. Continue to monitor water quality. Advance the use of INAD drugs. Have FDA approved/affordable anesthetic.

Spring Chinook Salmon

Present	5 Year Goal
EPA samples taken. No rearing water quality samples taken. Chemicals used: Formalin, erythromycin feed.	Meet all present and proposed EPA standards. Reduced dependency on chemicals used.

HATCHERY PROCESSES (METHODS), OPERATIONS

Tule Fall Chinook Salmon

Present	5 Year Goal
Procedures written, changes made. Staff and agency involvement through VISION.	Investigate new water sources. Maintenance standards developed. Ozone treatment capabilities of spring water and Columbia River water. Maintain, expand, and refine hatchery SOP's. Develop best possible rearing techniques to reduce stress and increase survival. HET functional and effective. NMFS and Corps participating.

Spring Chinook Salmon

Present	5 Year Goal
Staff and agency involvement through VISION.	Procedures defined by staff and reviewed and approved through HET. Maintenance standards developed. Maintain, expand, and refine hatchery SOP's. Investigate new water sources. HET functional and effective. NMFS and Corps participating.

SIGNIFICANCE OF DISEASE

Tule Fall Chinook Salmon

Present	5 Year Goal
Problems: ERM, coagulated yolk, occasional soft shell. BKD in adults and smolts?	ERM eliminated. Incorporated best disease management techniques and concerns of LCRFHC.
Monthly and pre-release check by LCRFHC. Goede Index done.	Evaluate fish health of smolts to adult survival.

Spring Chinook Salmon

Present	5 Year Goal
Problems: Some BKD, external parasites.	Incorporated best disease management techniques and concerns of LCRFHC.
Monthly and pre-release check by LCRFHC. Goede Index not done.	Initiate Goede Indexing.

ESCAPEMENT

Tule Fall Chinook Salmon

Present	5 Year Goal
Mitigation requirement is for 60,000 adults above Bonneville Dam (Tuss, 1982). 1989-1993 average return to the mouth of the Columbia is 29,000 adult BPH chinook salmon. To rack: 7,000 adults, of which 4,000 are ♀'s. Occasional trapping at north shore of Bonneville Dam.	Clarification of accountability to Corps and Mitchell Act. Evaluation completed to get best level of escapement to meet production goals and genetic diversity. North shore trapping eliminated.

Spring Chinook Salmon

Present	5 Year Goal
Terminal fishery, no escapement goals.	Terminal fishery significantly contributing to sport and tribal fisheries. Fishery impacts conforming to wild stock or ESA directives.

COMMUNICATION AND PUBLIC RELATIONS

Tule Fall Chinook Salmon & Spring Chinook Salmon

Present	5 Year Goal
Monthly hatchery team meetings and training. Contacts/Involvement with: Abernathy, NBS, FRO, Tribes, VISION Teams, other hatcheries. Public relations/Outreach: 3 cooperative agreements, Skamania Fair, educational (school) tours, national fishing week.	Continuing hatchery team meetings. Continued involvement with other offices and agencies. Improved communications between hatcheries. Full time position funded to assist in outreach activities. Continued outreach and cooperative agreements. Annual local fish culturists meeting established.

MONITORING AND EVALUATION

Tule Fall Chinook Salmon & Spring Chinook Salmon

Present	5 Year Goal
Hatchery uses Columbia River Information System (CRIS) database on a limited basis with backup from hatchery generated spreadsheets. Hatchery participates in and reviews ongoing studies conducted on the hatchery stock by either hatchery personnel or researchers from other offices (FRO, NMFS, etc.).	Integrate all data in CRIS database, with confidence in its' efficacy. HET will be active in reviewing ongoing studies of the hatchery stock. If studies are developed for the hatchery stock, study designs will closely follow the format described by the Fisheries Implementation Evaluation Team in its memo of June 4, 1993. A copy of this memo will be on file in the hatchery office.

Literature Cited

National Marine Fisheries Service. 1993. Endangered Species Act - Section 7 Consultation. Biological Opinion, 1993 Hatchery Operations and Juvenile Releases.

Tuss, C.A. 1982. John Day Fall Chinook Mitigation Evaluation, Spring Creek National Fish Hatchery, Broods 1972-1975. Final Report to U.S. Army Corps of Engineers. MOU No. DACW57-73-C-0064. 29p.

U.S. vs Oregon. 1988. Columbia River Fish Management Plan. Appendix B.

Washington Department of Fisheries. 1993. Salmon and Steelhead Stock Inventory.

WDF, 1994. Run Size Forecast of the Return of Columbia River Fall Chinook Salmon Stocks in 1994. Columbia River Laboratory Progress Report 94-07.

III. HATCHERY QUALITY STANDARDS

FEMALE DEAD IN POND's (DIP's) $\leq$ 2.0 %

Since every female that returns to the hatchery has the potential of producing 5,000 eggs, we recognize the importance of keeping them alive and healthy until spawning. Our goal is to keep all fish alive until spawning, but most especially to minimize the loss of females to less than 2.0 % of the total female return. Not including fish given away as food.

TOTAL DIP's $\leq$ 5.0 %

Once adults return to the hatchery, the staff will do everything feasible to keep them alive to attain our goal of less than 5.0 % die-off in the ponds. DIP's are removed daily in order to decrease the spread of parasites or fungus from a dead or dying fish to another live fish.

GREEN FEMALES $\leq$ 2.0 %

Spawning of green females will be kept to a minimum through quality evaluation of anaesthetized fish. The fewer number of green females sent to the spawners, the greater the overall spawning success. The goal of sending less than 2.0 % green females to the spawners does not include those females killed on the last day of spawning that are unlikely to ever become ripe. Wait on first spawn, use entry time as part of when to spawn first take.

SPAWNING RATIO OF FEMALES TO MALES $\leq$ 2:1

In years past a spawning ratio of 5 or 6 females to 1 male was considered the norm. We feel that the number of adults returning can and should support a lower ratio of at least 2 females to 1 male in order to maintain genetic diversity through a larger gene pool. Geneticists agree that by increasing the gene pool a healthier stock will result. The actual fertilization process will be done with one male and one female.

JACKS SPAWNED $\geq$ 2.0 %

Spawning jacks was once taboo-it was believed that jacks produced jacks. Geneticists believe this is untrue and that jacks can actually enhance a gene pool. In keeping with our belief that all fish that return to the hatchery have a right to be spawned, we will attempt to incorporate jacks into the spawning population at a rate of not less than 2.0 % of all spawned males.

EGG EYE-UP $\geq$ 95%

Percent eye-up is a measurement of how effective our techniques are in spawning the females and males, and their subsequent treatment in the incubation building through egg washing, maintaining adequate flows in the incubators, and prophylactically treating with iodophor for the control of fungus and soft-shell. We are always in the process of improving our techniques which we feel will ultimately influence the quality of the smolts we produce. By maintaining our goal of more than 95% eye-up we feel we have the best opportunity to produce a quality smolt for release. Treat egg take within 24 hours of spawn.

AMMONIA (NH_3) CONCENTRATION $\leq$ 0.3 ppm

Ammonia production is a problem inherent with fish production in a reuse system; however, ammonia levels and overall water quality do not have to become a limiting factor in quality smolt production at Spring Creek. Through weekly water analysis ammonia levels can be tracked in order to determine if changes are needed in fish cultural techniques. By adjusting feeding levels, cleaning ponds and filterbeds properly, and using beneficial bacteria in the system, ammonia levels can be maintained at or below 0.3 ppm for the entire system, as measured in the early morning before feeding commences.

DENSITY INDEX (D.I.) $\leq$ 0.28 FOR SYSTEM

The density index is the weight of fish in a pond or system divided by the average length multiplied by the cubic feet of rearing space. In a given pond, too high a density index can result in poor quality fish: eroded fins, stress

from competing for space and a resultant decrease in overall production for that pond. For Spring Creek's ponds it has been determined that maintaining a density index of less than 0.28 for the entire system and a D.I. of 0.30 for any one pond is important in attaining our goal of quality smolt production. We monitor this index on a bimonthly basis. In order to maintain low densities, fish are split after the March release.

FLOW INDEX (F.I.) $\leq$ 1.50 FOR SYSTEM

The flow index is the weight of fish in a pond or system divided by the average length multiplied by the gallons per minute flow in the rearing space. In a given pond, high flow indexes result in depleted oxygen and increased stress and, as stated before, this negatively influences our goal of producing quality smolts for release. At Spring Creek it has been determined that the flow index should never exceed 1.5 for the system. Throughout the production season, flow indexes are monitored bimonthly and changes are made accordingly: water flow is increased from 400 gpm to 550 gpm when the F.I. reaches 1.1 for the system, and increased to 700 gpm when the F.I. reaches 1.3.

WATER TEMPERATURE $\leq$ 51 °F

Due to problems observed with Enteric Redmouth Disease when water temperatures exceed 51 °F, we maintain water temperatures below that level, but not less than 46 °F. This can be accomplished by turning off the warmwater well in the last week of January and turning it back on if cold weather causes a drop in water temperature.

MORTALITIES FROM PONDING TO RELEASE $\leq$ 2.5 %

We believe that mortality after ponding is an indicator of fish health and resultant smolt quality at release. Through many actions before, during, and after ponding we can prevent high pond mortalities. All of these techniques are discussed further in the following procedural standards: quality spawning and incubation practices, removing cripples before ponding and incorporating the latest ideas to improve ponding techniques, disinfecting equipment, water supplies and holding facilities, cleaning ponds and filterbeds, monitoring fish health, reducing stress in the fish. By following current standards, and developing new ones, we can maintain our goal of less than 2.5 % mortality in the ponds.

GENETIC STANDARDS Ne $\geq$ 5000

We believe the Spring Creek Tule stocks genetic material has not been compromised since the hatchery's inception in 1901.

Outside influence has been minimal with only two incidents of outside stocks brought into the hatchery and crossed with Spring Creek stock. In 1974 tule stock from the Toutle River Hatchery and in 1987 & 1988 Tules from Bonneville Hatchery were mixed with our stock. Both of these either originated from the Spring Creek stock, as in the case of Toutle River Hatchery, or have been heavily influenced with strays from the Spring Creek stock, Bonneville Hatchery.

We believe over the years that the Effective Population size spawned each year has been significantly higher than most geneticists recommend. In fact, the Effective Population size, (Ne) has generally exceeded 2000. The Effective Population size will be determined by the following formula:

$$Ne = \frac{(4)\,(f)\,(m)}{f+m}$$

By maintaining a spawning ratio or $\leq$ 2 to 1, the Effective Population of each brood year should exceed 5000. We have decided to set the hatchery standards goal for Effective Population size to be $\geq$ 5000. If by some unforseen circumstance the run size becomes so low that a 5000 of better Ne could not be reached, we will maximize usage of females to get al least an Ne of 1000.

VI. HATCHERY INFORMATION MONITORING AND STUDY DESIGN

HATCHERY INFORMATION MONITORING

Hatchery quality standards, goals, and studies will be monitored and evaluated utilizing the Columbia River Information System (CRIS) database. CRIS reduces reporting requirements and eliminates repetitious data entry. The increased consistency and quality of the data facilitates transfer of information to other agencies and aids in evaluation of general goals and specific studies.

Information maintained by CRIS includes release, return, and production data organized by such parameters as take, pond, release group, and mark group. Other information such as water quality and fish health data will be incorporated into this database. Hatchery personnel and FRO personnel will coordinate data that is needed for input.

Standards for CRIS data transfer responsibilities are as follows:

Hatchery to Regional Office:

A hardcopy of a run summary within one week after the end of the spawning season.
A hardcopy of the hatchery production summary along with the monthly activity report.

Hatchery to FRO:

Fish removal database file within one week after the end of spawning. All records should be verified. Send the distribution data within one week after major distribution and within one week after the end of each quarter.
Egg transfer data within one week after completion of major egg transfers and within one week after the end of each quarter.
The lot history start file within one week after the end of each quarter.

FRO to Regional Office:

Quarterly fish and egg distribution report within three weeks after the end of each quarter.

FRO to Hatchery:

Hardcopy of the age composition data for each species sampled within one week after verification of data.
Hardcopy or database file listing mark and coded wire tag recoveries at the hatchery within one week of verification of data.

Reports and Responsibilities:

The capabilities of CRIS will be realized in data generated for annual, broodyear and special study reports.
Annual production reports will give yearly statistics on adult returns and juvenile releases.
Broodyear reports will evaluate hatchery goals and standards according to their performance for each broodyear.
Confounding factors (water quality, disease, etc.) will be taken into account.
Special studies will be proposed as needed to develop additional and/or reevaluate current hatchery goals and standards to meet management objectives of contribution, stock integrity, and minimizing impacts to wild fish.
Annual reports will be prepared by the hatchery with HET member input.
Broodyear reports will be prepared by FRO with HET member input.
Special studies will be prepared by the investigator with HET member and other appropriate entity review.

STUDY DESIGN

Guidelines for study plan development will closely follow those outlined by the Fisheries Implementation Evaluation Team in their memorandum dated June 4, 1993. A copy of this memo will be kept on file in the office of Spring Creek.

New studies that will always receive technical review by the Hatchery Evaluation Team will include:

All marking programs.
Release strategy changes which could affect watershed ecosystems.
Interagency/Interjurisdictional efforts.
In-hatchery studies which could result in recommendations for changes in hatchery management practices.

Steps in developing proposal will include:

HET members or other investigators brainstorm the issue.
Define the problem or question in simple terms.
Contact "experts" and conduct literature review.
List specific objectives and hypotheses to be tested.
List possible study approaches and assign tasks for proposal development.
Decide on feasibility of study and methods.
List measurements and statistical methods to test hypotheses.
Decide on data which is critical to meeting objectives.
Write proposal, select reviewers, and distribute proposal.

Appendix II and III of the aforementioned memo gives the format for study proposals and guidelines for development, approval, and funding of hatchery evaluations and special studies.

V. HATCHERY PROCEDURAL STANDARDS

A. SPAWNING STANDARDS

Pre-Spawning Preparation

By August 1 have chemicals and supplies on hand:

MS-222 (12 kilograms)
Pro-Polyaqua (5 gallons)
Iodine (24 gallons)
Salt (30 bags)

By the second week of August:

Prep ponds 28-44 for filling
Shovel out debris in the ponds
Remove every other cap from water nozzles
Put ladder in
Set troughs up in incubation building for egg washing
Put jump boards up
Put all pond screens in
Put counting shack in channel
Pull out planting pipe after spring water is flowing into filterbeds

By August 20:

Start filling filterbeds
Start water flow to ponds
Measure all the chemicals:
MS-222 = 30 bags of 400 grams each
Salt = 30 bags of 1.5 lbs each
Check the first aid kit
Move totes to the spawning area
Plug tote drain holes

Maintenance Crew:

Prep spawning building: check cables, grease bearings and run the lifts
check the electrical equipment
fill the crowder and forklift propane tanks
change the compressor oil
grease the wheels and bearings on the crowders
put the crowders in
grease, oil and do general maintenance on the egg cart
check the plastic pipes and chutes
and other things as discovered
URB tube in river

Adult Run

GOAL: Total count should be within 5% of total count at the end of spawning.

