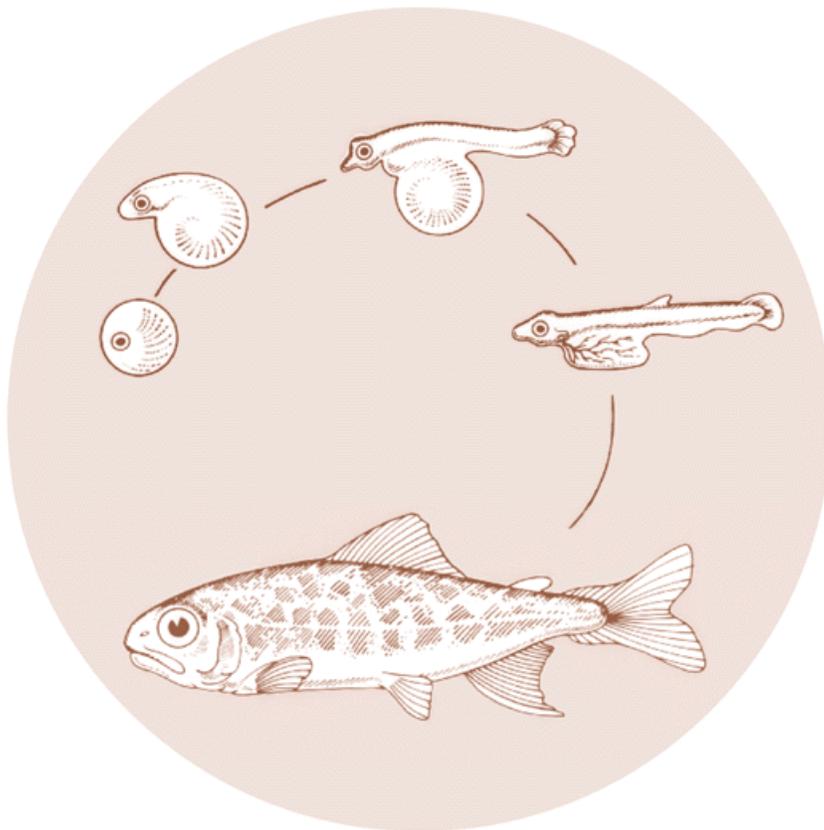


July 1990

# ASSESSMENT OF PRESENT ANADROMOUS FISH PRODUCTION FACILITIES IN THE COLUMBIA RIVER BASIN

Final Report



DOE/BP-98379-1



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ASSESSMENT OF PRESENT ANADROMOUS FISH PRODUCTION  
FACILITIES IN THE COLUMBIA RIVER BASIN

U.S. FISH AND WILDLIFE SERVICE HATCHERIES

Final Report

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## ABSTRACT

The goal of this report is to document current production practices for hatcheries which rear anadromous fish in the Columbia River Basin and to identify those facilities where production can be increased.

A total of 85 hatchery and satellite facilities operated by the IDFG, ODFW, USFWS, WDF, and WDW were evaluated. The years 1985 to 1987 were used in this evaluation. During those years, releases averaged 143,306,596 smolts weighing 7,693,589 pounds.

A total of 48 hatchery or satellite facilities were identified as having expansion capability. They were estimated to have the potential for increasing production by an 84,448,000 smolts weighing 4,853,306 pounds.

## ACKNOWLEDGMENTS

This project has been a time consuming endeavor that has taken over two years from the initial discussions to complete. It could not have been completed without the cooperation of the various fisheries agencies, tribes, Bonneville Power Administration, and others interested in improving the runs of anadromous fish in the Columbia Basin. We wish to thank all who contributed by providing data and/or comments concerning the many drafts. We also wish to recognize the agency personnel who provided the raw data and helpful suggestions that went into this report. They were:

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John Kerwin, Washington Department of Wildlife  
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## INTRODUCTION

The Pacific Northwest Electric Power Planning and Conservation Act, 1980 (16 U.S.C. 839, PL 96-501) passed by Congress, designated for the first time that fish and wildlife resources in the Columbia Basin should receive equitable consideration with power and other water users in resource allocation. The Act called for appointment of a council to guide the regions resource decisions and the resultant Northwest Power Planning Council (NPPC) was formed. The subsequent Fish and Wildlife Program (FWP) was designed to restore anadromous fish resources to previously abundant numbers. The Bonneville Power Administration (BPA), as the federal entity responsible for marketing much of the electrical power produced in the Northwest, is the principle source for funding of the FWP.

The interim goal of the NPPC is a doubling of the anadromous fish run produced in the Columbia Basin. To achieve this goal will require a mix of natural and artificial production. This report is designed to be used in conjunction with sub-basin plans currently being developed by the fishery agencies. In this report, policy and management personnel are being provided with sufficient information to allow informed decisions with regard to artificial production.

To aid in the implementation of the FWP, the NPPC set up Technical Work Groups (TWG) for coordinating and recommending fisheries research. The Hatchery Effectiveness TWG included a hatchery capacity evaluation as a high priority in their five year research plan. This resulted in BPA funding this hatchery capacity evaluation entitled "Assess Present Anadromous Fish Production Facilities in the Columbia River Basin."

In addition to documenting current production practices the goal of this evaluation is to identify hatcheries where production can be increased by one of the following methods: increase funding only, provision of additional water to existing facilities, or provision of additional pond space and/or water. Implementation of the last two also assume there is room for expansion, the potential for developing additional water supplies is good, and adequate operation and maintenance funding are available. This information is required to effectively evaluate options for expansion of existing hatcheries or construction of new ones which can easily cost 20 to 30 million dollars each.

This anadromous hatchery capacity evaluation was designed to summarize information and data which the fishery agencies were already collecting and had readily available. The evaluation was not designed to fill gaps in existing information or to create a multiple year study. Information gathered in a previous report to BPA titled "Survey of Artificial Production of Anadromous Salmonids in the Columbia River Basin" was 'utilized where applicable (Washington 1985).

The 1985 to 1987 juvenile release years were chosen for evaluation

in this report. These years were chosen because 1987 was the last year data had been finalized by each agency when this process began and three complete years of information were required. Only data on public facilities have been summarized. No information is included for private facilities such as Sea Resources in Washington or Clatsop Economic Development Commission in Oregon.

The National Marine Fisheries Service (NMFS), Environmental and Technical Services Division, in Portland, Oregon, volunteered to coordinate this evaluation and provide the final report. State and federal fishery agencies responsible for operating anadromous fish hatcheries in the basin supplied the data and reviewed this report for accuracy.

The operating agencies should be contacted to obtain additional information on hatchery operations not provided in this report. Appendix "A1" provides addresses and phone numbers for each agency. The following agencies operate anadromous hatcheries in the Columbia Basin and supplied data:

1. Idaho Department of Fish and Game (IDFG)
2. Oregon Department of Fish and Wildlife (ODFW)
3. United States Fish and Wildlife Service (USFWS)
4. Washington Department of Fisheries (WDF)
5. Washington Department of Wildlife (WDW)

The 5 agencies operated a total of 85 hatcheries and satellite facilities devoted to rearing anadromous fish (Table 1). Hatcheries are described as facilities operated year round while satellites are only operated part of the year and are managed by personnel from a parent hatchery. These facilities are located in the states of Oregon, Washington, and Idaho (Tables 2 to 6). Releases from these hatcheries averaged 143,306,596 smolts weighing 7,693,589 pounds during the three years evaluated (Table 7).

Table 1. Number Of Hatcheries And Satellite Facilities Rearing Anadromous Fish In The Columbia Basin And Included In This Evaluation, By Agency.

Agency	Number	Location
IDFG	9	Idaho, Oregon
ODFW	29	Oregon
USFWS	14	Oregon, Washington, Idaho
WDF	16	Washington
WDW	17	Washington
Total	85	

Table 2. Anadromous Fish Hatcheries And Juvenile Satellite Facilities Included In This Evaluation Operated By The Idaho Department Of Fish And Game In The Columbia River Basin.

Hatchery	Location In Columbia Basin	Closest Town
Magic Valley	Snake River Basin	Filer, Id
McCall	Snake River Basin	McCall, Id
Niagara Springs	Snake River Basin	Wendell, Id
Oxbow	Snake River Basin	Oxbow Dam, Or.
Pahsimeroi	Snake River Basin	Ellis, Id
Powell Satellite *	Snake River Basin	
Red River Pond *	Snake River Basin	Elk City, Id
Rapid River	Snake River Basin	Riggins, Id
Sawtooth	Snake River Basin	Stanley, Id

\* Will be operated as satellite facilities to the Clearwater Hatchery when it is completed in 1992.

Table 3. Anadromous Fish Hatcheries And Juvenile Satellite Facilities Included In This Evaluation Operated By The Oregon Department Of Fish And Wildlife In The Columbia River Basin.

Hatchery	Location In Columbia Basin	Closest Town
Big Creek	Below Bonneville Dam	Astoria, Or.
Bonneville	Below Bonneville Dam	Cascade Locks, Or.
Gnat Creek	Below Bonneville Dam	Clatskanie, Or.
Trojan Ponds *	Below Bonneville Dam	Clatskanie, Or.
Klaskanine	Below Bonneville Dam	Astoria, Or.
Sandy	Below Bonneville Dam	Sandy, Or.
Clackamas	Willamette Basin	Estacada, Or.
Leaburg	Willamette Basin	Leaburg, Or.
Marion Forks	Willamette Basin	Idanha, Or.
McKenzie River	Willamette Basin	Springfield, Or.
Roaring River	Willamette Basin	Albany, Or.
South Santiam	Willamette Basin	Sweet Home, Or.
Aumsville Ponds *	Willamette Basin	Aumsville, Or.
Stayton Pond	Willamette Basin	Stayton, Or.
Willamette	Willamette Basin	Oakridge, Or.
Dexter Pond *	Willamette Basin	Lowell, Or.
Cascade	Bon. Dam to Snake River	Cascade Locks, Or.
Irrigon	Bon. Dam to Snake River	Irrigon, Or.
Oak Springs	Bon. Dam to Snake River	Maupin, Or.
Oxbow	Bon. Dam to Snake River	Cascade Locks, Or.
Herman Cr. Ponds *	Bon. Dam to Snake River	Cascade Locks, Or.
Wahkenna Pond *	Below Bonneville Dam	Cascade Locks, Or.
Round Butte	Bon. Dam to Snake River	Madras, Or.
Pelton Ladder	Bon. Dam to Snake River	Madras, Or.
Lookingglass	Snake River Basin	Palmer Junction, Or
Imnaha Pond	Snake River Basin	Imnaha, Or.

Table 3. Continued

Hatchery	Location In Columbia Basin	Closest Town
Wallowa	Snake River Basin	Enterprise, Or
Big Canyon Ponds *	Snake River Basin	Minam, Or.
Little Sheep Cr Pd*	Snake River Basin	Imnaha, Or.

\* Operated as Satellite Facilities

Table 4. Anadromous Fish Hatcheries And Juvenile Satellite Facilities Included In This Evaluation Operated By The U.S. Fish And Wildlife Service In The Columbia River Basin.

Hatchery	Location In Columbia Basin	Closest Town
Abernathy SCTC	Below Bonneville Dam	Long-view, Wa.
Eagle Creek NFH	Willamette Basin	Estacada, Or.
Carson NFH	Bon. Dam to Snake River	Carson, Wa.
Little White Sal.	Bon. Dam to Snake River	Cook, Wa.
Willard NFH	Bon. Dam to Snake River	Cook, Wa.
Spring Creek	Bon. Dam to Snake River	Underwood, Wa.
Big White Pond *	Bon. Dam to Snake River	Underwood, Wa.
Warm Springs NFH	Bon. Dam to Snake River	Warm Springs, Or.
Entiat NFH	Col. Basin above Snake R.	Entiat, Wa.
Leavenworth NFH	Col. Basin above Snake R.	Leavenworth, Wa.
Winthrop NFH	Col. Basin above Snake R.	Winthrop, Wa.
Dworshak NFH	Snake River Basin	Ahsahka, Id.
Kooskia NFH	Snake River Basin	Kooskia, Id.
Hagerman NFH	Snake River Basin	Hagerman, Id.