Counting: Based on management decision: counting shifts begin and all males, females and jacks are counted. Counting will continue, if manpower is available and fish are running (>250 fish/day) even after spawning has begun.

Watchman: The night watchman will begin his shifts on or around September 1, or when the first fish comes in.

Ponding: Pond #44 should be held empty for a buck pool, unless a larger than normal run is expected, then fill first.
Pond #43 is to be filled with the first returning adults, and so on down the line.
500 adults per pond; however, if predicted run numbers are high, adults per pond may vary.
Pond numbers will not exceed 800 adults.

Spawning

In previous years spawning has started on September 15 or 16.

Guidelines for checking if fish are ready to spawn should be:

Check before the fish have been disturbed; the fish will be up in the water and not oriented toward the current; compare the oldest fish with other ponds, note that unripe fish normally swim in a circle going into the current.

General Rules:

Communication is the KEY! In order to limit exposure to anesthesia: if 30% or less of the females in the oldest pond are spawned on any given day then the next pond should not be spawned that day; give a pond at least one whole day before it's gone through again; don't overcrowd the channel and don't crowd out a pond right before break.

Specific jobs aside, everyone should be aware that help is needed with:

--morning preparation
--changing tubes
--moving and cleaning totes
--loading rendering truck
--crowding
--cleaning up each day, and
--gathering and accounting for DIP's.

On DIP's:

DIP's should be removed first thing in the morning, as well as whenever needed, and the numbers tallied on the clipboard by the buck table; check for marks; marked fish go to the FRO table; we are responsible for reporting the **total daily** DIP count to FRO. A person should be designated to relay the information.

Job Roles and Responsibilities

Lift Operator

Crowds fish to spawn building
Monitors water flow in channel
Backs crowder to relieve crowding fish during break
Responsible for providing a constant supply of anaesthetized fish for the checker, and for keeping in contact with the spawner so as to not overload the female table
Doesn't overload the lift-tries for 10-15 fish per lift
Keeps the fish in the anaesthetic for 2.5 to 3.5 minutes
If the spawner is swamped, delay lifts until space is available on the table

Checker

Responsible for sorting out ripe males and females
Keeps an accurate count of the fish numbers, the origin and destination of unripe fish
Kills ripe fish and sends them to the tailcutter and bucker
Ensures that 2% of male spawning population is comprised of jacks
Sends excess bucks to the other side of the sorting table
Communicates to the bucker the number of males available to him
Sends unripe males to pond #44, if being used for excess males
Keeps track of the spawning tubes and makes sure they get changed

Tailcutter

Responsible for cutting the females' tails and orienting the fish in the correct direction for the spawner
Puts the fish under the rinsing jets
Puts clothespins on the leaking females
Turns the table so the females are available to the spawner
Sorts the bucks to the bucking table
Periodically sorts the excess males on the checking table so the older fish will be used first making sure that all bucks are dead before putting them on the buck table
Communicates with the bucker to ensure a steady supply of bucks
Keeps knives sharp and wears a protective glove at all times
Keeps area clean, avoids spraying water in the direction of the eggs

Bucker

Responsible for spawning 1 male to 1 female in colander using the maximum number of males possible so spawning ratio (M:F) is less than 2:1
Sorts bucks to the bucking table
Drains ovarian fluid from the eggs until there is a slow drip and then adds the eggs to the colander
Adds adequate saline solution to the eggs and stirs
Rotates stocks of bucks and calls for additional fish as needed
Keeps count of used and green males, and jacks actually spawned
Disinfects, washes and replaces colanders as needed for the spawner
Communicates with the checker to ensure that 2% jacks are used
Communicates with the checker for numbers of bucks on the sorting table and communicates with the tailcutter to retrieve those bucks

Bucker Helper

POLICY: If there's an "outside" bucker there should be a member of the crew acting as bucker helper
Responsible for helping the bucker
Drains ovarian fluid until there is a slow drip
Adds the eggs to the colander with the bucker's knowledge
Disinfects, washes, and replaces colanders as needed for the spawner
Tallies green, bad, or bloody females
Places colander with fertilized eggs on saline table, adds 1 cup saline
Maintains accurate count on colanders places on saline table
Keeps time of fertilization 30 to 45 seconds
Communicates to egg driver when it's time to take the eggs over and if there are fewer than 3 females in bucket

Female Spawner

Responsible for spawning females
Communicates with lift operator on lift speed
Tries to maintain a timely pattern of spawning
Waits for the fish to bleed out
Points out bloody, green, or bad eggs to bucker or bucker helper
Makes decisions as to whether the eggs should be thrown away, or how much should be shaken
In years of high egg totals, throws out BB-sized eggs and counts the female as "bad"
If keeping small eggs, coordinates with bucker and egg washer to separate them into individual buckets and trays so that during shocking they can be thrown out if there are enough eggs
Changes knife blades

Egg Cart Driver

Responsible for driving eggs to incubation building and maintaining a line of communication between the egg washer and the spawning crew
Takes no more than 3 buckets at a time unless more are present, with no more than a 5 minute delay for additional buckets
After adding saline solution allow 45 seconds for fertilization
Places fertilized eggs from colander to bucket in egg hauling cart. Three colanders to bucket
Helps bucker by adding saline solution and stirring eggs
Disenfects colanders and places them on drying table
Takes eggs to hatchery washing troughs and helps unload, if necessary
Helps wash eggs if needed
Communicates with spawning crew if washer is swamped
Keeps the lid latched on egg cart
Adds oil and gas to the tractor at the end of the day

Saline Table Helper**

Moves egg and sperm from bucker table to saline table
Adds saline solution
After 30 to 45 seconds combines 3 colanders into one bucket
Helps egg cart driver load cart
Helps disinfect colanders

Egg Washer

Disinfects buckets
Responsibilities have already been covered in the incubation standards
Keeps the official female count
Communicates with the spawning crew through the egg cart driver

Egg Washer Helper**

Responsibilities will be covered in the incubation standards

Roving Helper**

If available, is responsible to help out where needed, all optional position
Asks if help is needed before jumping in
May rotate to various areas

** = Optional Positions

Post Spawning

Building: Several people should spend some time scrubbing everything down. Drains should be checked
Clean the grate under anesthetic tank in spawning building.

Ponds: Take all jumpboards down. Before disinfection, the ponds and channels should be checked to ensure that all fish and eggs are cleaned out. Ponds should be cleaned and then disinfected by introducing HTH at the 78".

Ladder: Shut off the water to the ladder and raise it as soon as possible after spawning is over.

B. INCUBATION PROCEDURES

Incubation Room Preparation

Flush main lines.
Block all sunlight.
Keep light off when not working.
Turn water on and adjust all incubators in one day.
Adjust all water with main valve. If not possible, adjust individually.
All employees should be knowledgeable of valves in hatchery.

Water Flows

Pre Eye-up	3 gpm
Eye-up to Hatch	5 gpm
Hatch to Button-up	7 gpm (up to 7 gpm)

Water Temperature

If temperature units need to be raised to meet a specific need, do so prior to hatching.

To Hatch	52°F at highest
Hatch to Button-up	50°F at highest

Green Egg Handling

Haul within 5 minutes after spawning.
Wash and tray 5 minutes after entering hatchery.
Wash twice unless excessive blood or foreign matter is present.
Disinfect spawning buckets in Argentyne prior to returning them to the spawning building.
Improve communication between incubation and spawning buildings to eliminate over-burdening egg washers, causing poor quality work.
Put no more than 7,500 eggs per tray (3 females into 2 trays). Divide evenly.
Mark all trays at beginning and end of each take. Tag trays that have only 1 or 2 females, or eggs that might be bad.
First treatment with iodophor within 24 hours of spawn.

Tray-Down to Eye-Up

Treat eggs with iodophor 3 times per week:
- 15 minute flow-through method using pump injection.
- Use Argentyne (or equivalent) at 15 to 20 ppm concentration.
- Treat tray stacks individually once hatching begins if there are wide time spreads between egg takes.

Check incubators every A.M. and P.M.
Add temperature units (TU's) daily in the morning.
Change thermograph every Monday morning.

Shocking and Salting Eggs

Wait until eggs are strongly eyed (550 TU's are attained or a strong eye can be seen visually).
Shock eggs by hand (pouring) or by using a shocking apparatus.
Wait 24 hours after shocking before starting salting process.

Putting Eggs Down

Wait 24 hours after salting.
Use a digital platform scale.
Sample all Takes:
- one sample for Takes less than 1,000,000 eggs.
- two samples for Takes larger than 1 million eggs.
- attempt to sample eggs from each basket in the Take.

Sample size will be the "put down" numbers.
Tray down no more than 4,500 eggs per tray, preferably 4000.
Pick all dead and blank eggs, keep an accurate count of pick-off.
Work weekends if necessary to carry out these quality work standards.

Eye-Up to Button-Up

Between putting eyed eggs down and ponding, pick trays one to three times to remove dead eggs, fry, and cripples
Keep an accurate count of all pick-off
Maintain morning and evening checks of incubators
Record TU's daily
Change thermograph every Monday morning

After Ponding

Start washing trays immediately after ponding fish.
Wash all trays by February 15th.
Check all screens in trays for holes or rough areas, repair or replace as necessary.
Scrub all troughs.
Clean and store all equipment.
Paint equipment as necessary.
Power wash water channels.
R&R broken valves and plumbing.

C. FEEDING AND CLEANING

Feeding

At Ponding:

Maintain a conversion factor of .85 (lbs. feed/lbs. growth) throughout production period.
Water Temperature should be maintained at 49-50°F.
Use Biodiet floating feeds: #2 and #3 starter. Feed 12-14 days on #2 and 8-10 days on #3.
Feed eight times per day.
For computer-generated feeding rates:
- Target a growth rate of 0.016 inches/month depending on temperatures.
- Use a condition factor figure of .28, adjust K-factor monthly to the actual measurement for each release starting February 1.

Waste feed can cause problems in the filterbed system. Feed ponded fry below calculated levels maximum two days; raise feed once the fish begin to actively feed.

After 3 Weeks:

Fish should be eating at least 1.0mm-sized Biodiet Moist or 1/32 Rangen soft moist pellet feed.
Change target growth rate in computer to 0.016 to .018 inches/month, depending on temperatures.
Try to maintain temperature between at 48-50°F.
If temperature drops (i.e. well stops functioning or there is unusually cold weather) lower target growth rate to 0.015, or 0.014 depending on temperature drop.
If necessary, raise the growth rate more rapidly than normal once the water temperature rises in order to get the fish up to size before release.

For All Releases:

Increase feeding rates by 10% two weeks prior to release. Keep a close watch on ammonia (NH_3) levels, especially for the March Release. Look for a drop in the condition factor to indicate smolting.
Target size for each release: 125 Fish Per Pound (FPP) for March, 65 FPP for April, 35-45 FPP for May.

After March Release:

Use a condition factor figure of 3.2 in the computer feeding formulas.
Raise target growth rate in computer to 0.020 and maintain this rate until all fish are released.
If there is surplus feed and need to accelerate growth the last two weeks, raise the growth rate to 0.022.

After April Release:

Use a condition factor figure of 3.4 in the computer feeding formulas.

Feed Quality:

Require quality feed and, if inferior feed is delivered, have it evaluated and returned.
Demand more stringent standards for nutritional quality, and dust and oil content.
Feed should be inspected and certified by a regional fish nutritionist.
Feed will not be held on station for longer than 60 days.

Number of Feeds Per Day:

Upon ponding, feed fish eight times per day until fish are on 1.0mm-sized feed.
Lower number of feedings based on weight of food per pond and number of fish in pond.
Feeding times are closely related to water temperature and flows.
The amount of ammonia (NH_3) will influence how many feedings must be used.
Increase feed amounts every three days, using the CRIS program.
Always feed your smallest fish.

Feeding Chart

Fish Feed Size and FPP*	Number of Feeds Per Day				
	8	7	6	5	4
Biodiet #2 Starter 1100-800	X				
Biodiet #3 Starter 800-550	X				
Biomoist 1.0 mm 550-400		X			
Abernathy 3/64 400-200		X	X		
Abernathy 4/64 200-75			X	X	
Abernathy 6/64 75-				X	X

*FPP = Fish Per Pound, these figures are the feed company's recommended feed sizes for the number of fish per pound

Cleaning

As fish begin to grow and become more active, pond cleaning can begin (usually 3 to 4 weeks).
If possible, ponds should be cleaned weekly.
On occasion, a week can be skipped due to fish planting, lack of man power, or if the bacteria are obviously working efficiently.
Take two or three days to clean all the ponds. Avoid cleaning ponds in the middle of the week to circumvent lieu days and backwashing activities.

Pond Cleaning Procedures:

Two people per pond, working in opposite directions.
Open #3 valve and close #2 valve, lower pond no lower than 2/3 normal depth.
Brush along pond walls, including center portion.
Brush remainder of pond bottom diagonally.
Move slowly and avoid fish.
Clean screens to prevent overflow.

Clean screens and flush #3 valves as needed.

D. WATER QUALITY AND EPA MONITORING

Spring Creek

Hatchery Water Supply:

There are several water sources available for use at Spring Creek, with accompanying water permits.
The following is a list of the sources, the permitted water use and permit numbers:

Unnamed Spring	1.5 CFS	Permit Number	10424
Unnamed Spring	12.0 CFS		6716
Unnamed Spring	12.0 CFS		11343
Unnamed Spring	.01 CFS		8398 (Domestic Use)
Well	2.67 CFS		G2-28217P
Columbia River	11.2 CFS		12045

At present all but the Columbia River permits are used.
Spring and well water are used in lieu of Columbia River water in order to eliminate the introduction of disease pathogens present in river water into the hatchery system.
Although Spring Creek possesses permits for a total of 25.51 CFS spring water, that flow is not available from the springs. In recent years the highest flow available has been 6.91 CFS.

Water Quality Testing:

In 1991 the U.S. Geological Survey conducted testing to determine if septic systems and fertilization of agricultural crops located on the bluff above the hatchery could influence hatchery water quality The study did determine that water quality at the hatchery could be adversely affected by these practices. It also determined that the age of the spring water (from 4 different springs) was, on average, 312 years old and the well water was 4,543 years old. This age is the number of years since the water was last in contact with the atmosphere.
Annually, a sample of the spring and well water are sent to a certified lab where they are tested for approximately 15 parameters.
A thermograph measures pond water temperatures continually.
A member of the staff will conduct the following tests weekly:

Test	Location
Ammonia (NH_3)	78" Pipeline, #3 Filterbed and Aeration Tower
Nitrite (NO_2)	78" Pipeline, #3 Filterbed and Aeration Tower
Nitrate (NO_3)	78" Pipeline, #3 Filterbed and Aeration Tower
pH	78" Pipeline, #3 Filterbed and Aeration Tower
Dissolved Oxygen	78" Pipeline, #3 Filterbed and Aeration Tower

The purpose of measuring these chemicals is twofold: ammonia and nitrite are detrimental to fish health in fairly low concentrations. In a reuse system, the presence of these chemicals is compounded. If levels reach hatchery standards, fish cultural activities will be modified in order to decrease the concentration of these chemicals, i.e. feeding levels will be lowered. Nitrifying bacteria are inoculated in the filterbeds of the reuse system in order to eliminate the majority of the ammonia and nitrite concentrations through oxidation to nitrates, which are not lethal to fish in low to moderate concentrations. These tests can help determine the efficacy of the bacteria.

Records Maintained of Water Quality:

Daily:

TU's in hatchery building during incubation period
% Saturation of Total Dissolved Gases in incubators
Temperature in ponds included in fish culture log
Flows in ponds

Weekly:

Filterbed measurements entered in computer database, graphs generated and held in production records.
Lagoon data entered in computer database, graphs generated and held in production records.

At each Release:

High and low records of water quality measurements are recorded and submitted with the Production Year Report and the Brood Year Report (see page 36).

EPA Requirements:

The EPA permit number for Big White is WA-000022-1.
Monitoring is to be done monthly for suspended solids and reported to the EPA quarterly.
Suspended solids may not exceed 15.0 mg/l over intake in an instantaneous grab sample.

Big White Substation

Pond Water Supply:

There is a single water source for the Big White Substation: the White Salmon River. Permit number 9029 provides for 30.0 CFS of inflow.

Water Quality Testing:

Thermograph records temperatures daily.

EPA Requirement:

The EPA permit number for Big White is WA-002553-4.
Monitoring is to be done monthly for settleable solids and reported to the EPA quarterly.
Settleable solids may not exceed 3.3 ml/l over intake in an instantaneous grab sample.

WATER QUALITY MONITORING FOR _____ RELEASE

Date of Release _____

TEST	SOURCE	FLOW	HIGH
Water Temperature (°F)	Incubators	_____	_____
	Rearing Ponds	_____	_____
	Lagoon	_____	_____
	Columbia River Temperature at Release_____		
Dissolved Oxygen (mg/l O_2)	78" Pipeline	_____	_____
	#3 Filterbed	_____	_____
	Aerator Tower	_____	_____
	Incubators	_____	_____
	Lagoon	_____	_____
Ammonia (ppm NH_3)	78" Pipeline	_____	_____
	#3 Filterbed	_____	_____
	Aerator Tower	_____	_____
Nitrite (ppm NO_2)	78" Pipeline	_____	_____
	#3 Filterbed	_____	_____
	Aerator Tower	_____	_____
Nitrate (ppm NO_3)	78" Pipeline	_____	_____
	#3 Filterbed	_____	_____
	Aerator Tower	_____	_____
pH	78" Pipeline	_____	_____
	#3 Filterbed	_____	_____
	Aerator Tower	_____	_____
	Lagoon	_____	_____
Phosphates (mg/l PO_4^{3-})	Lagoon	_____	_____
BOD (mg/l O_2)	Lagoon	_____	_____

E. FISH HEALTH

Spring Creek

Spawning Season

Adult fish health sampling performed by the Lower Columbia Fish Health Center (LCRFHC):

66 Males: kidney, spleen, and gill tested for virus (3 fish pools)
Infectious Hematopoietic Necrosis (IHN)
Infectious Pancreatic Necrosis (IPN)
Viral Hemorrhagic Septicemia (VHS)
Erythrocytic Inclusion Body Syndrome (EIBS)

150 Females: ovarian fluids tested for virus (3 fish pools)
Infectious Hematopoietic Necrosis (IHN)
Infectious Pancreatic Necrosis (IPN)
Viral Hemorrhagic Septicemia (VHS)

30 of 150 females are then tested for:
Yersina ruckeri (ERM)
Aeromonas salmonicida (furunculosis)

20 of 150 females are then tested for:
Ceratomyxa shasta (whirling disease)

Handling of Adults

No chemical treatment in ponds.
Remove DIP's daily.
Use MS-222 to facilitate handling and thereby reduce stress in fish.
Use Pro-polyaqua in anesthetic tank to reduce handling stress on fish and possibly adult holding ponds.
No individual spawning to isolate BKD positive progeny.
Remove carcasses every other day.

Egg Handling

Fertilized Eggs:
Wash after fertilization to remove blood, body cavity parts and excess sperm that may enhance fungal growth.
Disinfect 3 days/week with iodophor to prevent fungal growth, as described in incubation procedures.
Record TU's daily. Start treatment within 24 hours of spawning.

Eyed Eggs:
Disinfect as above with iodophor to prevent fungal growth until 750 TU's are reached.
Pick dead eggs to reduce fungal growth.

Sac Fry:
No chemical treatments.
Cripples and dead fry picked to reduce fungal growth before ponding.

Ponded Fry and Fingerlings

Further fish health monitoring is performed by the LCRFHC:

At Ponding:
60 fish are sampled for virus (3 fish pools):
Erythrocytic Inclusion Body Syndrome (EIBS)
Viral Hemorrhagic Septicemia (VHS)
Infectious Hematopoietic Necrosis (IHN)
Infectious Pancreatic Necrosis (IPN)

Monthly:

10 fish are sampled for:
Virus (EIBS only)
Bacterial Diseases
Parasites
Anything unusual

At Release:

60 fish are sampled (3 fish pools) for:
Virus
Bacterial Diseases
Parasites
200 sampled by organosomatic indexing

Preventative Measures

Post-Spawning Disinfection:

Wash all pond walls and scrub pond bottoms.
Add 6-7 100-pound drums of HTH to filterbeds at the 78" pipeline.
Circulate water in ponds for 24 hours.
Pump water to lagoon and allow to dissipate before release to the Columbia.

Post-Release Disinfection:

Wash all pond walls and scrub pond bottoms.
Clean channels.
In June remove brush from springs and disinfect with HTH using tractor's pump. Divert water to settling basin for neutralization.
Disinfect filterbeds for ICH with 4 55-gallon barrels of formalin; filterbeds should be filled with warm well water (65 °F); allow formalin to circulate for 2-3 hours, then let stand for 5-10 days; drain formalin to lagoon and leave to break down before releasing water to the Columbia River.

In General:

Clean ponds when algae growth builds up.
Pick mortalities daily to prevent the spread of a disease.
Disinfect nets and brushes in Roccal.
Disinfect marking trailer or vehicles from other hatcheries before they come on this hatchery. For disinfecting distribution trucks use 1/2 ounce (dry weight) of HTH (70% available chlorine) per 25 gallons of water for 30 minutes. When using water with a pH higher than 6.0, add 1 fluid ounce of glacial acetic acid per 100 gallons of water.

Treatments

Yersina ruckeri--occasionally Enteric Redmouth disease outbreaks occur at the hatchery. Oxytetracycline is administered in a medicated feed at a rate of 1.75-2.75 grams per pound of feed for 10 days.

Ichthyophthiriasis (ICH)--formalin is injected into the water system at a very low concentration (10-20 ppm) to knock down the protozoan population. Treatments of 55 gallons of formalin are administered three days in one week to the filterbeds and repeated the next week. The intent is not to completely kill the organism as this would result in killing the nitrifying bacteria in the reuse system.

Big White Substation

Ponded Fry and Fingerlings

At Ponding:

Sixty fish are sampled for virus (3 fish pools)
Erythrocytic Inclusion Body Syndrome (EIBS)
Viral Hemorrhagic Septicemia (VHS)
Infectious Hematopoietic Necrosis (IHN)
Infectious Pancreatic Necrosis (IPN)

Monthly:

Ten juvenile fish are sampled for:
Virus (EIBS only)
Bacterial Diseases
Parasites
Anything unusual

At Release:

Sixty juvenile fish are sampled (3 fish pools) for:

Virus
Bacterial Diseases
Parasites

Preventative Measures

Post-Release Disinfection:

No disinfection due to poor condition of ponds (small fish can escape between ponds).

In General:

Clean ponds weekly.
Pick mortalities daily to prevent the spread of disease.
Disinfect marking trailer or vehicles from other hatcheries before they come on the property.

Treatments

Renibacterium salmoninarum--due to high outbreaks of BKD in the summer, erythromycin is administered in medicated feed following the protocols of INAD 4333. Fish are fed erythromycin at a concentration of 100 mg/kg of feed for 21 days. ELISA samples for BKD on 60 fish are taken before and after feeding the medication.

External parasites--during periods of high mortalities due to the presence of external parasites, fish health biologists may recommend treating the fish with formalin. A concentration of 1:5000 is used and the formalin is siphoned from a 55-gallon drum set up at the head of the raceway. This flow through treatment is done without reducing the raceway flow. A typical treatment would be 23-24 gallons of formalin with enough water added to fill the 55-gallon drum and siphoned over an hour long period.

F. FISH RELEASE

Six Weeks Prior to Release

Inform Fish Health of upcoming release date so they can plan their sampling schedule.

Week Before Release

Place smolt release tube in first ladder step and secure.
Inform public of release dates.

Day Before Release

Get list of pond numbers from computer for that release.
Mark ponds that will be released with engineering tape.
Put long extension bar and chain on Baker forklift. Check and fill propane tanks.
Use forklift to place one adult crowder in channel by Pond 1. Check propane tanks on crowder and test run.
Feed fish in release ponds one-half their daily feed in the morning. After the last morning feed, pull all walkways from the end furthest from the channel.
Remove metal covers from channel over the road (between north and south banks of ponds), and block access with vehicles.
Remove channel walkways.
Lift bird cage.
Check river level.
Track down and set out the following near the pond to be released first (i.e. Pond 44, 1 or 27):

-- 3 Pond Seines, check for holes and repair (pump room)
-- 1 Channel Seine, check for holes and repair (pump room)
-- 1 Wood-Framed Channel Crowder (pump room)
-- 1 Aluminum Pond Crowder with Center Wall Collar
-- 1 Extended C-Clamp
-- 1 Aluminum Brace
-- 1 Metal-Framed Damboard Puller, the smaller one
-- 1 Smolt Screen, for channel under road
-- 3 Aluminum Channel Dam Boards
-- 1 Metal-Framed Channel Crowder, for Ponds 21-27
-- 1 Smolt Diverter, place on adult fish crowder
-- 1 Bucket of Wedges and Hammer

-- 2 Buckets of Wet Sawdust, set up the day before
-- 1 Pickaroon
-- Shotgun and Noise Crackers
-- Several walkways

Release Jobs

6 People on Seines	1 Person on Valves
1 Person in Waders in Pond	1 Person on Forklift
1 Person on Crowder	(1 Person in Waders for Ponds 21-27)

Release Ponds 28-44

Make sure walkways are on hand at pond for personnel to use instead of jumping the channel.
Turn on channel water valve in spawning room to red pencil mark.
Place smolt screen in channel crossing the road.
Move fish crowder to first pond to be released.
Wedge wooden framed screen in channel behind fish crowder.
Remove metal walkway and wooden pond screen from damboard.
Move forklift into position and attach hook to aluminum damboard.
Shut off pond valve #2.
Shut off pond valve #1 while collared pond screen is put in place and secured with C-clamp and brace.
Turn pond valve #1 on again.
Pond seines go in the right side of pond, the "crooked leg" seine pole is used on the middle wall, under the walkway. Keep seine poles as close to wall as possible.
Shut off pond valve #1 as the seines approach the far intake.
As the third seine gets to the left side of the pond, the damboard is lifted slightly.
As the first seine reaches the mid-way point the damboard is lifted out.
After the third seine is out of the pond, the damboard is replaced as quickly as possible. The third seine should remain as close to the pond opening as possible.
Move the crowder down to the next pond as soon as possible, following seine #3 closely.
If possible, seal the ponds with sawdust as soon as they fill.
Move the forklift, fish crowder, pond screen, clamp and brace to the next pond to be released.
The seiners should move the fish down the channel past several ponds, as needed. Care should be taken to move fish down the channel only when there is sufficient water present. If the fish ball up, remove the seines. If necessary, don't move on to the next pond until channel is flushed.
Maintenance should be asked about valve settings after a pond has been emptied, in order to maintain the correct flow and water level in the aeration tower.
A short screen needs to be put in the channel to block stragglers from getting in spawning building.
After all ponds on the south bank have been released, flush ponds and seine stragglers out of the channel and place an aluminum channel damboard at the end of the channel. Shut off water valve in spawning room and move equipment to the north bank of ponds.

Release Ponds 1-20

Place smolt diverter screen on adult fish crowder; move crowder to pond 6 or 7.
Wedge small wooden channel screen in channel, directly behind pond 1's damboard.
Turn on channel water valve, near valves at pond 1.
Seining procedure is the same as ponds 28-44, except for using the damboard puller instead of the forklift.
After pond 1 has been released, move adult fish crowder into place.
After ponds 1-20 have been released, crowd and flush out stragglers and put aluminum damboard in channel at end of pond 20.
Adjust channel water valve (near pond 1) to provide sufficient water for stragglers in channel.

Release Ponds 21-27

Procedure is the same as before, except for using an aluminum channel screen with tension lock instead of adult fish crowder. One person will have to get in the channel with the screen to move it down the channel as the ponds are released.
Start at pond 27. There are no water valves for channel here. Shut mud valve in pit and turn off valve #2 and open valve #3 to run water from pond 27 to the channel.
After releasing ponds 21-27, seine and flush out stragglers from channel and put in aluminum damboard in channel at the end of pond 21.
Turn off valve #3 and open valve #2 in pond 27.

Aftermath

Use the buckets of wet sawdust to plug leaks in the aluminum damboards of ponds that have been released.
Check with maintenance crew as to which valves should be open or closed and check to make sure they are in the right position.
Check, clean and repair equipment for damage; put away.
Replace channel covers on road the next day.

Safety

Releasing fish is probably the most dangerous task at Spring Creek. Nearly all personnel are required for the task in a small working space. Narrow pond walls, rapid water flow, and a great deal of equipment make this procedure very hazardous. Personnel must be alert for themselves and others at all times. Awareness is the key to a safe release.

Hazards are:
1. Jumping across channels--don't do it!
2. Moving seines through pond openings.
3. Moving forklift to hook up damboards.
4. Moving adult fish crowder.
5. Replacing damboards.

G. BIG WHITE SUBSTATION

Big White Substation (Big White) Facilities

Location: The Big White substation is located approximately two miles upstream from the confluence of the White Salmon River and the Columbia River. The confluence is one mile upstream from Spring Creek.

Rearing Conditions:

2 Ponds:	10' wide x 250' long x 4' deep Designed originally to hold adult salmon and can be modified into one pond
Intake:	Located 1/4 mile upstream, piped to ponds
Water Source:	White Salmon River
Water Flow:	30 CFS
Water Temperatures:	Winter = 33-40°F Spring/Fall = 46-53°F Summer = 50-60°F

Operational Concerns:
Intake needs occasional cleaning due to fall leaves, salmon carcasses and fallen limbs.
High water fluctuations can occur due to uneven discharge from Condit Dam, located upstream from Big White. High flows can flood the ponds, low flows can leave the ponds without water. Good communication with dam operators is necessary to prevent loss of fish. Dam operators have been instructed to call when water flow is interrupted.
Silt content is high during spring run-off.
Animal predation may be a problem, especially during the winter.
Due to the age and condition of the ponds, and the isolated location, a lone caretaker must be particularly aware of safety precautions at the site.