\* Operated as a Satellite Facility

Table 5. Anadromous Fish Hatcheries And Juvenile Satellite Facilities Included In This Evaluation Operated By The Washington Department of Fisheries In The Columbia River Basin.

Hatchery	Location In Columbia Basin	Closest Town
Cowlitz Salmon	Below Bonneville Dam	Salkum, Wa.
Elokomin	Below Bonneville Dam	Cathlamet, Wa.
Grays River	Below Bonneville Dam	Grays River, Wa.
Weyco Pond *	Below Bonneville Dam	Grays River, Wa.
Kalama Falls	Below Bonneville Dam	Kalama, Wa.
Lower Xalama	Below Bonneville Dam	Kalama, Wa.
Lewis River	Below Bonneville Dam	Woodland, Wa.
Speelyai	Below Bonneville Dam	Ariel, Wa.
Toutle	Below Bonneville Dam	Toutle, Wa.
Washougal	Below Bonneville Dam	Washougal, Wa.
Klickitat	Bon. Dam to Snake River	Glenwood, Wa.
Priest Rapids	Col. Basin above Snake R.	Mattawa, Wa.
Ringold Salmon Pond	Col. Basin above Snake R.	Mesa, Wa.
Rocky Reach	Col. Basin above Snake R.	E. Wenatchee, Wa.
Wells Salmon	Col. Basin above Snake R.	Pateros, Wa.
Lyons Ferry Salmon	Snake River Basin	Lyons Ferry, Wa.

\* Operated as a Satellite Facility

Table 6. Anadromous Fish Hatcheries And Juvenile Satellite Facilities Included In This Evaluation Operated By The Washington Department Of Wildlife In The Columbia River Basin.

Hatchery	Location In Columbia Basin	Closest Town
Beaver Creek	Below Bonneville Dam	Cathlamet, Wa.
Cowlitz Trout	Below Bonneville Dam	Winlock, Wa.
Gobar Pond	Below Bonneville Dam	Kalama, Wa.
Skamania	Below Bonneville Dam	Washougal, Wa.
Vancouver	Below Bonneville Dam	Vancouver, Wa.
Chelan PUD	Col. Basin above Snake R.	Chelan Falls, Wa.
Naches	Col. Basin above Snake R.	Naches, Wa.
Nelson Springs *	Col. Basin above Snake R.	Naches, Wa.
Ringold Trout Pond	Col. Basin above Snake R.	Mesa, Wa.
Turtle Rock	Col. Basin above Snake R.	E. Wenatchee, Wa.
Wells Trout	Col Basin above Snake R.	Pateros, Wa.
Yakima Trout	Col. Basin above Snake R.	Yakima, Wa.
Lyons Ferry Trout	Snake River Basin	Lyons Ferry, Wa.
Cottonwood Pond *	Snake River Basin	Asotin, Wa.
Tucannon Hatchery *	Snake River Basin	Pomeroy, Wa.
Curl Lake *	Snake River Basin	Pomeroy, Wa.
Dayton Pond *	Snake River Basin	Dayton, Wa.

\* Operated as Satellite Facilities

**Table 7. Summary Of Smolt Releases Made From Hatcheries Rearing Anadromous Fish In The Columbia River Basin.**

Agency	1985		1986		1987		3 Year Average	
	Numbers	Pounds	Numbers	Pounds	Numbers	Pounds	Number	Pounds
<b>IDFG</b>	6,068,894	<b>462,324</b>	5,863,152	<b>507,768</b>	8,562,600	<b>728,210</b>	6,831,549	<b>566,101</b>
<b>ODFW</b>	36,566,439	2,211,795	42,703,334	2,202,552	46,593,424	2,350,680	41,954,399	2,255,009
<b>USFWS</b>	21,153,938	1,409,515	35,422,782	1,974,484	30,632,436	1,960,689	29,069,719	1,781,563
<b>VDF</b>	53,938,979	2,197,389	<b>66,098,677</b>	2,464,092	63,171,986	2,283,541	61,069,881	2,315,007
<b>VDW</b>	4,167,312	<b>707,050</b>	4,286,585	<b>723,524</b>	4,689,249	<b>897,153</b>	4,381,049	<b>775,909</b>
<b>TOTAL</b>	121,895,562	6,988,073	154,374,530	7,872,420	153,649,695	8,220,273	143,306,596	7,693,589

The objectives of this report are to identify production constraints and expansion capabilities at existing hatcheries. It is expected that management and policy personnel for the fishery agencies, tribes, BPA, and NPPC will utilize this document in their planning process to meet the goal of doubling the run of anadromous fish into the Columbia River Basin.

### Data Collection Forms

Information used in this report was compiled in data collection forms completed by the operating agencies. The summary tables in the individual agency sections summarize data submitted on the collection forms. Blank copies of the data collection forms are presented in the appendix.

The data collection forms were divided into 3 parts as follows:

Part I. Existing Capacity: Includes basic information for all public hatcheries rearing anadromous fish within the Columbia Basin. It includes location, water supply, physical layout, staffing, operation costs, production numbers, adult returns, and production constraints. It also includes the agency production goal for each facility. Data collection forms 1.1 to 1.9 are included in this section.

Form 1.1, Hatchery Summary: This form identifies the hatchery or satellite facility, funding agency, initial year of operation, facility and operational synopsis, etc.

Form 1.2, Site Data: This form identifies hatchery location, legal covenants and conditions, and water rights held.

Form 1.3, Water Supply Summary: This form identifies water sources used in the hatchery for fish culture. It identifies the high, low, and average flow and temperature of water available for use that the delivery system is capable of supplying. If hatchery has water re-use system it is described.

Form 1.4, Facility Inventory: Lists rearing units at the hatchery by incubation, starter tanks, raceways, and ponds. It includes pond dimensions, volume, age, condition, etc. A schematic drawing of the hatchery is also attached.

Form 1.5, Staffing Summary: Lists staffing needed to operate hatchery.

Form 1.6, Adult Capturing/Handling: Completed if adults are captured and spawned. This form relates to form 1.7. One copy of this form should be provided for each form 1.7 that identifies releases from eggs taken. Brood year information provided in this form corresponds to egg take and release year data in form 1.7. As an example, yearling spring chinook released in spring 1985 (form 1.7) would have a corresponding

form 1.6 for brood year 1983 since this brood year led to the release. Egg take information on form 1.7 would also be for brood year 1983.

Form 1.7, Hatchery Production: Identifies releases for years 1985 to 1987. A separate form is required for each year. Egg take information corresponds to brood year for fish released. This form relates to form 1.6.

Form 1.8a, Hatchery Production Summary for Fiscal Years 1985 to 1987: Summarizes release information from form 1.7 and also identifies interim production. Interim production is identified as fish reared for a period of time and transferred to other stations. The other stations receive credit for these fish when released. No attempt has been made to track transferred fish. A separate form for each year is provided.

Form 1.8b, Hatchery Production Summary For Fiscal Years 1985 to 1987. Summarizes releases and transfers to obtain total hatchery production. Also identifies operating cost by fiscal year. A separate form is provided for each of the three production years.

Form 1.9, Production Constraints: Identifies factors which may be limiting production or affecting smolt quality. Also identifies problems and areas needing upgrading, rehabilitation, or replacement.

Part II. Theoretical Capacity: Theoretical capacity for each facility included in Part I is calculated using flow and density methodologies described in Piper et al (1982) and is identified in form 2.1. The following formulas were used:

Flow Method:  $W = F \times I \times L$       Density Method:  $W = D \times V \times L$

W = Weight of fish in pounds  
F = Flow Index  
L = Length of fish in inches  
I = Water inflow in gallons per minute  
D = Density Index  
V = Volume of rearing unit in cubic feet

The flow index was taken from the table on page 69 of Piper (1982) and varies depending on water temperature and elevation. The density index was assigned by agreement of all agencies-prior to compiling the information. The remaining variables are easily obtained from hatchery records. Different density indices were used for raceway type rearing units and large ponds. The definition of a large pond was left up to the individual agencies but is basically large ponds having poor flow patterns and long turnover rates. It should be kept in mind that no one or two

density indices can be expected to fit all the various rearing facilities currently in use. The density indices assigned to each species are shown in Table 8.

Table 8. Density Indices Assigned To Each Species Used To Calculate Theoretical Production Based On Density.

Species	Raceways/Small ponds	Large Ponds
Fall Chinook	.3	.03
Coho	.3	.03
Spring Chinook	.25	.03
Steelhead	.25	.03

Part III. Expansion Capability: Includes an estimate of expansion capability at existing facilities. The basis for expansion and the relevant information are detailed in form 3.1. Costs are not included in this report because in most cases they are little more than guesses. In most cases additional engineering studies are required before accurate costs can be determined.

## INDIVIDUAL HATCHERY REPORTS

The main body of this report consists of detailed information for each hatchery and is divided into individual agency sections. Each hatchery discussion is divided into 4 parts: Introduction, Current Production Constraints, Theoretical Production, and Hatchery Expansion Capability. Each part is described briefly below.

### Introduction

Includes a brief description of hatchery location, rearing facilities, operations, and water rights.

### Current Production Constraints

Contains information identifying areas constraining production in the existing facilities. It also identifies general problem areas which are affecting smolt quality, adult survival, egg take, etc.

### Theoretical Production

This section calculates 2 theoretical capacity levels, one based on flow and one based on density. A brief comparison is made between these two calculations, average production for the 3 years evaluated, and the agency production goal. Throughout the report theoretical capacity and theoretical production are used interchangeably.

Determining the theoretical capacity of a facility is a difficult and elusive concept. There is no single theoretical capacity figure as it will vary each time the species or size at release goal changes. Since size of fish in inches is a variable in the theoretical formulas, by simply changing the species reared or size at release will change the hatcheries theoretical capacity by 50% to 100%. As an example, changing production from fall chinook (3.5 to 4 inch smolts) to coho, steelhead, or spring chinook (5.5 to 8 inch smolts) can double the theoretical capacity in pounds of a facility.

No single set of criteria can be applicable to all hatcheries when attempting to determine theoretical calculations. The formulas used cannot account for the large number of physical and chemical variables which differ from hatchery to hatchery. In addition, recent research has shown that reduced densities may in fact produce as many or more adults over higher densities at least with some species and stocks. While theoretical calculations may provide you with a number which can be physically held and reared, it may or may not have any bearing on increasing adult survival or producing more adults, which is the ultimate goal. As such, production based on theoretical calculations is probably more applicable to commercial trout producers or catchable trout

programs where survival of juveniles in the wild to adults is not a factor.

Theoretical calculations can provide a production starting point with a new hatchery, but actual capacity must be adjusted as the agency gains experience with the facility and adult returns are analyzed.

The theoretical calculations in this report have only been used as a gross comparison to determine if rearing space is in balance with water supply. In cases where the result of the 2 theoretical calculations differ by a large amount, the assumption is made that one or the other (water supply or rearing space) is the limiting factor in production potential. As an example, if the flow method identifies 100,000 pounds can be produced and the density method shows 300,000 pounds it would indicate that additional production may be possible if additional water could be provided. It does not mean that 200,000 pounds more could be produced given additional water. The numbers generated by these 2 formulas are not meant to be absolute and are not to be used as identifying or quantifying what an anadromous hatchery can successfully produce.