Big White Fish-Rearing Program

Program purpose: Big White is a grow-out facility for approximately 500,000 spring chinook salmon spawned at the Little White Salmon (LWS) and Carson National Fish Hatcheries.

Program:
In mid-January, 1/2 million fry are shipped from LWS and/or Carson and ponded in the river-side pond.
Fry are raised in river-side pond; feed is administered by hand or via automatic feeders.
In mid-April, the previous year's 1-age fish are released into the White Salmon River.
Once the bank-side pond is empty, 150,000-160,000 fry are split into it from the river-side pond.
- Fish culture continues: feeding as before, mortalities picked daily and cleaning done weekly.

In August, 25,000 fish from each pond are right or left ventral clipped.
In mid-August, all fish from the river-side pond (approx. 350,000), are released into the White Salmon River, leaving 150,000 fish in the bank-side pond to overwinter and be released as 1-age fish in mid-April of the next year.

Cooperative Agreement

A cooperative agreement exists between the U.S. Fish and Wildlife Service and the White Salmon Steelheaders Club. Club members feed the fish on the weekends, and during the month of September when hatchery staff is involved in spawning.

H. SAMPLING PROCEDURES

Eggs

Upon egg eye-up, start shocking, wait 24 hours before salting and wait an additional 24 hours before traying. This time frame allows dead eggs to be identified easily, insures a cleaner environment for eggs, and minimizes inventory loss between eye-up and hatching.

Put salt loss in fresh water for 3 hours or overnight before weighing. Drain salt loss basket for 20 minutes. Weigh basket with salt loss on platform scale, weigh empty basket after loss has been discarded, and subtract from original weight. Total weight of salt loss times sample (see below) equals total eggs lost in salting for Take.

$$\frac{\#\ \text{Eggs}}{\text{WT of sample}} \pm \text{Eggs per pound}$$

$$\frac{4000\ \text{Eggs}}{\text{eggs/lbs}} \pm \text{WT per Tray}$$

Takes of 1,000,000 or less = 2 samples or trays
Takes of 1 to 2,000,000 = 3 samples or trays
Takes of 3 to 4,000,000 = 4 samples or trays
Takes of 4 to 5,000,000 = 5 samples or trays
Takes of 5 to 6,000,000 = 6 samples or trays

Average weight of samples and start trays down using this figure.
Pick off dead or blanks before putting trays in stacks.
After completing tray-down, between 2 to 4 weeks later, pick all stacks and record loss per stack as 2ne pick off. Clean tray lids and bottom of tray if necessary.
After hatching perform 3rd pick off, recording in the same manner.
After the 3rd pick off subtract losses from the original number and use it for ponding numbers.

Fry Sampling

When fry have "buttoned up" and are ready to be ponded, set up ponding/picking trough. Individuals will each start a stack, remove and count the crippled fry and dead eggs. The total pick off will be subtracted from the pond inventory and become the fry ponded number. In the mid-stack of each individual stack for the pond a spoonful or two of fry will be removed, weighed, and counted. Samples will be minimum of 0.75 lbs in size. Each pond will be sampled once.

Pond Fry Sampling

Fish should first be sampled 1 month after ponding.
Sample bi-weekly 15th and EOM, or as close today as possible. Use sample trailer and digital scale, use lb scale.
Use calibrated square tub on end of pond - three buckets of water.
Fish are dipped into the tub; minimum of 3 dip nets full of fish. Four or five dips from different areas of pond is best. While netting, close mouth of net to keep larger fish from escaping.
Use a small net or metal strainer for sample.
Kick sides of tub to homogenize fish.
Place net or strainer on bottom of square tub and lift straight up catching all the strata fish. Allow 15 seconds drain time before weighing on a tared digital scale. Record weight, count fish, and record numbers.
Size of sample will be dependent on the size of the fish. The larger the fish the heavier the sample.

Sample size: 1-2 lbs > 500 FPP
2-3 lbs > 250 FPP
3 lbs < 250 FPP

Split Ponds Sampling

Allow pond to be crowded.
Fill tub with water to lower line.
Use long handled sample net to get five nets full. One from each corner and middle. Homogenize fish in tub and place short handled net to bottom of tub and lift straight up. Allow 15 seconds to drain and weigh, count fish and calculate number per pound and pounds of fish to be split to another pond.

Special Studies

The hatchery will attempt to complete special study sampling according to study protocals.

VI. MAINTENANCE PROCEDURAL STANDARDS

A. OPERATIONAL PROCEDURES

1. Setting Up Hatchery For Adult Return

Set up filterbeds for water in the second or third week of August:
- Close all drain valves in pipe galley.
- Open all inlet water gates.
- Close all outlet water gates.
- Check backwash panel:
  - all air lines closed;
  - all filtered water lines open.
- If no water is needed at lagoon, open valve to river at lagoon waste water pit.
- Turn all waste water pump controls to "off" in chlorination building.

Set up Ponds 1-27:
- Close all valves 1's, 2's, and 3's:
  - be sure they are tight and do not leak too much;
  - seal any leakage as well as possible.
- Install south dam board in channel on filterbeds. This will save water that leaks and will go to lift pumps located in front of the mechanical building.

Set up Ponds 28-44:
(Two ways to set them up).
- Method 1:
  - close all #1 and #3 valves and open #2's;
  - as the filterbeds fill, the water will back up the 78" line and into the ponds.
  - Note: This method takes longer to fill the filterbeds, but is faster when filling ponds.
- Method 2:
  - close all three valves on ponds;
  - let the filterbeds fill by themselves.

To fill filterbeds:
- Start one or two spring water pumps to the aerator tower.
- To balance the spring water:
  - adjust the valves above spring water pumps in mechanical building just before lines enter aerator tower;
  - watch spring water pit (SWPit) go up or down and adjust accordingly;
  - after adjusting SWpit, check the spring water box between ponds #20 and #21;
  - adjust so there is just a trickle over the dam in the spring water box (this is just right).
- Filterbeds will fill overnight with water that has:
  - overflowed to the aerator tower,
  - gone through the aerator pit,
  - gone through the bottom of the filterbeds, and
  - flowed up to the top of the filterbed outlet water gates.
- Dam boards are shorter in filterbeds #1 and #2, which allows the excess water to flow to the waste channel through these two filterbeds.

Meanwhile (Spring water is being pumped to aerator tower and ponds are empty):
- Pull planting pipe and store.
- Install cover over planting pipe that remains in ladder.
- Set up ladder.
- Close gate valve on the end of the 78" line in S.E. corner of annex.
- Fish crew is:
  - removing every other small fitting from header in ponds to increase flow in ponds 28-44,
  - setting up jump boards, and
  - installing counting shed.

To fill ponds 28-44 (Filterbeds are full):
- Start one small (100 hp) aerator pump--this will put about 4,000 gpm in aerator tower;
- Close all #2 valves;
- Start on pond #44 or #38 and open #1 valves on three ponds.
- When the three ponds are full (about 25-30 minutes):
  - open their #2 valves;
  - open 2 or 3 more #1 valves on the next ponds.

Repeat until all 17 ponds are full and all #2 valves are open.
Be sure all #3 valves are closed as tight as possible (without breaking anything).

While filling ponds:
Check aerator tower for overflow after 7 or 8 ponds are full.
Start additional pumps as needed.
Go from a small 100 hp to a large 150 hp, turning off the 100 hp pump once the larger one has started.
When the demand is more than the 150 hp will handle:
start a 100 hp pump and continue as before until two 150 hp pumps are running.
Two 150 hp pumps will run the 17 ponds wide open.
If 2 large aerator pumps are started be sure selector switch in gray panel is turned to emergency power instead of commercial power.

Once Ponds Are Full:
If the water level in ponds is too high or too low:
Adjust 78" line valve to raise or lower ponds to desired level, about 27-30% open.
Management decides on the pond level.
Seal pond gates:
open mud valve by pond #44;
seal gates with sawdust to stop all leakage possible;
close mud valve.
Ponds 1-27:
open mud valves by ponds 1 and 27;
try to keep ponds not in use dry;
if ponds leak:
check and tightly close all #2 valves,
if still leaking, open #3 valve on leaking pond.

Start Ladder (For the two ponds fish will go in first):
pull dam boards;
install fish weirs;
close #2 valves.
This will run about 2,000 gpm to ladder.
Remember there is a limited amount of water--DO NOT WASTE MORE THAN IS NEEDED TO RUN THE LADDER!

2. Incubation Building
Start on approximately September 10-12

Preparations before starting water to incubation building:
Open valves in spring water pit on pumps not running to let gravity flow water into deaerator pit.
By spring water box, between raceways #20 and 21:
-open valve in roadway;
-close large valve in box under cover marked "gravity feed to hatchery."
Open drain valve at east end of main incubation room (under gripstrut).
In Southwest end of the annex:
close the gate valve to the 78" line (this should already be closed);
open lines to the river.

Start water to incubation building:
Start one large deaerator pump (#3 or 4):
Selector switch in gray cabinet by deaerator pumps should be turned to emergency power instead of commercial power.
This large pump will:
pump about 1250 gpm to deaerator tower,
fill tower and run through the hatchery building,
flow out drain line in Hatchery Building and flush out the lines.
At the same time, turn off a spring water pump. With a deaerator pump running and 2 spring water pumps running the spring water will be depleted fairly rapidly.
Check spring water pit and adjust to desired level (adjustment is described in Section 1 under "to Fill Filterbeds").

Start incubators:
Start in main Hatchery Building first! (One large deaerator pump will run the whole hatchery at 3 gpm per incubator).
Flush out lines.
Remember! There is a limited amount of water; with the ladder running conserve as much water as possible.
To recirculate incubation water:
open valve on end of 78" line in incubation building; close lines to river.

Adjusting water at incubator start-up:

Open and adjust all needed incubators.
Start closing drainline to back water up in deaerator tower, this will take some time.
Adjust drain line until flow meter in tool room of mechanical building reads approximately 1150 gpm.
This will make some overflow in the deaerator tower.
Once adjustments are made, the incubators are ready for eggs.

Adjusting water for maximum capacity:

Two deaerator pumps are running.
Adjust to approximately 1800 gpm on flow meter:
Use two people:
one to open or close drain valve;
one to watch flow meter.
Use a telephone to communicate.

Increasing temperature in incubation building:

Close valve from well to the deaerator pit.
Open valve to filterbeds.
Start well:
set laser control on about #5;
let well run to filterbeds for about 30 minutes to flush out lines;
flow meter will read high, probably 1,000 gpm, but will start to fall as static level in well falls.
Open valve to the deaerator pit.
At this time:
lines and well water should be clean,
flow meter should be reading about 500 gpm.
Open pet-cock on top of well line at the deaerator pit to let out air.
Start closing valve to filterbeds; close until there is just a little water leaking to filterbeds--DO NOT CLOSE COMPLETELY!
Close pet-cock.
Monitor temperature gauge in mechanical building until desired temperature is reached:
If temperature is too high:
turn laser control down to adjust gpm on flow meter.
If temperature is too low:
turn laser control up to adjust gpm on flow meter.
Adjust spring water as before. When well water is added to the deaerator pit it will raise the level of the spring water pit also. Spring water will have to be conserved. Adjustments should hold through spawning time.

To evacuate water from the system when spawning is over:

install dam boards in ponds with fish traps in them;
open mud valve by pond #44 to run all leaking water away from the ladder;
pull the ladder;
turn off spring water pumps (usually one);
close valve on 78" line in hatchery;
open valves to river;
evacuate system.

3. Filterbeds/Backwashing

Development of operational procedures in progress.

5. Alarm System

Development of operation procedures in progress.

B. MAINTENANCE PROCEDURES

1. Pumps and Motors

Daily Pump and Motor Maintenance:
- Feel for vibrations.
- Check bearings for heat.
- Listen for strange or different noises:
  - If bearings are noisy, grease (see below).
- Check lubrication oil sight glass (if present).

Annual Pump and Motor Maintenance:
- Check packing around shaft for excessive leakage:
  - Tighten packing if needed. It should leak about 16 drops per minute with pump running.
  - Re-pack when all adjustment is out of packing gland:
    - (On most vertical pumps):
      - remove packing gland;
      - use a packing puller to remove first three rings of packing;
      - remove brass sleeve with (2) threaded sleeve removers (sleeves are stubborn sometimes and some lubrication helps);
      - remove the remaining 2 or 3 rings. Normally there are 6 rings of packing, but it is common to find only 5.
- Grease bearings (Remember! Over-greasing can cause more harm than not greasing enough):
  - Pull plugs.
  - Give 4 shots of a good quality grease.
  - Repeat if bearing noise has not stopped.
  - Once noise has stopped leave plugs out for 2 hours and recheck.
  - If bearing noise has stopped after 2 hours, re-install plugs. This method of greasing is not in the manual, but is most effective.
- Change oil in oil bath bearings. Use turbine oil only.
- Wipe down inside pumps with safety solvent.

Periodic Pump and Motor Maintenance:
- Outside pumps and motors:
  - wipe down with safety solvent (test the solvent first for paint and rubber damage);
  - paint as needed for good appearance.
- Inside pumps:
  - paint every 7 or 8 years, or as needed.
- Main water pumps:
  - keep numbers clear and in place.
- Aerator, deaerator and spring water pumps:
  - visually inspect impellers for tightness and wear;
  - adjust impeller as necessary;
  - take amperage reading on all three phases (check amp rating plate on motor); check for balance and load;
  - clean sight glass.

Periodic Pump and Motor Maintenance (cont.)
- Check for oil leaks:
  - at sight glass,
  - at plugs,
  - around shaft, and
  - under lower bearing.
- Use Megger on all lines.

Pulling Pumps and Motors:
- When necessary pull pumps and motors to rebuild:
  - Large (50, 100 or 150 hp) and hard to reach units must be pulled by a commercial crane.
  - Small and easily accessible pumps can be pulled with station equipment.
- Ensure that company rebuilding the unit knows what work is expected:
  - Pumps:
    - check suction bells, impeller(s), bowls, bearings, shafting, discharge bowl and stuffing boxes;
    - clean piping and housing.
  - Motors:
    - check fields for leakage; check bearings and shaft end bells; revarnish.

Check on transportation costs-sometimes the lowest bid is not the best.
Subsequent painting of pumps and motors before installation to be done by maintenance staff.

Refer to the manuals when necessary.

2. Heat Pumps

Daily (on heat pumps that are running):
visually check oil level in sight glass;
check condenser and cooler pressure;
enter data in log (will help determine changes in heat pump operation):
oil pressure,
oil temperature, and
amperage.

Annually:
Change oil and oil filter.
Change filters in capillary tubes.
Pressurize unit with dry nitrogen to 1 to 2 psi (any leak or open line forces freon gas out instead of sucking oxygen into unit).
After oil and freon filters have been changed:
pressurize unit with dry nitrogen to about 10 psi;
test for leaks;
if there are no leaks, evacuate nitrogen to 0 psi;
hook up vacuum pump to unit and run until there is about 1 inch of vacuum on unit;
seal up unit;
run unit.