### Hatchery Expansion Capability

This section identifies the land area, potential water supplies, and provides estimates of possible production increases. Each hatchery operated by the individual agencies is discussed in it's respective section. Tables are provided in each agency section which identifies the facilities with the most potential for production increases. The operating agencies were responsible for determining which hatcheries have expansion capability.

The ODFW is currently conducting research into the potential applications of providing an oxygen supplementation system in a hatchery. It will be several years before results from this research provides needed information. If oxygen supplementation is proven effective there may be additional expansion capability which has not been identified in this report.

At several hatcheries, WDF is proposing small scale experimental net pen rearing near the mouths of tributary streams. This experimental net pen rearing has been identified as potential expansion capability in this report. If net pen rearing is proven successful there may be additional expansion capability which has not been identified in this report.

The four constraints identified in this report are defined as follows:

Budget: Identifies those facilities where production is set by budget level. If additional funding could be provided, then production could be increased with existing rearing space and flows.

space and flows.

- Flow: Identifies those facilities where production could be increased by providing additional water to existing rearing ponds. The likelihood that additional water can be found is good.
- Rearing Space: Identifies those facilities where production could be increased by providing additional rearing ponds. Space for expansion is available and existing water supply will support additional rearing ponds.
- Flow and Rearing Space: Identifies those facilities where production could be increased by providing additional water and rearing ponds. These facilities have space for expansion and a high probability of adequate water supplies to operate them. It also includes those facilities needing major renovation or complete rebuild to more efficiently utilize available water supplies.

The increased production identified in this report should be used as only a general indication of expansion capability. In many cases numbers provided are very preliminary and are based on various assumptions. In most cases, additional detailed evaluation is required for those facilities identified as having expansion potential. Only those facilities deemed by policy and management personnel as capable of meeting future production goals based on hatchery location and species which can be reared should receive additional evaluation. This phase 2 study should include engineering, feasibility study, and estimated cost. An updated estimate of the potential production increase should also be provided based on this phase 2 study.

Hatchery expansion capability has been identified as 84,448,000 smolts weighing 4,853,306 pounds from existing hatcheries or satellite facilities (Table 9). These facilities are located throughout the Columbia Basin and as described above require a wide range of actions to accomplish. It is left up to policy and management personnel to determine which facilities can best meet future goals.

Table 9. Hatchery Expansion Capability For Each Agency Operating Anadromous Fish Hatcheries In The Columbia River Basin.

Agency	Number of Facilities	Production Numbers *	Increases Pounds *
IDFG	4	7,000,000	359,500
ODFW	9	9,492,000	662,583
USFWS	10	12,930,000	546,755
WDF	14	46,865,000	1,923,135
WDW	11	8,161,000	1,361,333
Total	48	84,448,000	4,853,306

\* Numbers and pounds of fish used are those recommended by operating agencies. Numbers and pounds will change if species and/or size of smolts is changed.

U.S. Fish and Wildlife Service

A total of 14 hatcheries or satellite facilities operated by the USFWS were evaluated. Table 10 and Figure 1 shows the location in the Columbia Basin for each one. The facilities are scattered throughout the Columbia Basin, but most are located above Bonneville Dam. Summary Tables 1 through 13 detail information provided on the data collect forms by the USFWS. These 14 rearing facilities released an average of 29,069,719 smolts weighing 1,781,563 pounds during this evaluation.

Table 10. Location Of Hatcheries And Satellite Facilities Rearing Anadromous Fish Which Are Operated By The U.S. Fish And Wildlife Service In The Columbia River Basin.

Below Bon. Dam	Bon. Dam to Snake River	Col. Basin Above Snake R.	Snake River Basin
1. Abernathy SCTC	1. Carson	1. Entiat	1. Dworshak
2. Eagle Creek	2. Little White	2. Leavenworth	2. Kooskia
	3. Spring Creek	3. Winthrop	3. Hagerman
	4. Big White Pond		
	5. Warm Springs		
	6. Willard		

Several facilities have been identified where production could be increased (Tables 11 and 12). Ten facilities with an estimated expansion capability of 12,930,000 smolts weighing 546,755 pounds have been identified. To obtain more detailed information refer to the individual hatchery discussions. All facilities listed require various levels of construction before expansion capabilities can be fully realized.

Figure 1. Approximate Location Of Hatcheries Operated By The U.S. Fish And Wildlife Service Which Rear Anadromous Fish In The Columbia River Basin.

1. Abernathy SCTC
2. Big White Pond
3. Carson NFH
4. Dworshak NFH
5. Eagle Creek NFH
6. Entiat NFH
7. Hagerman NFH
8. Kooskia NFH
9. Leavenworth NFH
10. Little White NFH
11. Spring Creek NFH
12. Warm Springs NFH
13. Willard NFH
14. Winthrop NFH

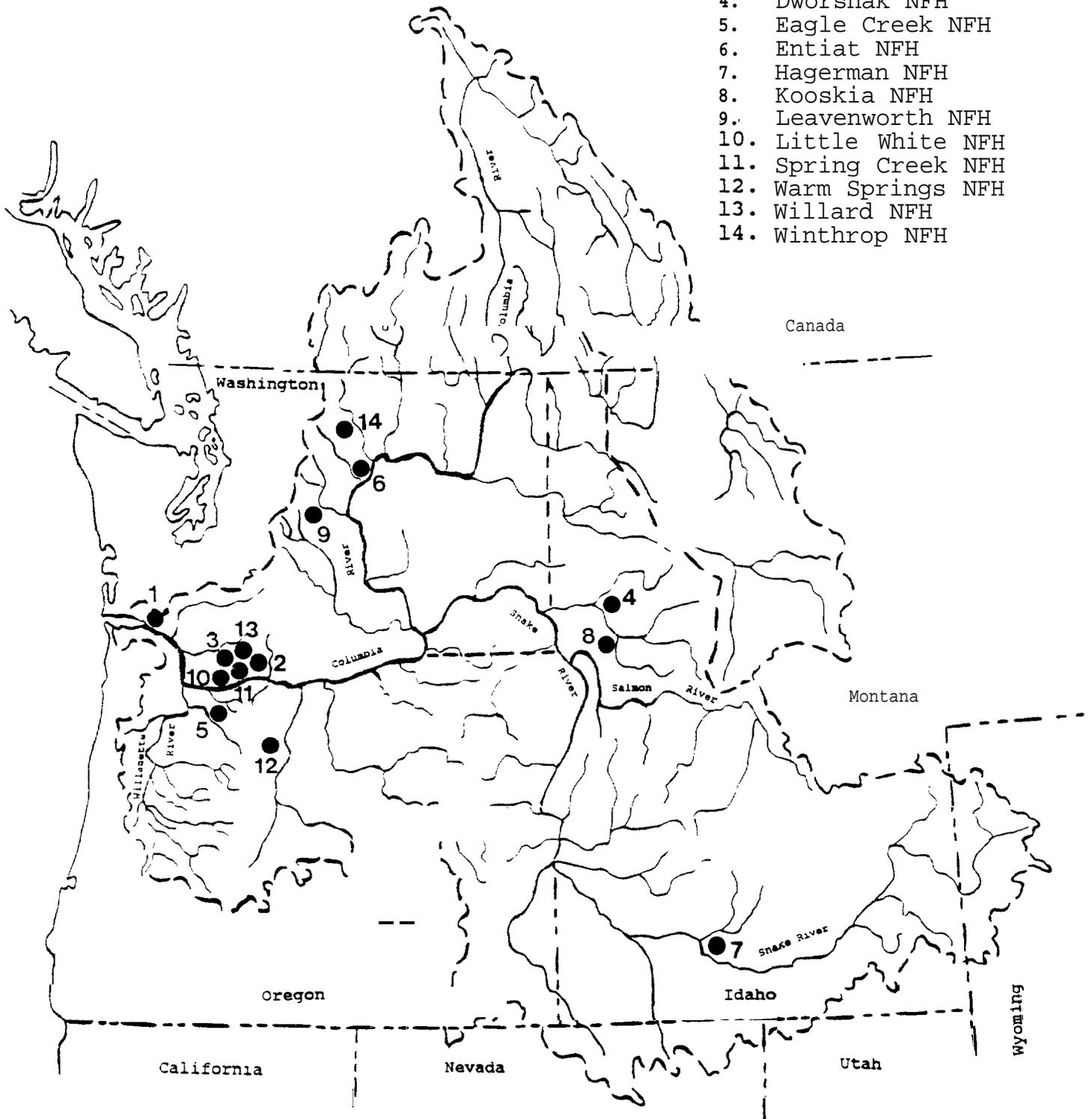


Table 11. List Of Hatcheries And Satellite Facilities Operated By The U.S. Fish And Wildlife Service Where Production Could Be Increased By Providing Additional Funding, Flow, Rearing Space, Or Flow And Rearing Space.

Budget	Flow	Rearing Space	Flow and Rearing Space
	1. Entiat	1. Big White Salmon	1. Abernathy
	2. Spring Creek	2. Dworshak	2. Carson
		3. Kooskia	3. Leavenworth
			4. Little White
			5. Winthrop

Table 12. Expansion Capabilities For Hatcheries Operated By The U.S. Fish And Wildlife Service Which Rear Anadromous Fish In The Columbia Basin.

Hatchery	Additional Water Available at Site	Delivery Method	Land Available	Potential Production Numbers	Pounds	Species
	Volume Temp. Range Source					
Abernathy SCTC	700/6,732 GPM 55/33-72 Well/Abernathy	Pump/Grav.	25 acres	1,600,000	51,000	Fall Chinook
Big White Salmon	13,465 GPM Big White River	Gravity	Yes	1,450,000	80,555	Spr. Chinook
Carson NFH	2,244/11,221 44 Spring/Uind Riv	Gravity	10 acres	1,200,000	65,200	Spr. Chinook
Dworshak NFH	Unlimited 38-52 Clearwater Riv.	Pumped	None	600,000	100,000	Steelhead
Entiat	600 48 Well	Pump	None	200,000	10,000	Spr. Chinook
Kooskia NFH	8,000 34-66 MF Clearwater	Pump/Grav.	Yes	580,000	29,000	Spr. Chinook
Leavenworth NFH	6286 GPM 32-68 Well/Surface	Pump/Grav.	160 acres	1,800,000	100,000	Spr. Chinook
Little White Salmon	13,465 CPM 31-51 Lit. White Sal.	Gravity	20 acres	900,000	20,000	Spr. Chinook
Little White Salmon	31-51 Lit. White Sal.	Gravity		3,600,000	45,000	URB Fall Chin
Winthrop NFH	2,500 CPM Ground/Surface	Pump/Grav.	None	1,000,000	55,000	Spr. Chinook
				<b>TOTAL</b>	<b>12,930,000</b>	<b>546,755</b>

Abernathy SCTC  
1440 Abernathy Road  
Longview, Wa. 98632

Funding Agency: USFWS, NMFS  
Species Reared: Fall Chinook

Manager: David A. Leith  
Phone #: (206) 425-6072

### Introduction

The Abernathy Salmon Culture Technology Center is located along Abernathy Creek approximately 3 miles above its mouth. Elevation of the site is 175 feet above sea level. Abernathy was constructed in 1959 at a cost of \$349,229 and fish culture operations began in 1960. A falls had been laddered at this site in 1951 and the fishway design incorporated a hatchery intake structure for the then planned chinook salmon hatchery. The fish rearing program is conducted under the Columbia River Fisheries Development Program (CRFDP). Staffing for the fish culture program totals 3.0 FTE's. Additional staff is also assigned to this station to fulfill other duties.

The current mission of this facility includes fish production, research/development, and technical assistance. The station objectives are to: 1) develop or improve practical methodologies for use in artificial propagation of Pacific salmon and steelhead trout; 2) identify techniques for improving the quality of hatchery reared fish and increase their ability to survive following release from hatcheries; 3) rear fall chinook salmon (1,500,000 fish at 42,000 pounds) for distribution in the Columbia River to enhance sport, commercial, and native American fisheries; and 4) provide technical advice and assistance to hatchery biologists, fishery biologists, and fish culturists in both public and private sectors.

Juvenile rearing facilities are in fair condition and consist of 12 standard raceways. The adult holding pond is in poor condition and is also used for juvenile rearing. Lower river tule fall chinook are the only species and stock currently being reared on a production basis. Adult fall chinook are collected mainly during September, spawned, eggs incubated, and juvenile fish reared until release the following April or May as zero age smolts. All production is currently released at the hatchery directly into Abernathy Creek.

Water rights total 22,059 gpm from Abernathy Creek, 3 wells, and an unnamed source. The water right is made up primarily from Abernathy Creek with the other sources only accounting for 1,862 gpm. Actual water use averages about 6,000 gpm from Abernathy Creek and 300 gpm from well number 3. Also, additional water is used to operate the fishway and for research purposes. The other 2 sources listed in water right are not being utilized. Well water

has high iron content and the amount currently utilized is limited by the capacity of the iron filter. A 5% re-use system with rock and oyster-shell media bio-filter is used to start fingerlings prior to supplying them with creek water and for rearing fish to smolt size.

### Current Production Constraints

Available rearing space is limiting production. Fish are presently released early through thinning releases to meet production goals.

Well water is high in iron. The iron treatment facility can only treat 300 gpm of well water. A test well has been drilled and indications are that approximately 3,000 gpm could be supplied if developed. This water is free of iron and would not require treatment.

An old spawning/incubation channel was abandoned many years ago. Approximately 7,450 gpm of creek water is available for use there if facilities are provided.

Twenty-four new 80 feet by 8 feet standard raceways are identified in the station development plan.

Bridge to property on east side of creek needs to be replaced.

### Theoretical Production

Theoretical production based on the flow method is 38,976 pounds and with density is 32,659 pounds. The 3 year average production was 38,463 pounds and the 1987 agency goal 42,857 pounds. Theoretical calculations were computed for fall chinook as follows:

#### Flow Method

$$1.5 \times 5,800 \text{ gpm} \times 4.48" = 38,976 \text{ lbs}$$

#### Density Method

Raceways	.3 X 1,500 cu ft X 4.48 " X 12 ponds	= 24,192 lbs
Holding Pond	.3 X 6,300 cu ft X 4.48 "	= 8,467 lbs
		<u>32,659 lbs</u>

comparison of the 2 theoretical calculations indicates that rearing space is probably the limiting factor in production. The 1987 agency goal is greater than either of the theoretical calculations. This larger production is possible because of thinning releases which occur during the rearing cycle. The existing facility is not capable of holding the entire agency goal at one time.

### Hatchery Expansion Capability

The hatchery is situated on 99 acres owned by the USFWS. Approximately 75% of the area is being utilized. About 25 acres is available for expansion. Additional well and creek water are available with water rights already held, however the existing pipeline to rearing facilities can only supply 6,000 gpm.

The station development plan identifies an expansion capability of 1,600,000 fall chinook smolts weighing 51,000 pounds. This will require construction of an additional 24 standard raceways each 80' X 8' organized into two banks of 12 each. Site excavation, a retaining wall, plumbing, etc will be required. The USFWS estimates costs at \$1,851,100.

# Existing Facilities

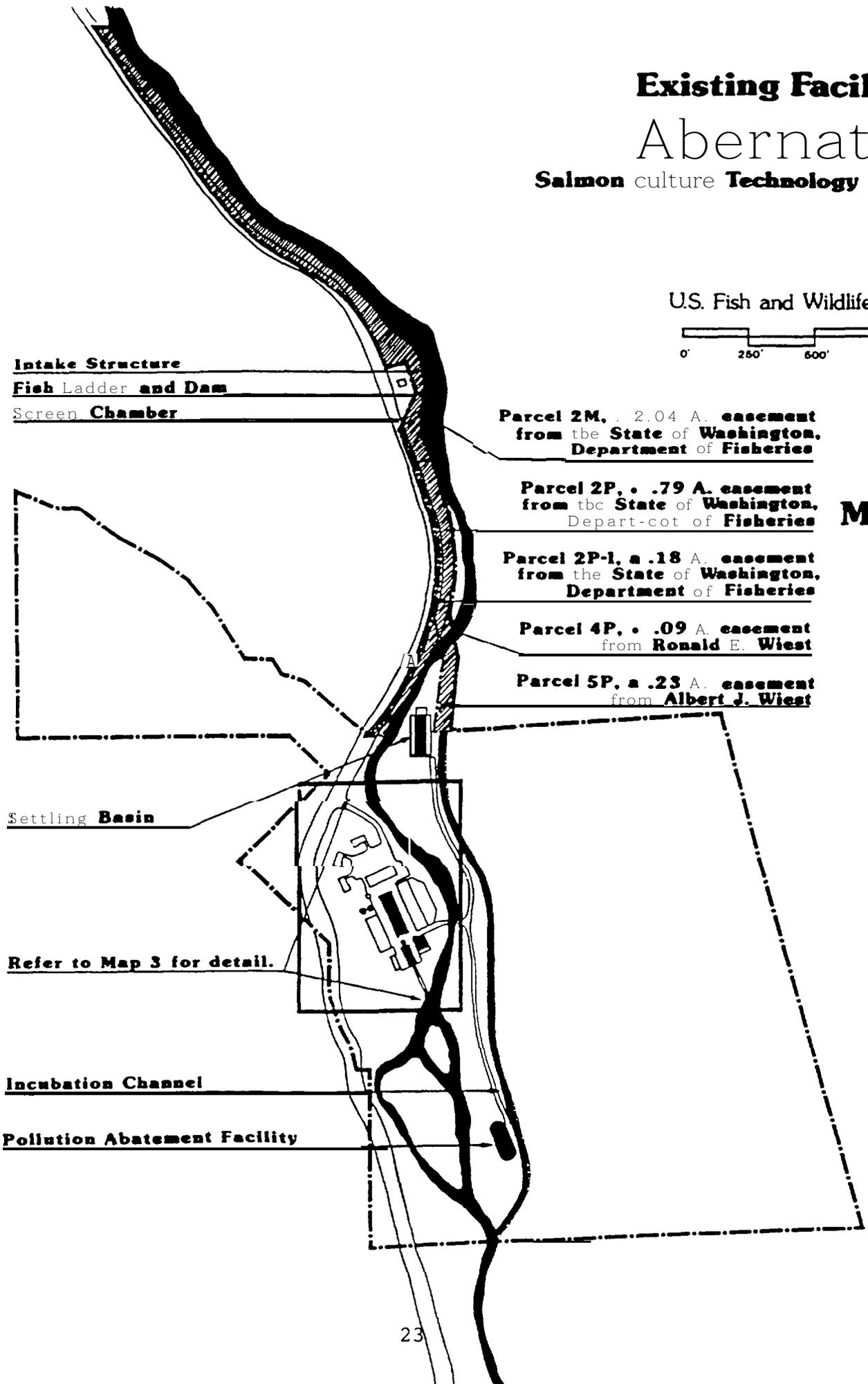
## Abernathy

Salmon culture Technology Center

U.S. Fish and Wildlife Service



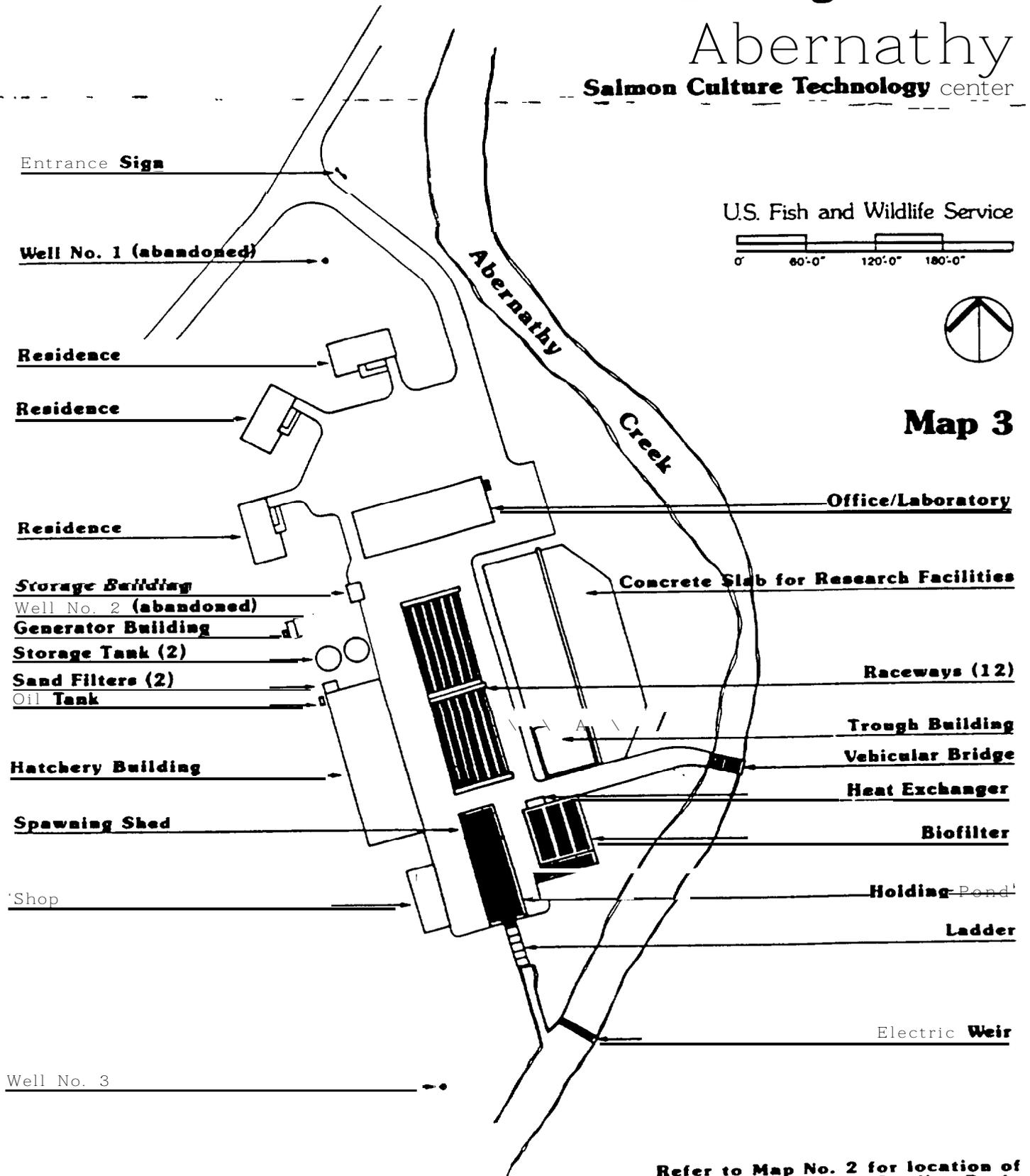
**Map 2**



# Existing Facilities

## Abernathy

Salmon Culture Technology center



U.S. Fish and Wildlife Service



### Map 3

Refer to Map No. 2 for location of Intake Structure, Settling Basin and Pollution Abatement Facility.