During the Summer:
Evaporator Tubes:
there are about 480 copper evaporator tubes;
remove end bells and clean with a brush;
remove end drain plugs, water and grime will leak out.

Heat Exchangers:
heat exchanger tubes are stainless steel;
pull drain plug;
pull off end caps;
clean tubes with a wire brush;
using a new gasket, install end cap.

3. Spawning Equipment

Development of maintenance procedures in progress.

4. Building Heating and Cooling Systems

Development of maintenance procedures in progress.

5. Standby Generator

Development of maintenance procedures in progress.

6. Electrical Equipment

Development of maintenance procedures in progress.

7. Rotary Compressors

Development of maintenance procedures in progress.

8. Domestic Water System

Development of maintenance procedures in progress.

9. Air Compressors

Development of maintenance procedures in progress.

10. Paint Inventory

Development of paint inventory in progress.

VII. HATCHERY SAFETY STANDARDS

Station Safety Plan

A station safety plan is updated annually and posted in every building. Included in the document:

Emergency Action Directory--includes all pertinent telephone numbers for emergency services.
Fire Extinguisher Inventory--a complete listing of all fire extinguisher locations.
First Aid Equipment Inventory--a complete listing of all first aid kit locations.
Locations of other safety equipment, including safety goggles, face masks, gas masks and protective clothing.
Station Action Fire Plan--includes plans in the eventuality of a fire, search and rescue operation, or damage or injury to property or personnel.
Directives for:
- a two day response to employee safety hazard reports.
- Material Safety Data Sheets (MSDS's) are to be posted for all chemicals used on the station.
- Job Hazard Analysis (JHA) written for each job will be critiqued quarterly.
- an inspection of hatchery grounds for safety hazards will be performed quarterly.
- training for key personnel in health and safety monitoring will be available annually.
- maintenance of a log of occupational injuries and illnesses.
- an annual summary of injuries, which will be posted and retained 5 years.

Station Safety Officer

A station safety officer is appointed from within the hatchery staff and is responsible for:
- updating the hatchery crew on Regional safety issues
- informing the crew of reported or observed safety hazards
- conducting quarterly safety meetings where safety films are viewed and discussed, and new safety issues are brought up and discussed by the crew
- posting MSDS's and writing JHA's for all jobs
- inspecting safety equipment and purchasing replacement parts or new equipment
- writing and submitting accident reports
- maintaining a log of occupational injuries and illnesses
- inspecting fire extinguishers
- organizing safety training for personnel as needed
- annual hatchery safety inspection
- writing and/or editing station safety plans and reports
- installs and submits radon monitoring equipment for analysis
- other duties as necessary.

Hatchery Crew

The hatchery crew is responsible for:
- reporting hazardous working conditions or faulty equipment
- participating in quarterly safety meetings
- adhering to safety guidelines written in the station safety plan
- not risking personal injury.

Attachment 5. List of Listed and Proposed Endangered and Threatened Species, Candidate Species, and Species of Concern Which May Occur within the Vicinity of the Proposed Master Plan Improvements – Spring Creek NFH dated 8/11/1998.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
North Pacific Coast Ecoregion
Western Washington Office
510 Desmond Drive SE, Suite 102
Lacey, Washington 98503
Phone: (360) 753-9440 Fax: (360) 753-9008

August 11, 1998

Michelle Wilson
PALSA, L.L.C.
522 SW 5th Avenue, Suite 1003
Portland, OR 97204

FWS Reference: 1-3-98-SP-0416

Dear Ms. Wilson:

This is in response to your letter dated August 3, 1998, and received in this office on August 3, 1998. You have requested a list of listed and proposed threatened and endangered species, candidate species, and species of concern (Attachment A) that may be present within the area of the proposed Master Plan Improvements - Spring Creek National Fish Hatchery Recreational Site Project in Skamania County, Washington. This response fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act of 1973, as amended (Act). We have also enclosed a copy of the requirements for Army Corps of Engineers (COE) compliance under the Act (Attachment B).

Should the COE determine that a listed species is likely to be affected (adversely or beneficially) by the project, you should request section 7 consultation through this office. If the COE determines that the proposed action is "not likely to adversely affect" a listed species, you should request Service concurrence with that determination through the informal consultation process. Even if there is a "no effect" situation, we would appreciate receiving a copy for our information.

Candidate species are included simply as advance notice to Federal agencies of species which may be proposed and listed in the future. Species of concern are those species whose conservation standing is of concern to the Service, but for which further status information is still needed. Conservation measures for candidate species and species of concern are voluntary, but recommended. Protection provided to these species now may preclude possible listing in the future.

There may be other Federally listed species that may occur in the vicinity of your project which are under the jurisdiction of the National Marine Fisheries Service (NMFS). Please contact NMFS at (360) 753-9530 to request a species list.

In addition, please be advised that state regulations may require permits in areas where wetlands are identified. You should contact the Portland District of the U.S. Army Corps of Engineers for Federal permit requirements and the Washington State Department of Ecology for State permit requirements.

Your interest in endangered species is appreciated. If you have additional questions regarding your responsibilities under the Act, please contact Bobbi Barrera at (360) 753-6048, or John Grettenberger of this office, at the letterhead phone/address.

Sincerely,

James L. Michaels
for

Nancy J. Gloman
Acting Supervisor

BB/jko
Enclosures
SE/COE/1-3-98-SP-0416/Skamania
c: COE, Portland
WDFW, Region 5
WNHP, Olympia
FWS, Spring Creek NFH ✓

ATTACHMENT A X

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, CANDIDATE SPECIES AND SPECIES OF CONCERN WHICH MAY OCCUR WITHIN THE VICINITY OF THE PROPOSED MASTER PLAN IMPROVEMENTS - SPRING CREEK NATIONAL FISH HATCHERY RECREATION SITE PROJECT IN SKAMANIA COUNTY, WASHINGTON (T03N R10E S28)

FWS REF: 1-3-98-SP-0416

LISTED

Bald eagle (*Haliaeetus leucocephalus*) - Wintering bald eagles may occur in the vicinity of the project from about October 31 through March 31.

Bull trout (*Salvelinus confluentus*) - Columbia river population may occur in the vicinity of the project.

Peregrine falcon (*Falco peregrinus*) -spring and fall migrant peregrine falcon may occur in the vicinity of the project.

Major concerns that should be addressed in your Biological Assessment of the project impacts to listed species are:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project construction (i.e., habitat loss, increased noise levels, increased human activity) which may result in disturbance to listed species and/or their avoidance of the project area.

PROPOSED

None

CANDIDATE

The following candidate species may occur in the vicinity of the project:

Oregon spotted frog (*Rana pretiosa*)

SPECIES OF CONCERN

The following species of concern may occur in the vicinity of the project:

Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Pacific lamprey (*Lampetra tridentata*)
Pacific Townsend's big-eared bat (*Corynorhinus townsendii townsendii*)
River lamprey (*Lampetra ayresi*)

ENT B

FEDERAL AGENCIES' RESPONSIBILITIES UNDER SECTIONS 7(a) AND 7(c) OF THE ENDANGERED SPECIES ACT OF 1973, AS AMENDED

ECTION 7(a) - Consultation/Conference

Requires:

1. Federal agencies to utilize their authorities to carry out programs to conserve endangered threatened species;

2. Consultation with FWS when a federal action may affect a listed endangered or threate species to ensure that any action authorized, funded, or carried out by a federal agency is likely to jeopardize the continued existence of listed species or result in the destructio adverse modification of critical habitat. The process is initiated by the federal agency aft has determined if its action may affect (adversely or beneficially) a listed species; and

3. Conference with FWS when a federal action is likely to jeopardize the continued existenc a proposed species or result in destruction or an adverse modification of proposed crit habitat.

SECTION 7(c) - Biological Assessment for Construction Projects *

Requires federal agencies or their designees to prepare a Biological Assessment (BA) for construction proj only. The purpose of the BA is to identify any proposed and/or listed species which is/are likely to be affecte a construction project. The process is initiated by a federal agency in requesting a list of proposed and li hreatened and endangered species (list attached). The BA should be completed within 180 days after tiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 day receipt of the species list, please verify the accuracy of the list with our Service. No irreversible commitmen resources is to be made during the BA process which would result in violation of the requirements under Sec 7(a) of the Act. Planning, design, and administrative actions may be taken; however, no construction may be

To complete the BA, your agency or its designee should: (1) conduct an onsite inspection of the area to affected by the proposal, which may include a detailed survey of the area to determine if the species is pre and whether suitable habitat exists for either expanding the existing population or potential reintroduction of species; (2) review literature and scientific data to determine species distribution, habitat needs, and o biological requirements; (3) interview experts including those within the FWS, National Marine Fisheries Serv state conservation department, universities, and others who may have data not yet published in scien literature; (4) review and analyze the effects of the proposal on the species in terms of individuals populations, including consideration of cumulative effects of the proposal on the species and its habitat; analyze alternative actions that may provide conservation measures; and (6) prepare a report documenting results, including a discussion of study methods used, any problems encountered, and other relevant informat Upon completion, the report should be forwarded to our Endangered Species Division, 510 Desmond Drive Suite 102, Lacey, WA 98503-1273.

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* "Construction project" means any major federal action which significantly affects the quality of the hu environment (requiring an EIS), designed primarily to result in the building or erection of human-made struct such as dams, buildings, roads, pipelines, channels, and the like. This includes federal action such as perm nts, licenses, or other forms of federal authorization or approval which may result in construction.

Attachment 6. Fall Chinook Salmon Spawning and Distribution from the Big White and Spring Creek Stations during Brood Years 1901-1937.

FALL CHINOOK SALMON SPAWNING AND DISTRIBUTION FROM THE BIG WHITE AND SPRING CREEK STATIONS DURING BROOD YEARS 1901 TO 1937 PRE-BONNEVILLE DAM CONSTRUCTION

BROOD YEAR	BIG WHITE EGGS	SPRING CREEK EGGS	TOTAL	EGGS SHIPPED	UNFED & PRE-SMOLT FRY*	LOCATION	FINGERLINGS	LOCATION	TOTAL RELEASED
[redacted]									
1901					691,000	BW			691,000
1902	3,415,000				234,000	BW			2,258,390
					2,024,390	SC			
1903					1,866,000	BW			4,676,690
					2,810,690	SC			
1904				2,219,000	1,208,200	BW			5,950,800
					4,742,600	SC			
1905					1,928,214	SC			1,928,214
1906	7,714,000				6,678,415	BW			6,878,415
					200,000	SC			
1907	245,000	163,000	4,080,000		500,000	BW			2,169,000
					1,669,000	SC			
1908			5,654,000		4,304,184	SC	387,337	BW	5,282,325
							590,804	SC	
1909			3,739,000						0
1910			1,933,000						0
[redacted]11			6,681,000		1,350,000	BW			6,280,600
					4,930,600	SC			
1912			15,261,000		2950,000	BW			13,526,400
					10,576,40	SC			
					0				
1913			10,046,000		2,837,000	BW	477,948	BW	14,905,448
					11,500,50	SC	90,000	SC	
					0				
1914			11,908,000		2,274,500	BW	6,010,700	SC	14,713,500
					6,428,300	SC			
1915			13,209,000		2,490,861	BW	598,465	BW	19,746,110
					8,931,784	SC	8,025,000	SC	
1916			4,322,000		1,597,958	SC	387,290	BW	4,878,248
					2,713,000	BW	18,000	SC	
1917			15,051,000		1,100,000	BW	376,000	BW	18,960,357
							14,100,357	SC	
1918			10,687,700		2,000,000	BW	600,000	BW	9,102,000
							6,502,000	SC	
1919			16,042,000						0
[redacted]20			5,005,000				6,564,000	SC	6,564,000
1921			12,025,000				12,000,000	SC	12,000,000
1922			6,237,000				6,000,000	SC	600,000

* - PRE SMOLT FRY THOSE BETWEEN 500 TO 800 PER LB.

FALL CHINOOK SALMON SPAWNING AND DISTRIBUTION FROM THE BIG WHITE AND SPRING CREEK STATIONS DURING BROOD YEARS 1901 TO 1937 PRE-BONNEVILLE DAM CONSTRUCTION

BROOD YEAR	BIG WHITE EGGS	SPRING CREEK EGGS	TOTAL	EGGS SHIPPED	UNFED & PRE-SMOLT FRY*	LOCATION	FINGERLINGS	LOCATION	TOTAL RELEASED
1923			7,020,500						0
1924	7,420,000	7,000,000	14,420,000				9,138,800	SC	9138,800
1925	5,250,000	7,000,000	12,500,000						0
1926	7,040,000	6,138,000	13,178,000	2,941,000			7,781,000	SC	7,781,000
1927	14,703,000	5,088,000	19,791,000	8,523,000			7,959,000	SC	7,959,000
1928	11,216,000	4,356,000	15,572,000	6,886,000			7,860,000	SC	7,860,000
1929	4,389,000	1,456,000	5,845,000				5,000,000	SC	5,000,000
1930	8,050,000	4,087,000	12,137,000				1,620,000 6,700,000	BW SC	8,320,000
1931	11,433,000	6,881,000	18,314,000	8,934,000	450,000	?	7,764,000	?	8,214,000
1932	10,025,000	7,872,000	17,897,000	6,174,000	2,405,000	?	7,927,000	?	10,332,000
1933	5,060,000	3,166,000	8,226,000	2,000,000			1,250,000 3,858,000	BW SC	5,108,000
1934	3,900,000	1,450,000	5,350,000	202,860	1,000,000	BW	400,000 3,708,000	BW SC	5,108,000
1935	13,340,000	3,925,000	17,265,000	4,484,000			10,161,225	?	10,161,225
1936	15,310,000	2,155,000	17,465,000	7,200,000			8,051,200	?	8,051,200
1937	6,825,000	2,950,000	9,775,000	25,000	4,570,000	BW	1,662,000 2,750,000	BW SC	8,982,000

* - PRE SMOLT FRY THOSE BETWEEN 500 TO 800 PER LB.

Attachment 7. Fall Chinook Salmon Spawning and Distribution from the Big White and Spring Creek Stations during Brood Years 1938-1970.