Big White Salmon Pond  
Spring Creek NFH  
Mile Post 61.75 R.,  
State Road 14,  
Underwood, Wa. 98651

Funding Agency: USFWS, NMFS  
Species Reared: Spring Chinook

Manager: Ed LaMotte  
Phone #: (509) 493-3156

### Introduction

The Big White Salmon Pond is located adjacent to the Big White Salmon River about 2 miles upstream from the town of Underwood. Elevation of the pond is 500 feet above sea level. The Big White Salmon River enters the Columbia River above Bonneville Dam. The pond is operated as a satellite to Spring Creek NFH and operation of the facility is accomplished with staff from there.

The ponds were initially used to rear juvenile fish in 1939, but were constructed prior to then. They were originally built as an adult collection and holding facility. Operation of the ponds have been sporadic with 1987 the only year during this evaluation that fish were reared and released. Most recently the ponds have been used to rear 300,000 to 400,000 spring chinook each year. The 2 ponds are currently in fair condition.

Water rights total 13,465 gpm from the White Salmon River. An average of 3,591 gpm is currently supplied by gravity flow. The ponds can be used only for a few months each year because high water during the winter and spring inundates them.

### Current Production Constraints

Pond volume is limiting production. Available water will support far greater production. At present, smolt releases can not be planned on each year as ponds are inundated during winter/spring in many years. Standard raceways located above flood plain would assure winter and spring rearing and allow planning for an annual smolt program.

Ponds were constructed as an egg taking station, so are not conducive to rearing. Ponds are below flood level so river over tops them during winter and spring in most years.

At present numbers of fish reared is dependent on excess eggs being available from Carson NFH.

### Theoretical Production

Theoretical production based on the flow method is 173,324 pounds

and with density is 19,769 pounds. Theoretical calculations were computed for spring chinook as follows:

Flow Method \*

$$2.26 \times 13,500 \text{ gpm} \times 5.6809" = 173,324 \text{ lbs}$$

Density Method

$$.25 \times 13,920 \text{ cu ft} \times 5.6809" = 19,769 \text{ lbs}$$

\* Note: Flow used in theoretical flow calculation includes the entire water right.

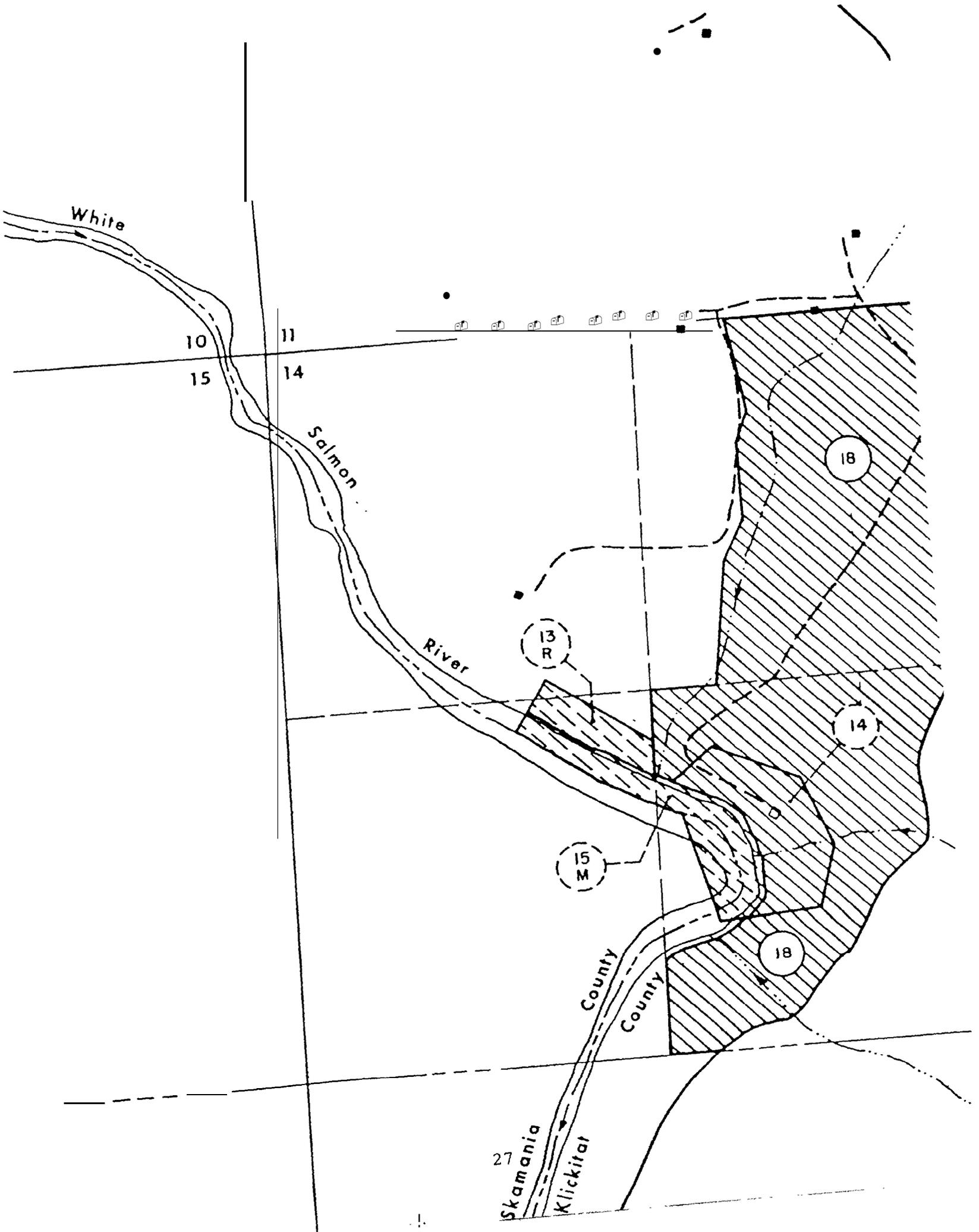
Comparison between the 2 theoretical calculations appears to indicate that pond volume is limiting factor in production. Current water supply should be able to support additional rearing space and greater production. Smolt releases were made only in 1987 during this evaluation and totaled 16,535 pounds. The 1987 agency goal was 30,000 pounds and the current agency goal is to produce 20,000 pounds.

#### Hatchery Expansion Capability

The rearing ponds are situated on 40.85 acres owned by the USFWS. Approximately 5% of the area is being utilized. Some of the remaining property is suitable for fish culture operations. The existing water right of 13,465 gpm can support additional rearing facilities. The potential for water from wells is not known.

Production could be increased by 1,450,000 spring chinook smolts weighing 80,555 pounds. This would require the following:

1. Site preparation.
2. Construction of 40 standard raceways each 8' X 80' or equivalent deep channels.
3. Installation of a new 36" water supply pipeline to supply new raceways which would be situated at a higher elevation.



Carson NFH  
Carson, Wa. 98610

Funding Agency: USFWS, NMFS  
Species Reared: Spring Chinook

Manager: Bruce McLeod  
Phone #: (509) 427-5905

### Introduction

Carson NFH is located 13 miles northwest of Carson in Skamania County, Washington. It lies in a heavily forested valley within the Gifford Pinchot National Forest at the confluence of Tyee Creek and Wind River. Elevation of the site is 1,180 feet above sea level. The hatchery began operating in 1938 producing fall chinook and resident trout. The facility was remodeled in 1956 under the Mitchell Act and is currently operated under the CRFDP producing spring chinook. Authorized staff totals 7 FTE's.

The facilities include 46 raceways, 2 dirt rearing ponds, and 2 adult holding ponds. Returning adult spring chinook are trapped on-site starting in mid-may. Adults are held through the summer and spawned in August and September. Fertilized eggs are incubated in baskets placed in troughs until eye-up. They are then incubated in stacked trays in the troughs. Swim-up fry are transferred to indoor tanks and outdoor raceways. Some fish are later transferred to the dirt rearing ponds until release at about 15 fish per pound. Most of the rearing occurs in the raceways. The majority of smolts produced are released on-site, but off-site releases into the Umatilla River and Catherine Creek, both in Oregon, have also occurred.

Water rights total 42,639 gpm from 3 sources: Tyee Creek, Tyee Spring, and the Wind River. The main source of water for the hatchery is from Tyee Creek and the Wind River is used as a secondary supply. Incubation and domestic water is provided by Tyee Spring. Average flow available is about 20,000 gpm. All water is supplied by gravity flow. All rearing units receive single pass water, but in the event of an emergency, raceway water can be re-circulated.

### Current Production Constraints

Many facilities are over 50 years old and require considerable maintenance to insure continued operation.

Tyee springs water collection system and pipeline is over 35 years old and is subject to fouling. This source provides most of the water for the hatchery.

The Wind River intake is ineffective in providing the 6,732 gpm needed in late summer. Low river flows in late summer make it difficult to supply all the needed river water plus the intake

fills with gravel during high flows further compounding the problem.

The water distribution system is inefficient during summer months. Where the majority of rearing space is located, water cannot be supplied in adequate volume and where flow can be supplied there is inadequate rearing space to fully utilize it.

Have had prior disease problems with infectious hematopoietic necrosis (IHN) and bacterial kidney disease (BKD). Individual female incubation of eggs may be required to help control these diseases.

Large dirt pond needs to be divided to increase efficiency and a new bank of raceways is needed to increase production.

### Theoretical Production

Theoretical production based on the flow method is 198,169 pounds and with density is 199,678 pounds. Average production was 131,287 pounds and the 1987 agency goal was 138,889 pounds. Theoretical calculations were computed for spring chinook as follows:

Flow Method \*

$$2.18 \times 15,920 \text{ gpm} \times 5.71" = 198,169 \text{ lbs}$$

Density Method

Raceways:	.25 X 58,880 cu ft X 5.71" =	84,051 lbs
Ponds: **	.25 X 81,000 cu ft X 5.71" =	<u>115,627 lbs</u>
		199,678 lbs

\* Note: Only water supplied to rearing units is used in calculation. Approximately 5,000 gpm of additional water is supplied to adult holding pond and is not used in this calculation.

\*\* Note: Data provided indicate that the 2 dirt rearing ponds have a volume of 80,392 cubic feet. Note that 81,000 cubic feet was used by agency in calculation.

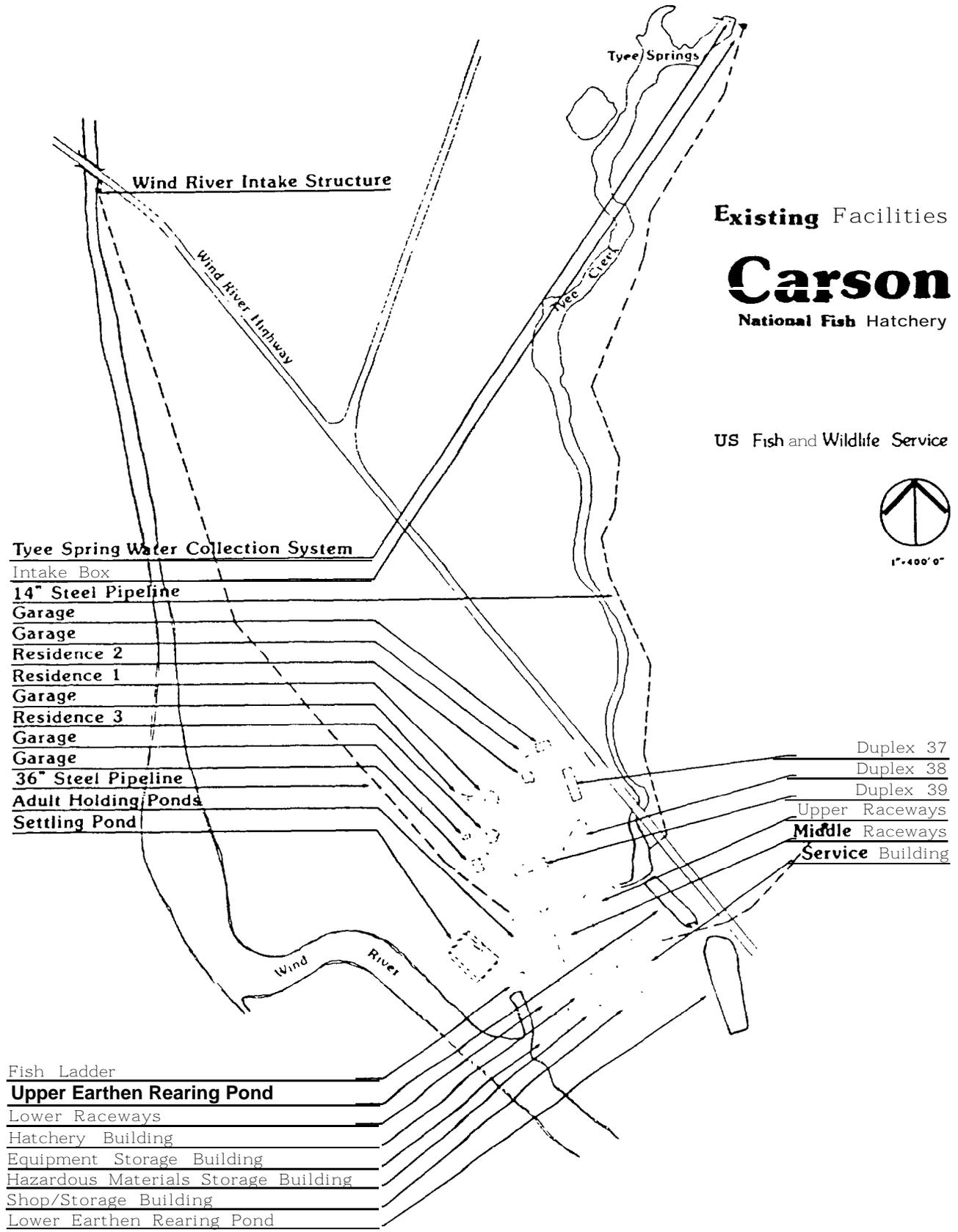
Comparison of the 2 theoretical calculations indicates that flow and pond space appear to be in balance. Average production and agency goal is less than the theoretical calculations. This is due at least in part because 2 brood years are held on station at the time theoretical calculations were computed (during spring). The zero age fingerlings take up pond space at this time and the theoretical calculations have not factored this in.

## Hatchery Expansion Capability

The hatchery is situated on 220 acres owned by the USFS. Approximately 10% of the area is being utilized. All but 10 acres of the remaining land is unsuitable for expansion. At peak flows, approximately 2,244 gpm of spring water and 11,221 gpm from the Wind River of additional water is available. All this water is probably not available during dry years. Water rights are already held and water is located on hatchery property. The potential for well water is unknown.

An additional 1,200,000 spring chinook smolts weighing 65,200 pounds could be produced if the following are accomplished:

1. Rebuild Tyee Spring water collection system
2. Install pipeline from Tyee Spring to hatchery
3. Rebuild Wind River intake
4. Rehabilitate existing rearing facilities
5. Rehabilitate existing hatchery buildings
6. Upgrade plumbing
7. Construct new bank of raceways



Dworshak NFH  
P.O. Box 18  
Ahsahka, Id 83520

Funding Agency: USFWS, COE  
Species Reared: Summer Steelhead  
Spring Chinook

Manager: Wayne H. Olson  
Phone #: (208) 476- 4591

## Introduction

Dworshak NFH is located at the confluence of the North Fork Clearwater River and the main stem Clearwater River near the unincorporated town of Ahsahka, in north central Idaho. The site is 1,000 feet above sea level and situated 3 miles west of Orofino on the north bank of the Clearwater River and 1 mile downstream from Dworshak Dam. The hatchery was originally constructed to provide mitigation for lost steelhead habitat from construction of Dworshak Dam on the North Fork Clearwater River. Land the hatchery is located on was purchased by the U.S. Army Corp of Engineers (COE) from several land owners in 1967. Construction began shortly thereafter and operations began in 1969 rearing summer steelhead and resident trout with completion of the first phase of construction. Phase 2 construction was completed in 1972 and placed all ponds on recycled flow. Additional construction was completed in 1982 under the Lower Snake River Compensation Program (LSRCP) which expanded facilities to rear spring chinook salmon. The first releases of spring chinook occurred in 1983. The COE retains title to the facilities. The facility is authorized a staff level of 23 FTE's.

Steelhead and rainbow trout are mitigation production assigned to the hatchery with construction of Dworshak Dam. Spring chinook are produced under the LSRCP for federal dams constructed on the lower Snake River. Steelhead and spring chinook are released into the Clearwater River drainage and rainbow trout into Dworshak Reservoir. In recent years, IHN has caused extensive fish losses in steelhead. As a result, rainbow trout production has been contracted to Hagerman NFH since 1983. The 12 raceways formerly used for rainbow trout are currently being utilized to rear spring chinook.

The rearing units are in good condition and consist of 84 Burrows ponds, 42 standard raceways, 3 adult holding ponds, and 128 starter tanks.

Adult spring chinook are collected throughout the summer. They are spawned in August and September, incubated, ponded in starter tanks from November to April, and reared outside until release the following March or April. Smolts are released both on-site and into various tributaries of the Clearwater River.

Summer steelhead adults are collected from fall through spring, spawned from February through May, incubated, ponded from March

through August, and rear until release the following April or early May. Smolts are released both on-site and into various tributaries of the Clearwater River.

No water right information was provided.

Water use ranges from 27,000 gpm (60 cfs) to 83,000 gpm (184 cfs) from the North Fork Clearwater River below Dworshak Dam. Water is pumped from the river and is believed to be the source of IHN problems. Water is not limiting as flow above hatchery needs are present in the river year round. All starter tanks and Burrows ponds are capable of receiving re-circulated water. The remaining facilities receive single pass water. The re-use system is capable of handling nearly 90,000 gpm (200 cfs).

### Current Production Constraints

Steelhead mortality caused by the IHN virus is a major constraining factor. An ozone treatment system is needed to treat river water to prevent this and other diseases. Currently, mortality caused by IHN requires taking and starting three times the number of eggs and fry than normal to ensure sufficient steelhead **smolt** releases.

Burrows ponds are not as efficient as standard raceways in rearing fish. The circular design provides inefficient flow patterns and decreases loading densities which can be held. If Burrows ponds were replaced or converted to standard raceways production could probably be increased with the same rearing volume.

A counting, coded wire tag detection, and separation system is needed to help evaluate adult returns and to efficiently monitor tag data.

The facility is owned by the COE and any production changes would require negotiation.

### Theoretical Production

Theoretical production based on the flow method is 1,144,316 pounds and with density is 525,852 pounds. Average production was 413,674 pounds and the 1987 agency goal was 483,000 pounds. Theoretical calculations were computed as follows:

#### Flow Method

Steelhead:	2.18 X 50,400 gpm X 8.04"	=	lbs
Spring Chinook:	2.18 X 21,000 gpm X 5.70"	=	<u>883,376</u> lbs
			1,144,316 lbs

#### Density Method

Steelhead:	.25 X 222,200 cu ft X 8.04"	=	446,622 lbs
Spring Chinook:	.25 X 55,600 cu ft X 5.70"	=	<u>79,230</u> lbs
			525,852 lbs

Note : Only 70 of the 84 Burrows ponds were used to compute theoretical density calculation for steelhead. Density calculation for spring chinook used only 55,600 cubic feet out of the 84,000 cubic feet available in the 42 standard raceways. Remaining pond space is being utilized to hold adults and fingerlings. The 3 adult holding ponds were not used in calculations as they are not utilized for rearing.

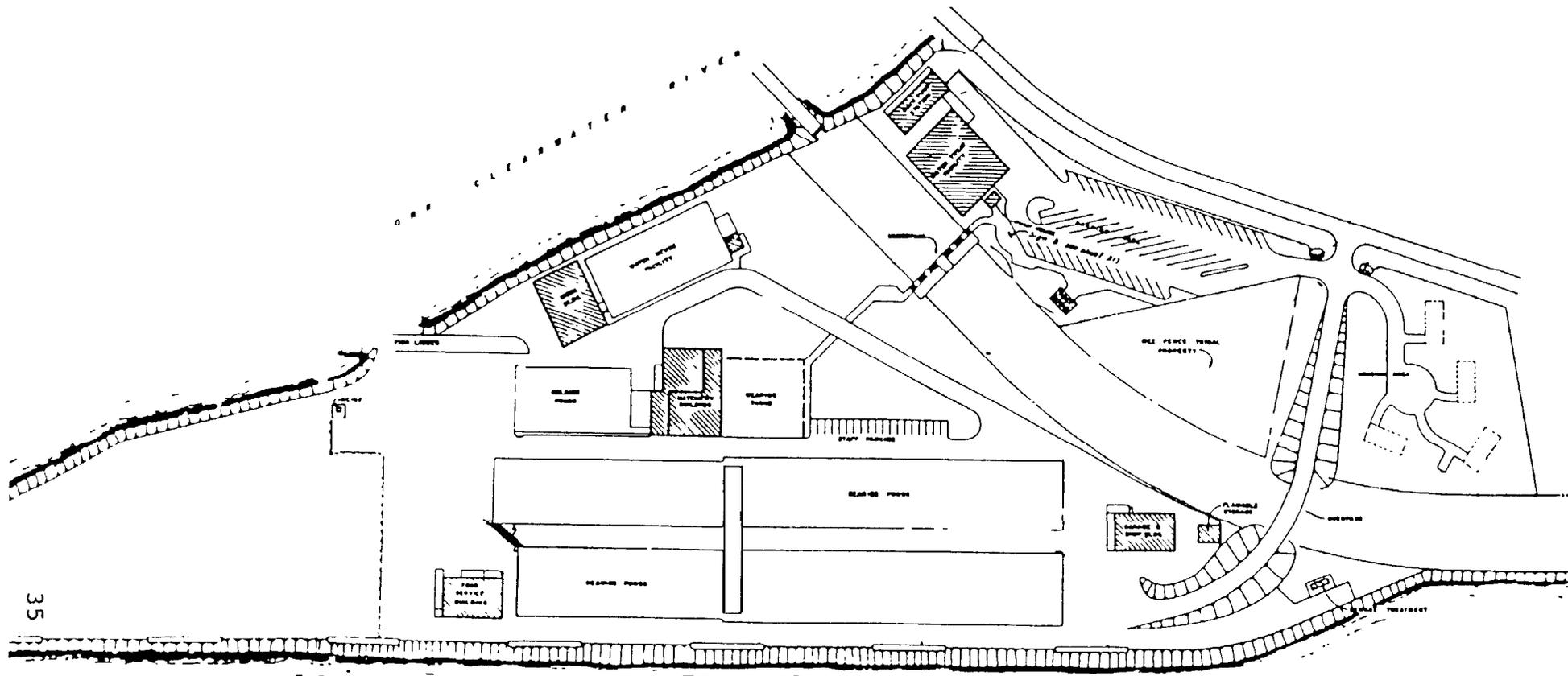
Comparison of the 2 theoretical calculations indicates that pond space is probably the limiting factor in production. Average production listed above is less than normal due to smaller than normal release in 1985 (200,000 pounds less than 1986 or 1987). Burrows ponds are not as efficient as standard raceways in rearing fish and is a constraining factor in production. The existing water supply should be sufficient to support additional rearing units. The USFWS lists the production capacity based on existing facilities as follows:

Summer Steelhead:	2.3 million	420,000 pounds
Spring Chinook:	<u>1.7 million</u>	<u>90,000 pounds</u>
	5.0 million	510,000 pounds

#### Hatchery Expansion Capability

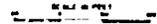
The hatchery is situated on 28 acres owned by the COE. Approximately 95% of the area is being utilized. The remaining land is unsuitable for expansion. Additional water is available from the North Fork Clearwater River. It would require pumping as does the existing hatchery water supply. Disease problems such as IHN and BKD are thought to be associated with this water supply. An ozone treatment plant is required to ensure pathogen free water for egg incubation, nursery rearing, and early outside rearing. There is no well water available.