FALL CHINOOK SALMON SPAWNING AND DISTRIBUTION FROM THE BIG WHITE AND SPRING CREEK STATIONS DURING BROOD YEARS 1938 - 1970 POST-BONNEVILLE DAM CONSTRUCTION

[redacted]	BIG WHITE EGGS	SPRING CREEK EGGS	TOTAL	EGGS SHIPPED	UNFED & PRE-SMOLT FRY*	LOCATION	FINGERLINGS	LOCATION	TOTAL RELEASED
1938	14,300,000	3,950,000	18,250,000	25,000	10,597,900	BW	396,800 3,072,000	BW SC	14,066,700
1939	13,768,000	5,812,000	24,580,000	6,318,000	10,522,000	BW	1,180,000 6,325,000	BW SC	18,027,000
1940	19,026,000	6,685,000	25,711,000	7,196,000	8,750,000	BW	2,713,000 5,001,000	BW SC	16,464,000
1941	10,650,000	14,230,000	24,880,000	7,665,755	5,994,000	BW	3,870,550 4,036,480	BW SC	13,901,030
1942	13,664,000	13,870,000	27,534,000	12,186,435	9,390,000	BW	2,041,720 4,130,325	BW SC	15,562,045
1943	24,000	7,369,500	7,393,500	249,480	2,648,000	BW	4,038,895	SC	6,686,895
1944	6,020,000	6,782,000	12,802,000	451,500	5,205,320 4,088,000	BW SC	1,821,620	SC	11,114,940
1945	10,724,000	6,662,000	17,386,000	1,250,000	9,178,000 3,065,000	BW SC	1,916,780	SC	14,159,780
1946	10,772,000	12,365,000	23,137,000	7,073,000	7,630,000 4,175,000	BW SC	2,008,110	SC	13,813,110
[redacted]	14,008,200	12,376,890	26,385,090	8,970,100	6,797,000 4,327,000	BW SC	2,029,100	SC	13,153,100
1948	8,302,000	18,222,400	26,524,400	10,459,000	5,872,000 7,312,000	BW SC			13,184,000
1949	3,006,000	25,725,400	28,731,400	10,011,700	14,171,700	SC	1,002,260 957,000	BW SC	16,130,960
1950	5,090,520	30,538,465	35,628,985	20,028,650	5,083,580 4,390,000	BW SC	3,413,790	SC	12,887,370
1951	5,926,396	27,654,498	33,580,894	18,191,820	6,060,000 1,028,000	BW SC	6,241,786	SC	13,329,786
1952	14,574,000	27,509,845	42,083,845	16,143,500	13,468,180 2,501,820	BW SC	6,911,991	SC	22,881,991
1953	1,289,700	27,041,760	28,331,460	11,695,880	4,832,000	SC	1,024,803 7,581,845	SC BW	13,438,648
1954	2,786,000	34,983,000	37,769,000	18,057,500	1,823,850 4,639,635	BW SC	9,523,614	SC	15,987,099
1955	464,000	29,322,906	29,787,306	94,199,20	5,009,160	SC	9,710,852	SC	14,720,012
[redacted]	1,000,000	30,681,000	31,681,000	5,465,000	3,899,850	SC	1,132,156 10,680,941	BW SC	15,712,947
1957	4,953,700	26,904,997	31,858,697	10,498,077	6,955,290	SC	4,399,920 7,962,480	BW SC	19,317,690

* - PRE SMOLT FRY THOSE BETWEEN 500 TO 800 PER LB.

FALL CHINOOK SALMON SPAWNING AND DISTRIBUTION FROM THE BIG WHITE AND SPRING CREEK STATIONS DURING BROOD YEARS 1938 - 1970 POST-BONNEVILLE DAM CONSTRUCTION

[redacted]	BIG WHITE EGGS	SPRING CREEK EGGS	TOTAL	EGGS SHIPPED	UNFED & PRE-SMOLT FRY*	LOCATION	FINGERLINGS	LOCATION	TOTAL RELEASED
1958	9,336,989	80,991,486	90,328,475	64,795,110	8,027,800	SC	3,982,473 7,891,692	BW SC	19,901,965
1959	7,193,208	70,320,478	77,513,686	55,149,040	5,832,145	SC	3,352,775 7,767,360	BW SC	16,952,280
1960	1,493,160	33,043,210	34,536,370	11,523,635	3,773,000	BW	3,352,775 7,917,619	BW SC	15,045,394
1961	980,606	30,232,434	31,213,040	14,487,818			3,455,780 9,732,272	BW SC	13,188,052
1962	2,405,800	30,934,356	33,340,176	17,715,000			2,420,436 9,897,506	BW SC	12,317,942
1963	284,400	36,413,800	36,698,200	22,082,500			2,472,147 7,658,902	BW SC	10,131,049
1964	2,782,550	36,701,144	39,483,694	22,571,584			2,041,438 6,608,427	BW SC	8,649,865
1965		16,715,600	16,715,600	4,066,380			1,062,670 8,240,275	BW SC	9,302,945
[redacted]		33,730,320	33,730,320	13,076,260	3,404,000	SC	1,076,660 8,926,514	BW SC	13,407,174
1967		18,736,000	18,736,000	1,553,000	536,700	SC	9,033,720	SC	9,570,420
1968		28,937,000	28,937,000	16,304,000			9,966,100	SC	9,966,100
1969		37,129,588	37,129,588	16,677,640			17,585,632	SC	17,585,632
1970		13,051,144	13,051,144	12,000			11,022,958	SC	11,022,958

* - PRE SMOLT FRY THOSE BETWEEN 500 TO 800 PER LB.

Attachment 8. Fall Chinook Salmon Spawning and Distribution from the Big White and Spring Creek Stations during Brood Years 1971-2002, Reuse System Era.

FALL CHINOOK SALMON SPAWNING AND DISTRIBUTION FROM THE BIG WHITE AND SPRING CREEK STATIONS DURING BROOD YEARS 1971-2002 - REUSE SYSTEM

BROOD YEAR	BIG WHITE EGGS	SPRING CREEK EGGS	TOTAL	EGGS SHIPPED	UNFED & PRE-SMOLT FRY*	LOCATION	FINGERLINGS	LOCATION	TOTAL RELEASED
1971		25,065,965	25,065,965	1,500			18,390,250	SC	18,390,250
1972*		15,495,049	27,605,049	37,500			20,287,536	SC	20,287,536
1973		25,646,079	256,46,029				16,726,972	SC	16,726,972
1974		28,794,000	28,794,000	9,000			1,898,616 18,074,429	BW SC	19,973,045
1975		52,893,456	52,893,456	20,109,600			1,960,400 17,551,649	BW SC	19,512,049
1976		41,504,265	41,504,265	11,949,494			2,899,422 18,351,122	BW SC	21,250,544
1977		33,285,000	33,285,000	2,457,460			3,138,958 19,510,044	BW SC	22,649,002
1978		31,764,965	31,764,965	6,673,594			3,028,687 20,720,985	BW SC	23,749,672
1979		29,390,574	29,390,574	5,894,700			2,199,000 15,817,893	BW SC	18,016,893
1980		42,880,042	42,880,042	11,725,159	3,349,198	SC	16,689,525	SC	20,038,723
1981		39,783,503	39,783,503	19,970,555			13,677,175	SC	13,677,175
1982		41,795,400	41,795,400	16,848,042			1,202,881 14,594,463	BW SC	15,797,344
1983		22,866,314	22,866,314	4,139,360			2,869,174 11,043,010	BW SC	13,912,184
1984*		20,040,000	20,040,000				13,905,414	SC	13,905,414
1985		13,547,590	13,547,590				10,594,893	SC	10,594,893
1986*	438,279	3,681,801	11,050,332				10,649,406	SC	10,649,406
1987*	475,584	1,310,646	11,605,988				8,850,899	SC	8,850,899
1988*		2,445,190	21,715,038				15,307,411	SC	15,307,411
1989*		7,876,632	12,201,380				10,200,000	SC	10,200,000
1990		20,720,416	20,720,416				12,591,188	SC	12,591,188
1991		33,304,686	33,304,686	8,786,637	5,350,704	SC	13,826,943	SC	19,177,647
1992		24,135,622	24,135,622		7,663,086	SC	14,311,420	SC	21,974,506
1993		20,383,826	20,383,826				15,607,896	SC	15,607,896
1994		26,197,875	26,197,875	7,732,033			15,990,014	SC	15,990,014
1995		23,309,109	23,309,109	4,397,734			15,653,081	SC	15,653,081
1996		16,220,012	16,220,012				14,316,616	SC	14,316,616
1997		24,247,737	24,247,737		6,928,619	SC	15,619,626	SC	22,548,245

1998	11,886,708	11,886,708				SC	10,592,076
1999	26,517,894	26,517,894	3,116,006	SC	15,807,262	SC	18,917,268
2000	11,755,238	11,755,238			10,569,810	SC	10,569,810
2001	30,975,272	30,975,272	3,041,402	SC	15,302,863	SC	18,344,262
2002	24,690,676	EST					

1972* - EGGS TRANSFERRED FROM TUTTLE RIVER HATCHERY

1984* - MAJOR OUTBREAK OF BACTERIAL GILL DISEASE ALL FISH RELEASED IN FEBRUARY

1986* - 5.8 MILLION EGGS COLLECTED FROM FISH TRAP AT NORTH SHORE OF BONNEVILLE DAM & 1.1 MILLION EGGS IMPORTED FROM LITTLE WHITE SALMON NFH

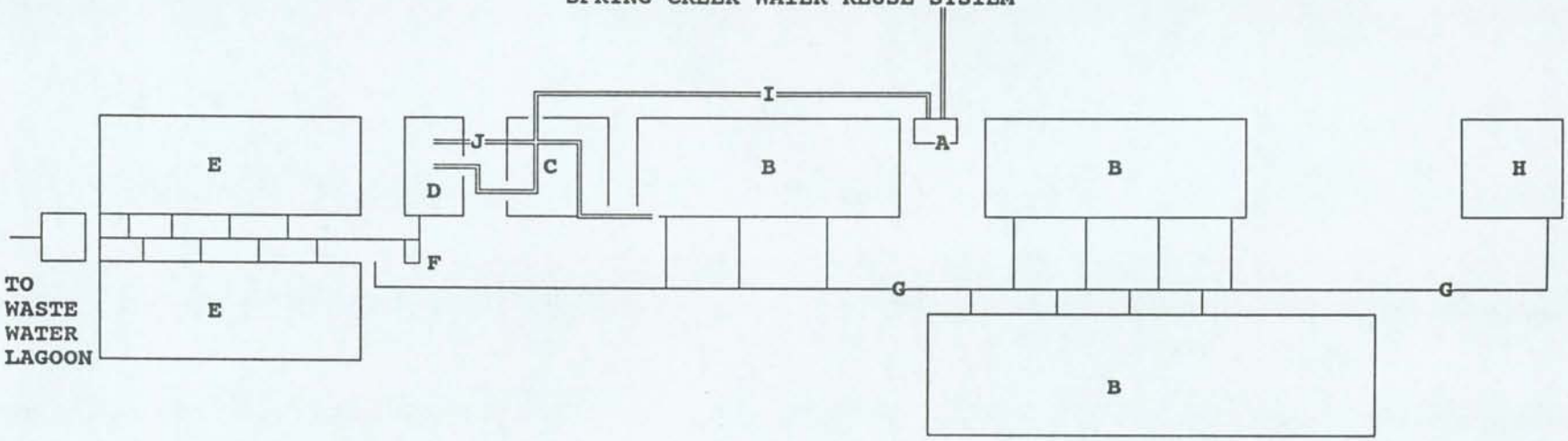
1987* - 2.3 MILLION EGGS FROM NST; 1.4 MILLION EGGS FROM ABERNATHY NFH & 6.1 MILLION EGGS FROM BONNEVILLE STATE HATCHERY.

1988* - 5.7 MILLION EGGS FROM NST; 13.6 MILLION EGGS FROM BONNEVILLE STATE HATCHERY

1989* - 4.3 MILLION EGGS FROM NST

Attachment 9. Spring Creek Water Reuse System.

SPRING CREEK WATER REUSE SYSTEM



1.) Water is supplied from six springs across Highway 14. Flow fluxuates from 1800 to 3000 G.P.M.

2.) Spring water (A) is diverted to Mechanical Building (C) where it is pumped into the Aeration Tower (D).

3.) Filter Beds (E) and Rearing Ponds (B) are filled with 3 million gallons. Aerator Pumps (F) are started.

4.) The Aerator Pumps (F) pump the filtered water into Aeration Tower (D) where water is mechanically re-aerated and flows by gravity to Rearing Ponds (B).

5.) From the ponds, water moves by gravity through the 78" line (G) to the Filter Beds.

6.) Filter Beds work on a down flow system. Water flows down through the Filter Beds and is collected into the Aeration Pit (F).

A. SPRING WATER DISTRIBUTION BOX
B. REARING PONDS
C. MECHANICAL BUILDING
D. AERATION TOWER
E. BIOLOGICAL FILTER
F. UNDERGROUND AERATION PIT AND AERATOR PUMPS
G. 78" WATER RETURN LINE
H. INCUBATION BUILDING
I. SPRING WATER SUPPLY LINE
J. POND WATER SUPPLY LINE

Attachment 10. Recommended Spawning Protocols for Pacific Salmon and Steelhead at U.S. Fish and Wildlife Service Hatcheries. Donald E. Compton author. Dated 12/1/02.

Recommended Spawning Protocols for Pacific Salmon and Steelhead at U.S. Fish & Wildlife Service Hatcheries

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(Updated December 1, 2002)

The mating of hatchery fish should strive to achieve two principal objectives: (1) maximize the effective number of breeders and (2) prevent natural selection for reproductive fitness in the artificial spawning environment. These objectives can be achieved if steps are taken to ensure that every selected adult has an equal probability of producing progeny. To achieve this goal, male and female hatchery fish can be mated in one of three, principal ways: pairwise (1 male:1 female), nested (e.g. 1 male to 2 or more females), or factorial (e.g. 2 x 2 spawning matrix).

Each of the spawning protocols described below represents a potential trade-off between maximizing the genetic/genotypic diversity of the progeny and ease of implementation. For example, simple pairwise mating between males and females is relatively easy to implement, but poor quality gametes from a particular male or female will result in a lost genetic contribution from two adults and not just the adult with poor gametes. Such pairwise spawning protocols should thus be implemented only in relatively large hatchery programs where hundreds, and perhaps at least 1,000, adults are spawned each year. Conversely, factorial mating designs (a.k.a. *matrix spawning*) will maximize the genetic contribution of each parent and the genotypic diversity of their progeny, but such protocols are very difficult to implement on large scales. Factorial spawning protocols are, thus, best reserved for small programs, particularly captive broodstock programs or similar programs where genetic conservation is the principal goal of the program. The various protocols are described briefly below.

Pairwise spawning: Pairwise mating of males and females is a production-oriented method that strives for equal genetic contribution by each parent to the progeny gene pool. This relatively straightforward method is recommended for large

broodstock programs where the number of males and female parents available for spawning each exceeds more than one-half of the desired effective number of breeders each year. These production types of programs typically spawn at least 500 males and 500 females each year. These programs are considered large enough such that losses of fertilized eggs (i.e. progeny) from single-pair matings (i.e. due to poor egg or sperm quality from a particular parent) are not considered a significant loss from a genetic management perspective. Under this spawning protocol, the genetic contribution from both parents will be loss if either parent has poor quality gametes. Hence, programs implementing strict pairwise spawning must be of sufficient size to absorb at least a 10-20% egg loss (or more) without dropping below the desired effective number of breeders.

Overlapping pairwise spawning: One variation of pairwise spawning is *overlapping* pairwise spawning. Under this protocol, milt from each of two males is added sequentially to the eggs of two females in an overlapping fashion. Approximately 30 seconds after the milt and eggs from a "primary" male and one female are combined, the milt from a second male is added to the first female's eggs as "back-up" in case the primary male has poor sperm quality. This second male then becomes the primary male for the next female spawner. The process is repeated until all males and females are spawned. At least 30 seconds should be allowed for the sequential addition of sperm between the primary and secondary males to minimize the potential effects of sperm competition (see below). This protocol is also recommended for "production" programs but where the total number of spawners may be less than 1,000 adults and the sex ratio is approximately equal.