Production could be increased in the existing facilities if the Burrows ponds were rehabilitated and converted to standard raceways. No additional water would be required. An additional 600,000 steelhead weighing 100,000 pounds could be produced.



35

— CLEARWATER RIVER



DWORSHAK NATIONAL FISH HATCHERY

AHSAHKA, IDAHO

Eagle Creek NFH  
34288 S.E. Rainbow Road  
Estacada, Or 97023

Funding Agency: USFWS, NMFS

Species Reared: Coho  
Spring Chinook  
Winter Steelhead

Manager: Douglas K. Dysart  
Phone #: (503) 630-6270

## Introduction

Eagle Creek NFH is located 40 miles east of Portland, Oregon along Eagle Creek, a tributary of the Clackamas River. The hatchery is situated on about 25 acres of bottom land in a deep canyon. Site elevation is 950 feet above sea level. Eagle Creek NFH was authorized under the Mitchell Act and is currently operated as part of the CRFDP. Land for the hatchery was initially purchased from private ownership in 1953. Construction was completed in 1956 and the hatchery began operating at that time. The facility originally consisted of 39 standard raceways, an adult holding pond, and several hatchery buildings. Hatchery expansion occurred in 1964 when an additional 36 standard raceways were constructed. No major change occurred until 1975 when the National Environmental Protection Agency requirements mandated construction of pollution abatement facilities. The hatchery is staffed with 8 FTE's.

The hatchery currently consists of 75 standard raceways divided into upper and lower sections, 1 adult holding pond, and 10 starter tanks. The adult holding pond is not used for rearing. A small hydro-power generating plant has been constructed at the intake on Eagle Creek. Power can only be generated when flows exceed hatchery requirements. Revenue is used to offset operation costs.

During this evaluation: spring chinook, **coho**, and winter steelhead were reared. Currently only **coho** and winter steelhead are being reared. Adults from all 3 species are collected, spawned, eggs incubated, and juveniles reared until release as yearling smolts in April. Spring chinook were also released at the end of October during this evaluation. Smolts were released on-site during the years studied. Fingerlings were released into various areas of the Clackamas River in most years. In addition, small numbers of smolts were provided to numerous universities and labs each year. In recent years up to 50% of **coho** production has been released in Youngs Bay in the lower Columbia River.

Water rights total 116,730 gpm (260 cfs), almost all from Eagle Creek. A spring used for egg incubation and well for domestic use supply a small amount of water. About 67,325 gpm (150 cfs) of the water right is for power generation and is not used for fish culture. There is not enough water during low flow periods to provide the entire water right so power generation can only occur during high flows. Flow available for hatchery use ranges from 3,603 gpm to 25,146 gpm from Eagle Creek. All rearing units are supplied with single pass water.

### Current Production Constraints

A major constraint is high water temperature and low flows available during July, August, September.

Adult holding pond design requires excess handling which causes stress in adults. Existing pond should be re-designed to incorporate new technology and reduce handling stress.

Existing springs should be piped to hatchery to allow utilization of warmer temperature water for egg incubation.

Some raceways are starting to sag and leak indicating that soil under them may be eroded out. Walkways are starting to crumble.

### Theoretical Production

Theoretical production based on the flow method is 222,324 pounds and with density is 209,520 pounds. Average production was 144,077 pounds and the 1987 agency goal was 154,764 pounds. Theoretical calculations were computed for coho as follows:

Flow Method

$$1.91 \times 20,000 \text{ gpm} \times 5.82" = 222,324 \text{ lbs}$$

Density Method

$$.3 \times 120,000 \text{ cu ft} \times 5.82" = 209,520 \text{ lbs}$$

Comparison of the 2 theoretical calculations indicates that pond space and water supply is nearly in balance. The USFWS indicates that an additional 1,000,000 coho smolts weighing 66,667 pounds could be produced in existing facilities and water. This increased smolt production is planned beginning in 1991. The current agency goal includes the increased coho production, is nearly equal to the theoretical calculations, and should be considered the hatchery capacity. The current production program is as follows:

Winter Steelhead:	100,000	14,285 pounds
Coho:	<u>3,000,000</u>	<u>200,000 pounds</u>
	3,100,000	214,285 pounds

### Hatchery Expansion Capability

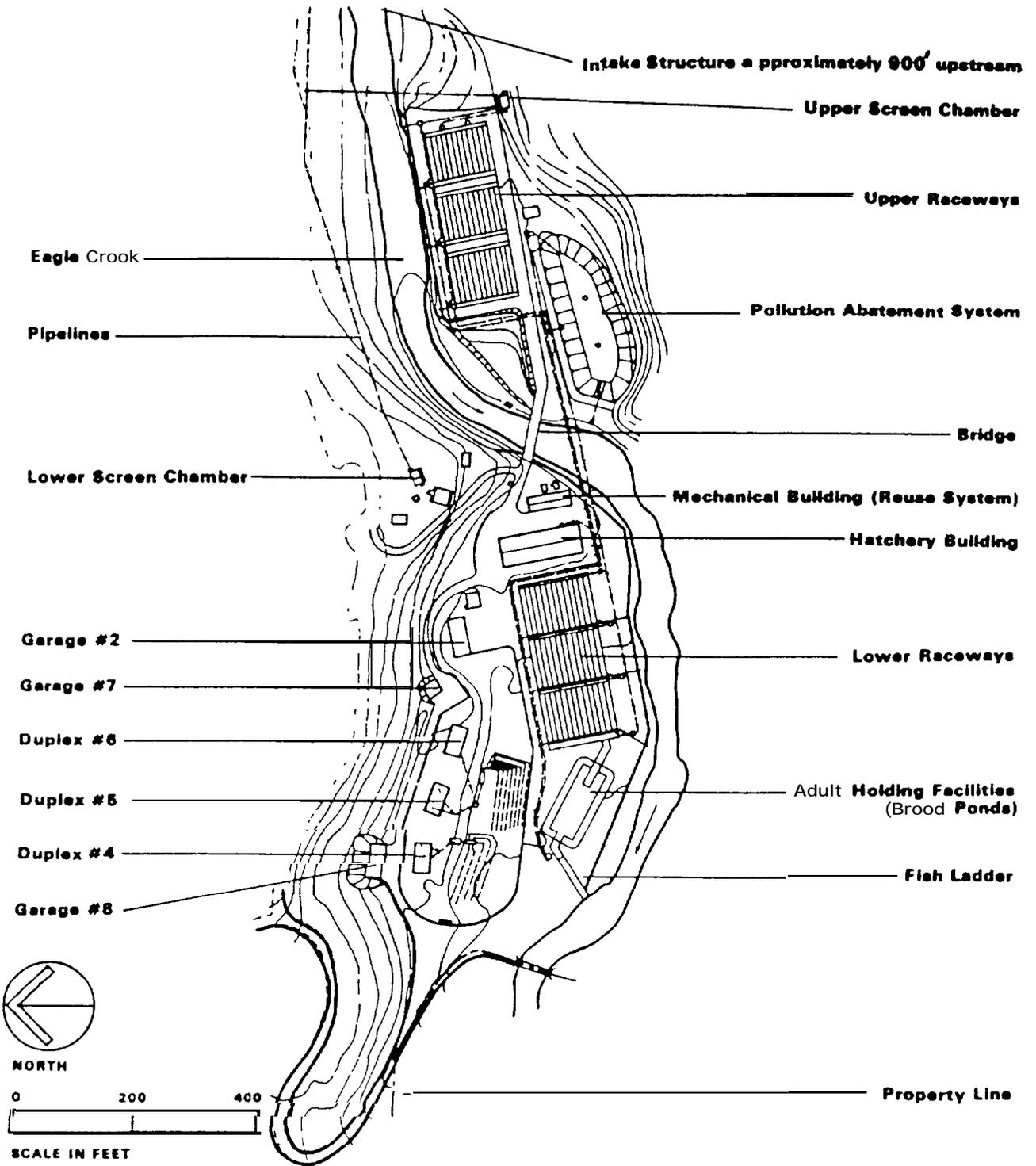
The hatchery is situated on 126 acres owned by the USFWS. Approximately 20% of the area is being utilized. The topography of

most of the remaining area is unsuitable for hatchery expansion. No additional water is available from Eagle Creek during low flow periods. Additional water is available during winter and spring high flow periods. The potential for well water is unknown.

The USFWS identifies rebuilding adult holding pond, rehabilitating existing raceways and several miscellaneous items as needing to be accomplished. These items would not increase production but would allow a more efficient operation.

Beginning with the 1991 release, production is to be increased by 1,000,000 coho smolts weighing 66,667 pounds. Since this production is already scheduled to occur it is not identified in this report

No expansion capability is identified

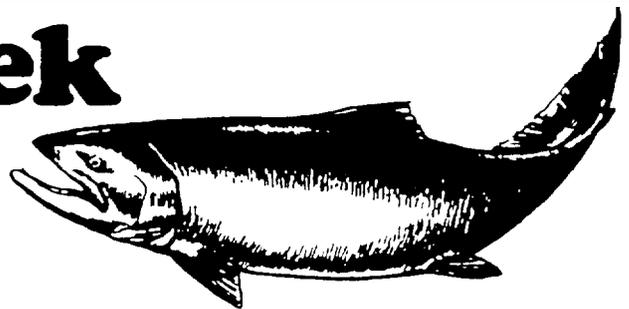


# Eagle Creek

NATIONAL FISH HATCHERY

EXISTING FACILITIES

REGION ONE U.S. FISH AND WILDLIFE SERVICE



Entiat National Fish Hatchery  
Entiat River Road  
Box 6970  
Entiat, Wa. 98822

Funding Agency: USFWS  
Species Reared: Spring Chinook

Manager: William **Thorson**, Assistant  
Phone #: (509) 784-1131

### Introduction

Entiat NFH is located along the Entiat River East of the town of Entiat in northeast Washington. Facility elevation is 980 feet above sea level. The hatchery was authorized by the Grand Coulee Fish Maintenance Project on April 3, 1937, and re-authorized by the Mitchell Act, May 11, 1938. Land was purchased and construction of the original facility was initiated by the Bureau of Land Management (BLM) in 1940. Limited operation of the hatchery began in 1941. The original purpose of the hatchery was to mitigate for loss of salmon spawning grounds due to construction of Grand Coulee Dam. Construction costs and land purchase were approximately \$281,000. The facility is operated as a satellite of Leavenworth NFH and staffed with 3.0 FTE's.

The rearing units are in good condition and consist of 27 circular and 16 rectangular starter tanks, 30 raceways, and 1 adult holding pond. The adult holding pond is not used to rear fish. Entiat NFH produces approximately 800,000 yearling spring chinook smolts at 15 to 20 fish per pound. They are released into the Entiat River in April of each year.