Nested spawning: A nested design, or modified nested design, may be required if a shortage of one sex (or skewed sex ratio) precludes the use of strict pairwise mating or overlapping pairwise mating for achieving the desired effective number of breeders. Primary and secondary males may be implemented as described above for overlapping pairwise mating, but some modification may be necessary if the sex ratio is skewed (e.g. 40% males, 60% females). In such situations, some individuals from the least abundant sex are mated with two or more individuals of the more abundant sex. The general guideline is that the number of male and female spawners should be maximized, and individuals of the more abundant sex NOT excluded from spawning because of a lower number of adults of the other sex. Surpluses of one sex can compensate genetically for shortages of the other sex for achieving the desired effective number of breeders. However, as the sex ratio becomes more skewed, the total number of spawners necessary for achieving the desired effective number of breeders (Ne) will increase proportionately according to the formula: $Ne = 4NmNf/(Nm+Nf)$ where Nm = number of male spawners and Nf = number of female spawners. If Nm = Nf, then Ne = Nm + Nf.

Factorial spawning: Factorial spawning, commonly referred to as *matrix spawning*, will maximize the number of family groups and the *genotypic diversity* of the resulting progeny. The basic protocol is to first split the eggs from each of 2 to 5 females into 2 to 5 aliquots of approximately equal size, and then use 2-5 males to

fertilize the eggs of each female in a "checkerboard" or *matrix* fashion (e.g. 2x2, 3x3, etc.) This type of mating protocol can be very labor intensive and is usually impractical for large broodstock programs. Consequently, it is usually reserved for comparatively small, conservation broodstock programs where maximizing genotypic diversity among progeny is a high priority goal. In such situations, factorial mating can increase the effective population size above the total number of parents by reducing the variance in family size that results from variation in egg quality or sperm potency among individual parents.

Modified matrix spawning: The overall genetic objectives of matrix spawning (as described above) can be achieved by a modified version that substantially reduces the labor involved. In modified matrix spawning, eggs from 2 to 5 females are first pooled, mixed, and then apportioned into 2 to 5 aliquots, each with approximately equal numbers of eggs. Each aliquot is then fertilized by a different male. This spawning protocol can potentially maximize the number of pairwise spawning combinations with only a small amount of extra effort compared to pairwise or modified pairwise spawning. This approach has two drawbacks, though: (1) potential vertical transmission of pathogenic organisms from female parents to their progeny may preclude modified matrix spawning where fertilized eggs from female spawners must be segregated prior to pathogenic tests of female spawners (e.g. ELISA tests of adult, female spring chinook salmon for *Renibacterium* sp. prior to mixing of progeny), and (2) pedigrees of individual families cannot be maintained where such information is necessary (or highly desired) in conservation broodstock programs.

Sperm competition: Regardless of which mating protocol is used, milt from two or more males should not be combined in a single container of eggs except as described above for *overlapping pairwise mating.* Mixing milt from two or more males can substantially reduce the genetic contribution of one or more males due to sperm competition. Several studies have shown that when milt from two or more males are mixed simultaneously with unfertilized eggs, the eggs are often fertilized predominantly by one male (Gharrett and Shirley 1985; Withler 1988; Withler and Beacham 1994). Such *sperm competition* is common among internally fertilized animals where multiple males may mate with a single female (e.g. insects). Such sperm competition under hatchery conditions contrasts with male-dominance competition under natural conditions where males physically compete for female mates (e.g. fishes, mammals). Sperm competition under hatchery conditions not only reduces the effective number of breeders, but it can also impose an unknown amount of *domestication* or *artificial selection* in the hatchery environment for traits that may be correlated with sperm viability. For example, sperm competition resulting from pooling milt from two or more males can indirectly select for younger age at maturity (or smaller adult size) if sperm viability is negatively correlated with age at reproduction (e.g. as occurs in mammals and birds). Sperm competition can thus change the genetic composition of a hatchery population in unknown and potentially undesirable ways after several generations (i.e. if the milt of multiple males is pooled during spawning). The pooling of gametes from multiple males and females simultaneously in a single container (bucket) is the historical (or traditional) method of spawning salmonid fishes but is now recognized as

highly undesirable. Alternatively, one of the methods described above is now recommended. The exact method chosen will depend on the size of the program (i.e. total number of adult spawners) and the goals of the hatchery program.

Literature cited

Gharrett, A.J., and S.M. Shirley. 1985. A genetic examination of spawning methodology in a salmon hatchery. Aquaculture 47: 245-256.

Withler, R.E. 1988. Genetic consequences of fertilizing chinook salmon (*Oncorhynchus tshawytscha*) eggs with pooled milt. Aquaculture 68: 15-25.

Withler, R.E., and T.D. Beacham. 1994. Genetic consequences of the simultaneous or sequential addition of semen from multiple males during hatchery spawning of chinook salmon (*Oncorhynchus tshawytscha*). Aquaculture 126: 11-23.

Attachment 11. Spring Creek NFH Fish Health Quality Goals 1980-1992.

SPRING CREEK NATIONAL FISH HATCHERY QUALITY GOALS
DATED May 20th 2000

BROOD YEAR	ADULT CAPTURE (>7,000)	FEMALE DIP % (<= 2.0 %)	TOTAL DIP % (<= 5.0%)	GREEN FEMALE % (<= 2.0%)	F:M SPAWN RATIO (<= 2)	JACK SPAWN % (=> 2.0%)	EFFECTIVE POPULATION SIZE (=> 5,000)	EGG TAKE (MILLION) (>17.8)	% EYE-UP (= >95.0%)	% PONDED	NH3 (ppm) (<= 0.30)	D.I.* (<= 0.28)	F.I.* (<= 1.50)
1980	27021	15.10	15.60	29.10	6.56	0.00	4658	44.74	77.20		0.460	0.35	1.86
1981	30524	22.60	19.10	16.00	3.23	0.00	8272	40.65	81.70		0.295	0.26	1.36
1982	27447	32.10	35.90	19.40	4.11	0.00	7080	27.09	79.70		0.616	0.32	1.71
1983	10408	15.40	15.20	4.70	3.33	0.00	4353	22.87	85.70	84.90	0.533	0.33	1.73
1984	9507	1.10	3.80	6.40	4.71	0.00	3392	20.47	80.10	79.27	0.428	0.22	1.19
1985	5481	2.10	4.60	6.30	5.09	0.00	1916	13.54	85.90	84.89	0.325	0.29	1.26
1986	3389	3.80	7.10	3.30	3.92	0.00	1533	11.05	91.80	88.86	0.330	0.27	1.48
1987	3741	5.20	8.70	7.00	4.95	0.00	1664	11.61	81.96	77.69	0.412	0.27	1.50
1988	7448	4.80	7.90	2.90	5.86	0.00	2378	21.72	80.16	77.89	0.162	0.26	1.43
1989	4893	1.80	2.90	2.30	2.29	6.40	2821	12.20	93.00	86.50	0.269	0.31	1.52
1990	11434	22.10	18.10	1.60	3.33	N/A	3586	20.72	91.70	85.80	0.286	0.34	1.45
1991	13955	2.60	4.50	0.90	1.58	9.00	9499	33.30	95.50	90.10	0.309	0.30	1.50
1992	9169	2.30	4.40	0.40	1.74	N/A	6868	24.14	96.30	93.30	0.310	0.27	1.39
1993	8498	2.10	4.90	1.20	1.47	2.50	6795	20.45	96.11	87.00	0.320	0.28	1.44
1994	10989	1.35	2.65	0.94	1.35	3.30	9064	26.20	95.43	91.10	0.250	0.31	1.44
1995	10254	4.35	7.52	1.60	1.93	2.90	6730	23.31	93.10	90.90	0.34	0.29	1.42
1996	7934	5.74	11.62	0.97	1.55	4.02	5727	16.22	93.18	90.50	0.26	0.28	1.40
1997	8792	0.80	2.09	0.91	1.88	2.82	7451	24.25	96.63	94.30	0.17	0.31	1.39
1998	10179	2.14	2.28	0.90	1.55	5.87	4396	11.89	95.73	92.60	0.30	0.29	1.50
1999	14640	0.56	1.53	0.63	1.96	1.80	8228	26.52	97.35	94.80	0.41	0.31	1.50
2000	11347	11.15	12.00	0.29	1.48	4.84	3878	11.76	94.42	92.40	0.29	0.30	1.44
2001	48702	4.65	6.54	0.02	1.51	3.38	9978	30.98	91.94	88.10	0.55	0.30	1.41
2002													
AVE.=	13443	7.45	9.04	4.90	2.97	2.34	5467	22.53	89.76	87.94	0.35	0.29	1.47
Avg 1980-90	12845	11.46	12.63	9.00	4.31	0.64	3787	22.42	84.45	83.23	0.37	0.29	1.50
Avg 1991-presen	14042	3.43	5.46	0.80	1.64	4.04	7147	22.64	95.06	91.37	0.32	0.29	1.44
Avg last 5 yr	18732	3.86	4.89	0.55	1.68	3.74	6786	21.08	95.21	92.44	0.34	0.30	1.45

* = Highest average density and flow indexes attained in production year, as measured the day before release.

% POND MORTS (<= 2.5%)	Goedes Index Number March (<=20)	Goedes Index Number April (<=20)	Goedes Index Number May (<=20)	MILLIONS RELEASED	UNFED FRY RELEASED	SIZE AT RELEASE (#/LB) MARCH (<125)	SIZE AT RELEASE (#/LB) APRIL (<90)	SIZE AT RELEASE (#/LB) MAY (<60)	TOTAL SURVIVAL ALL REL GRPS (0.5%)	Total Survival March 0.8325	Total Survival April 1.5700	Total Survival May 1.5080	Ave 72-79
5.30				16.70	3349198	92	72	65	0.1883	0.1156	0.2443	0.2535	
10.50				13.70		110	78	49	0.3716	0.2425	0.3743	0.6963	
8.20				15.80			87	79	0.9775		0.9775		
8.30				13.90			74	64	0.1462		0.1462		
12.90				13.90					0.0465	0.0465			
7.90				10.60		124	69	39	0.1292	0.2583	0.0806	0.0512	
2.83	24.53	72.00	55.09	10.60		83	61	37	0.4333	0.4616	0.7361	0.0879	
1.80		35.53	46.08	8.80			67	35	0.3093		0.4607	0.2046	
9.50	33.77	20.63	41.90	15.31		116	68	37	0.5157	0.5865	0.5615	0.4343	
3.10	45.44	50.00	91.56	10.23		108	63	36	0.5120	0.4328	0.6477	0.4538	
2.30	29.01	35.61	44.38	14.35		123	67	42	0.1372	0.1040	0.1299	0.1781	
4.50	37.45	43.41	49.31	15.90	3292304	112	53	36	0.1514	0.1221	0.3191	0.0057	
3.70	38.99	43.54	52.07	14.30	7663086	137	91	50	0.1606	0.2551	0.1134	0.2819	
2.80	23.21	29.59	24.21	15.40		128	83	42	0.2612	0.1575	0.3527	0.1302	
1.20	38.27	36.37	22.14	15.65		114	78	45	0.0743	0.0890	0.0630	0.0888	
2.51	43.22	27.96	28.93	16.44		124	77	45	0.0444	0.0692	0.0305	0.0323	
2.02	19.34	20.36	21.11	14.55		120	69	43	0.4655	0.3413	0.5022	0.5557	
1.91	25.80	16.80	20.00	15.62	6928619	112	61	40	0.0677	0.0736	0.0904	0.0395	
3.72	28.20	31.04	32.99	10.59		116	75	60	0.2787	0.2157	0.3460	0.2747	
2.82	22.22	20.75	19.82	16.07	3116006	122	68	39					
2.69	17.69	84.40		10.57		120	68						
2.08	49.60	63.10	33.19	16.12	3041402	118	101	49					
4.66	31.78	39.44	38.85	13.87	4,565,103	116	73	47	0.28	0.22	0.34	0.24	Avg
6.60	33.19	42.75	55.80	13.08		108	71	48	0.3424	0.2810	0.4359	0.2950	Avg 1980-90
2.72	31.27	37.94	30.38	14.66		120	75	45	0.1929	0.1724	0.2302	0.1824	Avg 1991-96
2.64	28.70	43.22	26.50	13.79	4362009	118	75	47					

Attachment 12. FIS Deferred Maintenance – Five Year Plan (Fiscal Years 2003-2007), Spring Creek NFH Maintenance Projects.

National Fish Hatchery System, U. S. Fish and Wildlife Service, Department of the Interior

Proj. No.	DOI Score	Region	Facility or Unit Name	State	Cong. Dist.		Ranking Category CHS CRP CM C&O	Total $
9999	300	1	Spring Creek NFH	WA	03	"COMPLETED" Remove/replace w/ above ground tanks. Underground tanks are out of compliance, with imminent deadline violation. Gas tank in place-needs barrier wall to protect river. Above ground generator diesel tank on hand but not on line, needs pad, day tank, properly designed protections. The old underground diesel tank is still in operation.	0 0 0 100	57,000
13255.1995002	4	153					CI CURRENT 9999.999 PREVIOUS CHG?	
1,203,950	R						57000	
570	87000							
4087	650	1	Spring Creek NFH	WA	03	"COMPLETED" Rehabilitate spring water collection system for domestic water supply. System needs to be updated to protect the health of employees and their families. Half open collection box leaves springs open to bird droppings, amphibians, or human transmitted pathogens. New pressure tank needed to provide proper pressure in residences.	50 0 0 50	9,350
13255.1995003	1	63					CI CURRENT 2004.087 PREVIOUS CHG?	
1,203,950	Q						9350	
214	9350							
9999	490	1	Spring Creek NFH	WA	03	Resurface 1/2 mile entrance road. Entrance road in disrepair with large potholes, cracks and asphalt breaking up. Road is used by thousands of visitors for river access and hatchery entrance. Vehicles drive on wrong side of the road to avoid sections of road. Lewis and Clark inspired visitation is expected to increase use. Vehicle accidents may be caused by conditions.	0 30 70 0	94,000
13255.1999002	4	999					CI CURRENT 9999.999 PREVIOUS CHG?	
1,203,950	R						94000	
320	94000							
9999	700	1	Spring Creek NFH	WA	03	"COMPLETED" Replace deteriorated 25 year old forklift which has become unreliable with heavy loads. Occasionally, if the load is heavy, the hydraulics do not hold and the load will actually began to come down. This equipment is not safe for employees who operate and work around. Lift is used to unload fish feed and move large loads of processed salmon carcasses.	50 0 50 0	22,000
13255.1999004	1	72					CI CURRENT 9999.999 PREVIOUS CHG?	
1,203,950	E						22000	
780	22000							
4085	670	1	Spring Creek NFH	WA	03	"NO LONGER NEEDED" Rehab flat, non-draining (accumulates up to 3" rain), leaking roof in office/visitors complex. Currently past replacement schedule. Roof leaks and contributes to further damage to facility . High winds, heavy rains take toll on building. Station rears chinook salmon, important resource to Tribes that aided Lewis and Clark on their journey.	0 90 10 0	76,000
13255.1999005	7	60					CI CURRENT 2004.085 PREVIOUS CHG?	
1,203,950	R						76000	
104	76000							
7048	550	1	Spring Creek NFH	WA	03	"COMPLETED" Replace gaskets on 18 rotating gates - during years of drought hatchery water supply drops - water leaking through gates is critical to water quality and the environment in hatchery's reuse system. Deteriorating water quality in 90% reuse system puts stress on fish may cause catastrophic fish losses.	0 50 50 0	176,000
13255.1999006	3	124					CI CURRENT 2007.048 PREVIOUS CHG?	
1,203,950	R						176000	
440	17600							

National Fish Hatchery System, U. S. Fish and Wildlife Service, Department of the Interior

GO2entr

Proj. No.	DOI Score	Region	Facility or Unit Name	State	Cong. Dist.		Ranking Category CHS	CRP	CM	C&O	Total $
6126	400	1	Spring Creek NFH	WA	03	Rehab Big White substation of hatchery complex - Phase 1 (design). Age /wear of facilities dictate rehab of substation, incorporating proper sized ponds, water delivery systems, electrical systems, etc. Worn systems affect ability of crew to properly propagate Pacific salmon. Because of changes in river geomorphology, ponds are under water during flooding events.	0	0	100	0	81,000
13255.1999009		12	143				CI				
1,203,950	R						CURRENT	PREVIOUS	CHG?		
444	81000						2006.126				
											81000
3062	700	1	Spring Creek NFH	WA	03	Enclose biological filter beds for water supply reuse system that is partial water supply essential for salmon production. This will allow for more efficient operation by retaining heat and promoting bacteria growth. Thus improving water quality, health and growth of salmon smolts. Restoration and management of interjurisdictional salmon populations affected.	0	100	0	0	351,000
13255.1999011		11	603				CI				
1,203,950	R						CURRENT	PREVIOUS	CHG?		
440	35100						2003.062				
											351000
7028	580	1	Spring Creek NFH	WA	03	Replace existing radio alarm system to meet new Service standards. System is used to alert off duty employee about potential problems ocurring in the reuse system. If alarm system fails the loss of fish production could occur.	0	60	40	0	22,000
13255.2000001		8	602				CI				
1,203,950	R						CURRENT	PREVIOUS	CHG?		
218	22000						2007.028				
											22000
9999	550	1	Spring Creek NFH	WA	03	"COMPLETED" Replace 1989 pickup with over 90,000 miles. Vehicle essential to hauling fish cultural supplies, moving fish, and general maintenance task. Constant repairs becoming expensive and vehicle is not always usable when it is needed. Restoration of Pacific salmon program impacted.	0	50	50	0	20,000
13255.2000002		5	149				CI				
1,203,950	E						CURRENT	PREVIOUS	CHG?		
778	20000						9999.999				
											20000
9999	440	1	Spring Creek NFH	WA	03	"COMPLETED" Replace 1991 Dodge Van Wagon with over 80,000 miles.	20	0	0	80	20,000
13255.2000003		9	603				CI				
1,203,950	E						CURRENT	PREVIOUS	CHG?		
777	20000						9999.999				
											20000
9999	440	1	Spring Creek NFH	WA	03	Replace 1994 Ford Aerostar Van Wagon with over 72,000 miles.	20	0	0	80	21,000
13255.2000004		10	999				CI				
1,203,950	E						CURRENT	PREVIOUS	CHG?		
777	21000						9999.999				
											21000

National Fish Hatchery System, U. S. Fish and Wildlife Service, Department of the Interior

GO2entr

Proj. No.	DOI Score	Region	Facility or Unit Name	State	Cong. Dist.		Ranking Category CHS CRP CM C&O	Total $
2028	760	1	Spring Creek NFH	WA	03	"DONE WITH FY02 FUNDS" Replace 44 12" pond valves, 44 8" pond values with actuators. Worn condition of current valves decreases pond water flows, affects quality of fish produced (Pacific salmon restoration). Failure to rehab/replace will result in great risk to program and of higher costs long term. Extensive corrosion risks stressing workers backs when operating valves.	20 80 0 0	103,000
13255.2000005	11	8					CI	
1,203,950	R						CURRENT 2002.028	PREVIOUS CHG? 103000
440	10300							
7072	520	1	Spring Creek NFH	WA	03	The feed storage building floor has a false floor covered with plywood. Underneath is a four foot crawl space. This area has been inhabitated by mice which have been difficult to control. Due to health concerns the floor needs to be replaced with a solid floor thus eliminating this area where mice breed. Space needs to be filled with concrete.	20 0 80 0	94,000
13255.2001002	999	128					CI	
1,203,950	R						CURRENT 2007.072	PREVIOUS CHG? 94000
110	94000							
3031	820	1	Spring Creek NFH	WA	03	The electrical panel has been abandoned except for one breaker. The remainder of the panel is a home for mice. Efforts to eliminate the mice have failed. The panel needs to be removed and area cleaned. This is a health priority for the facility.	70 0 30 0	26,000
13255.2001003	999	999					CI	
1,203,950	R						CURRENT 2003.031	PREVIOUS CHG? 26000
110	26000							
9999	350	1	Spring Creek NFH	WA	03	"COMPLETED" Old roof in need of replacement. Last replaced in 1986.	0 0 50 50	800
13255.2001004	999	999					CI	
1,203,950	Q						CURRENT 9999.999	PREVIOUS CHG? 800
105	8000							
9999	350	1	Spring Creek NFH	WA	03	"COMPLETED" Old roof in need of relacement. Last replaced in 1986.	0 0 50 50	800
13255.2001005	999	999					CI	
1,203,950	Q						CURRENT 9999.999	PREVIOUS CHG? 800
105	8000							
9999	375	1	Spring Creek NFH		03	"COMPLETED" Replace twelve year old electic cart use to transport fish food. Vehicle is constantly in disrepair,	0 0 75 25	6,000
13255.2001006	999	999					CI	
1,203,950	E						CURRENT 9999.999	PREVIOUS CHG? 6000
785	6000							

National Fish Hatchery System, U. S. Fish and Wildlife Service, Department of the Interior

GO2entr

Proj. No.	DOI Score	Region	Facility or Unit Name	State	Cong. Dist.		Ranking Category CHS	CRP	CM	C&O	Total $
9999	300	1	Spring Creek NFH		03	Paint interior of residence. Last painted in 1989.	0	0	0	100	6,000
13255.2001007		999	999				CI				
1,203,950	Q						CURRENT	PREVIOUS	CHG?		
105	6000						9999.999	6000			
9999	300	1	Spring Creek NFH	WA	03	Asphalt access road to quarters is in disrepair and needs to be repaved.	0	0	0	100	18,000
13255.2002001		999	999				CI				
1,203,950	Q						CURRENT	PREVIOUS	CHG?		
321	18000						9999.999	18000			
9999	0	1	Spring Creek NFH	WA	03	Replace 1983 Hyster forklift - 2 to 4 ton capacity- unit is in constant disrepair	0	0	0	0	18,000
13255.2002002		999	999				CI				
1,203,950	E						CURRENT	PREVIOUS	CHG?		
780	18000						9999.999	0			
999	0	1	Spring Creek NFH	WA	03	Replace existing shingled roof with metal roof. Last replaced in 1986.	0	0	0	0	9,000
13255.2003001		999	999				CI				
1,203,950	Q						CURRENT	PREVIOUS	CHG?		
105	9000							0			
999	0	1	Spring Creek NFH	WA	03	Replace existing shingle roof with metal roof on residence #5. Last replaced in 1986	0	0	0	0	9,000
13255.2003002		999	999				CI				
1,203,950	Q						CURRENT	PREVIOUS	CHG?		
105	9000							0			

Attachment 13. Memorandum to Fishery Project Leaders – Subject: Occupancy of Government Quarters at Spring Creek NFH.

April 10, 1998

Memorandum

To: Employees
Spring Creek NFH

From: Project Leader
Spring Creek NFH

Subject: Occupancy of Government Quarters at Spring Creek National Fish Hatchery

The intent of having hatchery personnel in government quarters is for security and operations of the hatchery during non-working hours. Quick response time to emergency situations and the knowledge to respond to those emergencies is needed. Employees living in government quarters allows for the quickest response time.

The policy for the hatchery will be to have at least three of the four residences in required occupancy status. The preferred positions for required occupancy will be the Lead Maintenance position, the Lead Fish Culturist and the Assistant Manager. Other employees may request residence, if vacant quarters are available, and may request required status. The required occupancy will be included on position descriptions. These preferred positions will always have priority for housing and other employees living in station housing may be asked to vacate.

Employees must request to be removed from required status and follow procedures outlined in the U.S. Fish and Wildlife Policy on Required Occupancy in Government Furnished Quarters. This procedure requires approval of Project Leader and Regional Director. These decisions will be decided on a case by case basis.

Attachment 14. Memorandum to Employees of Spring Creek NFH – Subject: Surplus Fish as Government Property. Dated 7/10/2001.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
911 NE. 11th Avenue
Portland, Oregon 97232-4181

IN REPLY REFER TO
AFR

JUL 10 2001

Memorandum

To: Fishery Project Leaders

From: Regional Director, Region 1
Portland, Oregon

Subject: Surplus Fish as Government Property

The Hatchery system in Region 1 is currently enjoying success with increasing returns of adult fish. This success is due in no small part to the dedication of Service Fisheries employees who have worked tirelessly to ensure the Hatchery system produces quality fish. However, it is important that all Service employees honor the public trust placed in them as stewards of the Nation's resources and administrators of public property.

With this memorandum I want to emphasize that 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. The attached Standards of Ethical Conduct for Employees of the Executive Branch, contained in 5 CFR 2635.704, specifically address use of Government property. Please review and be acquainted with these standards. Also, please ensure that all your employees read and understand this memorandum.

It is important that you first consider all possible uses of hatchery fish that are consistent with the Service Mission. Surplus fish must be disposed of using prescribed government contracting procedures. Furthermore, you must comply with other Service and FDA policies related to the disposition of carcasses and parts that have been treated with chemicals making them unfit for human consumption. Should you have any questions regarding this policy, please contact the Assistant Regional Director, Fishery Resources, through your supervisor.

Attachment

Attachment 15. Memorandum from ARD Fisheries Region 1 – Subject: Guidance on the use of anesthetics, drugs, and other chemicals. Dated 11/9/00.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
911 NE. 11th Avenue
Portland, Oregon 97232-4181

IN REPLY REFER TO:
AFR

NOV - 9 2000

Memorandum

To: Region 1 Fisheries Project Leaders

From: Assistant Regional Director, Fishery Resources

Subject: Guidance on Clove Oil and Other Fisheries Use Drugs and Chemicals

Hatcheries and other Fisheries offices within Region 1 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 (see attached copy) from the FDA concerning the use of compounds in the recovery of threatened and endangered species, but there are certain restrictions even in those situations.

This document is intended to review the use of aquatic animal drugs for Fisheries Projects and provide guidance on their proper use in food animals. Attached are summaries of drugs and chemicals that are approved for aquatic animal use, considered Low Regulatory Priority for use in aquiculture, on the deferred regulatory list for aquiculture, and INAD permitted chemicals. Also attached are the FDA criteria for veterinary extra label use of approved human and animal drugs and a glossary of terms commonly used by FDA and others involved with the use of drugs and chemicals.

Region 1, working closely with the National INAD Office (NIO) 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.

The use of clove oil as an anesthetic in food fish has been declared illegal by the Center for Veterinary Medicine (CVM) of the FDA. Until notified otherwise by the CVM, a fish is a food fish if it is reasonably likely that it will be consumed directly or indirectly by humans for food. Non-food fish salmon, steelhead, or trout are those to be rendered, buried, or released to the wild where they are not subject to harvest in legal fisheries. If a fish to be treated is not a food fish, then clove oil can be used as an anesthetic. However, juvenile fish cannot be anesthetized using

clove oil because of possible residual effects[1] (this excludes listed fish which are not harvested in legal fisheries as adults). If fish anesthetized with clove oil are rendered, the rendering plant operator who receives the fish must be notified in writing of this treatment; the same is true for MS-222 if its established 21-day withdrawal period is not observed. If the fish is outplanted, the Service must be assured that it will not be harvested in a legal fishery. These situations will be treated on a case-by-case basis and will need written approval from the Assistant Regional Director, Fishery Resources. Please notify your supervisor if you feel you have a non-food fish that would be appropriate for clove oil treatment.

The Service believes that its mission and goals can be achieved within the existing framework of allowable drug and chemical use, but recognizes the pressing needs for additional safe and effective drugs to facilitate recovery and restoration efforts. The Service continues to support the efforts of the National INAD Office, fisheries professionals, and the FDA by supplying data and working towards the registration and labeling of new chemotherapeutic compounds.

Attachment 1: Letter from FDA on the use of drugs in Threatened and Endangered Species
Attachment 2: Form TE-1, "Guide for Reporting Shipment/Receipt of Unapproved Drugs for Use on Threatened and Endangered Fish Species," and Form TE-2, "Chemical Use Log for the Use of Unapproved Drugs on Threatened and Endangered Fish Species."
Attachment 3: List of FDA Approved Compounds for Use in Aquatic Animals
Attachment 4: FDA Compliance Policy Guide 1240.4200: Drug use in Aquiculture Enforcement Priorities. Includes the lists of compounds FDA considers to be of Low Regulatory Priority, Deferred Regulatory Priority, and High Regulatory Priority for enforcement
Attachment 5: List of FDA INAD Permitted compounds and their sponsors
Attachment 6: FDA Compliance Policy Guide 1240.4210 Extralabel Use of Approved Drugs in Aquiculture
Attachment 7: Glossary of terms frequently encountered in chemotherapeutic compound registration and use.
Attachment 8: Clove oil fact sheet
Attachment 9: FDA Compliance Policy Guide 1240-4260: Classification of Aquaculture Species/Population as Food or Nonfood Animal
Attachment 10: Use of Unapproved Drugs in Culturing Endangered and Threatened Fish Species (02/06/96)
Attachment 11: Use of Unapproved Drugs in Culturing Endangered and Threatened Fish Species (03/04/96)

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[1]If a drug is not covered by an INAD exemption permit it has no established withdrawal period, or more precisely, the drug must be considered to be present in a residual form into adulthood when it is subject to harvest in a legal fishery. On the other hand, juvenile fish exposed to MS-222 or drugs under an INAD exemption permit that have an FDA-specified withdrawal time could be stocked immediately following treatment, as this period of time would elapse before the fish could be legally harvested.

cc:
Fisheries Line Supervisors (Dunn, Johnson, Hillwig, Zylstra)
Ed Forner, Chief, Hatcheries
Dave Erdahl, USFWS, Bozeman, Montana
Joy Evered, USFWS, Olympia FHC