Water rights total 15,340 gpm from 3 sources; 4 wells, Entiat River, and Packwood Spring. Average flow available for hatchery use is 7,786 gpm with the Entiat River and wells providing the majority of it. Well and spring water is mixed at the water treatment structure and used for incubation and rearing. River water is used for rearing. Water can be re-used through serial raceways when fish loading's are heavy.

### Current Production Constraints

The supply of well and spring water is restricting fish production at this station. It may be possible to rear 1 million smolts (50,000 pounds) given additional well and/or spring water. This is approximately 200,000 smolts (10,000 pounds) more than currently is produced.

Water temperature from the Entiat River approaches 70 degrees fahrenheit during the summer and must be tempered with well and/or spring water. The current supply of well and spring water is insufficient to temper sufficient river water to operate all facilities in the summer. A tradeoff must be made between

supplying cool water to the adult holding pond and the juvenile rearing facilities. The current supply of cool water can provide water enough to rearing units to hold only 726,000 fingerlings during summer.

Smolts must be held until late April to coincide with water budget releases. Fingerlings are 100 fish per pound at this time and compete for space and water. The 27 circular ponds should be replaced with rectangular starter tanks to increase early rearing space.

River intake is subject to ice jams in the winter. River water is also presumed source of Myxolbolus and IHN.

Early rearing cannot be accomplished on river water.

Existing adult holding pond is antiquated and inefficient because of need to handle fish for erythromycin injection and sorting. High adult mortality has occurred in the past.

An additional 10 stacks of vertical incubators are needed so all eggs can be hatched in them.

### Theoretical Production

Theoretical production based on the flow method is 104,358 pounds and with density is 62,764 pounds. Average production was 48,240 pounds and the 1987 agency goal was 47,060 pounds. Theoretical calculations were computed for spring chinook as follows:

#### Flow Method \*

Total all Flows: 2.26 X 7,800 gpm X 5.92" = 104,358 lbs \*  
Springs/Wells: 2.26 X 2,400 gpm X 3.22" = 17,465 lbs  
(Disease free water )

#### Density Method \*\*

Smolts in April: .25 X 37,500 cu ft X 5.92" = 55,500 lbs  
Fingerling/April: .25 X 9,024 cu ft X 3.22" = 7,264 lbs  
62,764 lbs

\* Note: The spring/well water supplies are required to temper 70 degree fahrenheit river water during the summer and is a limiting factor. Calculation under "Total all Flows" includes water from springs/wells.

\*\* Note: Only 25 of the 30 raceways were used to calculate theoretical density for smolts. Fingerlings utilize the remaining 5 raceways in April. Adult holding pond was not used in calculation since it is not utilized for rearing.

Comparison of the 2 theoretical calculations indicates that rearing space appears to be the limiting factor in production. It appears that the existing flow should support additional production. This is misleading as more well and/or spring water is required to temper high river water temperatures in the summer to fully utilize the existing supply. Given an additional supply of cool water to temper river water the existing flow could support additional production.

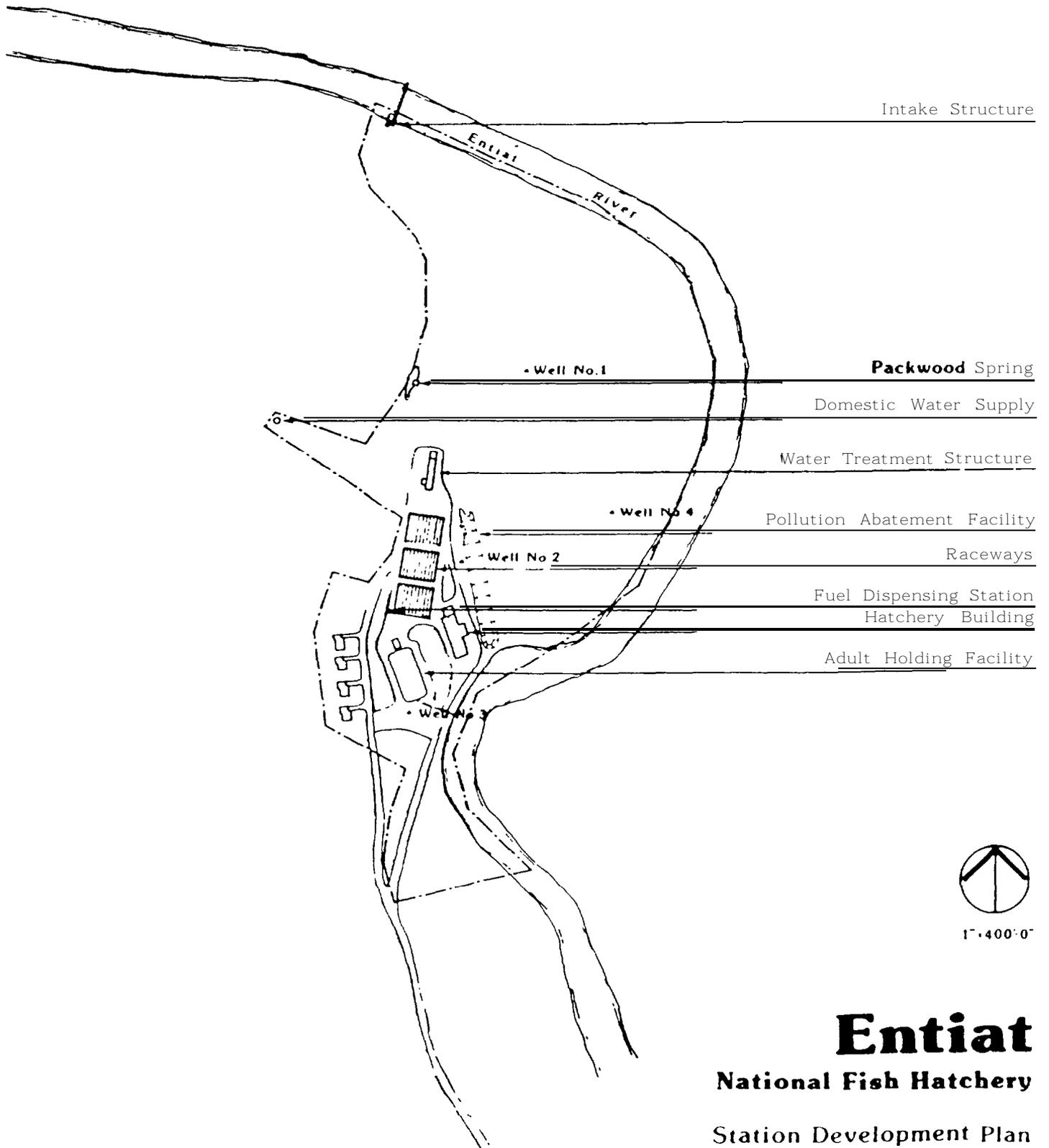
The current production goal is 800,000 smolts weighing 50,000 pounds. The theoretical density calculation was based on only 25 of the 30 raceways. If additional early rearing facilities and cool water were provided it would free up the 5 standard raceways for smolt production. This would allow the facility to rear an additional 200,000 smolts weighing 10,000 pounds (for a total hatchery production of 60,000 pounds).

#### Hatchery Expansion Capability

The hatchery is situated on 34.4 acres owned by the USFWS. Approximately 100% of the area is being utilized. Additional water is available (500 to 700 gpm) from wells. There is additional water from the Entiat River but the water right may not be available and it would require additional well water to temper the temperature.

Construction needed to increase production includes replacement of troughs with vertical incubators, replacement of circular starter tanks with rectangular fiberglass tanks, additional fingerling rearing facilities, new adult holding facility, equipment, and rehabilitation of spring and well water supplies. This would allow an additional 200,000 spring chinook smolts weighing 10,000 pounds to be produced.

# Existing Facilities



## Entiat National Fish Hatchery

Station Development Plan

US Fish and Wildlife Service

Hagerman NFH  
3059D-National Fish Hatchery Rd.  
Hagerman, Id 83332

Funding Agency: USFWS, COE  
Species Reared: Summer Steelhead  
Resident Trout

Manager: David S. Bruhn  
Phone #: (208) 837-4896

### Introduction

The Hagerman NFH is located next to the Snake River in southern Idaho, approximately 5 miles southeast of the town of Hagerman. Elevation of the site is 2,964 feet above sea level. The hatchery was authorized in 1930, construction began in 1932, and operations commenced in 1933. Historically, production consisted of rainbow trout for stocking waters in Idaho, Oregon, and Nevada. In the late 1970s trout production was reduced and the steelhead program began. The hatchery was rebuilt and expanded from 1982 through 1984 under the LSRCP by the COE. Current production consists mainly of summer steelhead for LSRCP mitigation. Dworshak NFH also contracts with Hagerman NFH to produce about 200,000 rainbow trout for Dworshak Reservoir. The facility is authorized a staff of 9.5 FTE's.

The rearing units are in good condition and consist of 66 starter tanks, and 102 raceways. No adults are collected or spawned at this facility. Eggs are transferred in from other hatcheries. Steelhead are reared to yearling smolts and all are released off-site into various tributaries. Hagerman NFH is also utilized for early rearing of Dworshak NFH steelhead in an attempt to eliminate early rearing loss at Dworshak from IHN.

Water rights total 31,957 gpm from 6 different sources. They include Riley Creek, Bickel Ditch, Brailsford Ditch, Spring No. 17, Spring No. 13, and Miscellaneous Springs and Seeps. The state of Idaho is presently going through a complete adjudication of water rights in the Snake River Basin, which within a few years may further refine the hatcheries water rights. Water available for hatchery use ranges from 18,900 gpm to 31,500 gpm from spring sources. Water temperature is a constant 59 degrees fahrenheit. Raceways are organized into two systems each with three tiers for serial re-use of water.

### Current Production Constraints

This facility is dependent on eggs from other hatcheries.

The current supply of water to the hatchery is a production constraint. If additional water could be found, production could be increased in the existing facilities.

## Theoretical Production

Theoretical production based on the flow method is 321,996 pounds and with density is 540,672 pounds. Average production was 329,475 pounds and the 1987 agency goal was 266,220 pounds. The current agency goal is 360,000 pounds (340,000 pounds steelhead and 20,000 pounds trout). Theoretical calculations were computed for steelhead as follows:

Flow Method

$$1.19 \times 31,500 \text{ gpm} \times 8.59" = 321,996 \text{ lbs}$$

Density Method

$$.25 \times 251,768 \text{ cu ft} \times 8.59" = 540,672 \text{ lbs}$$

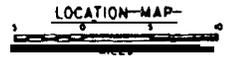
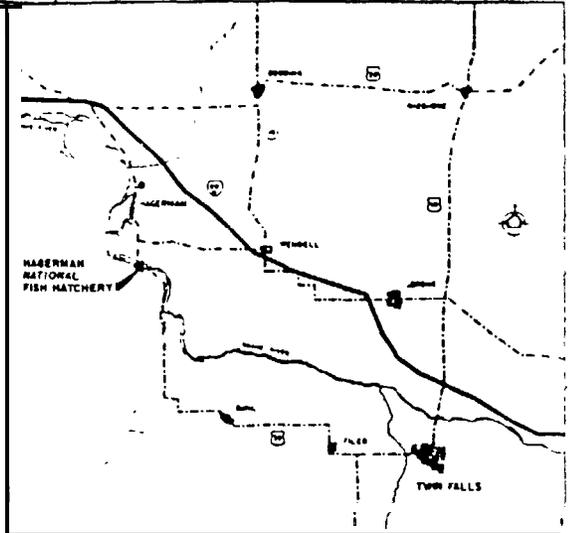
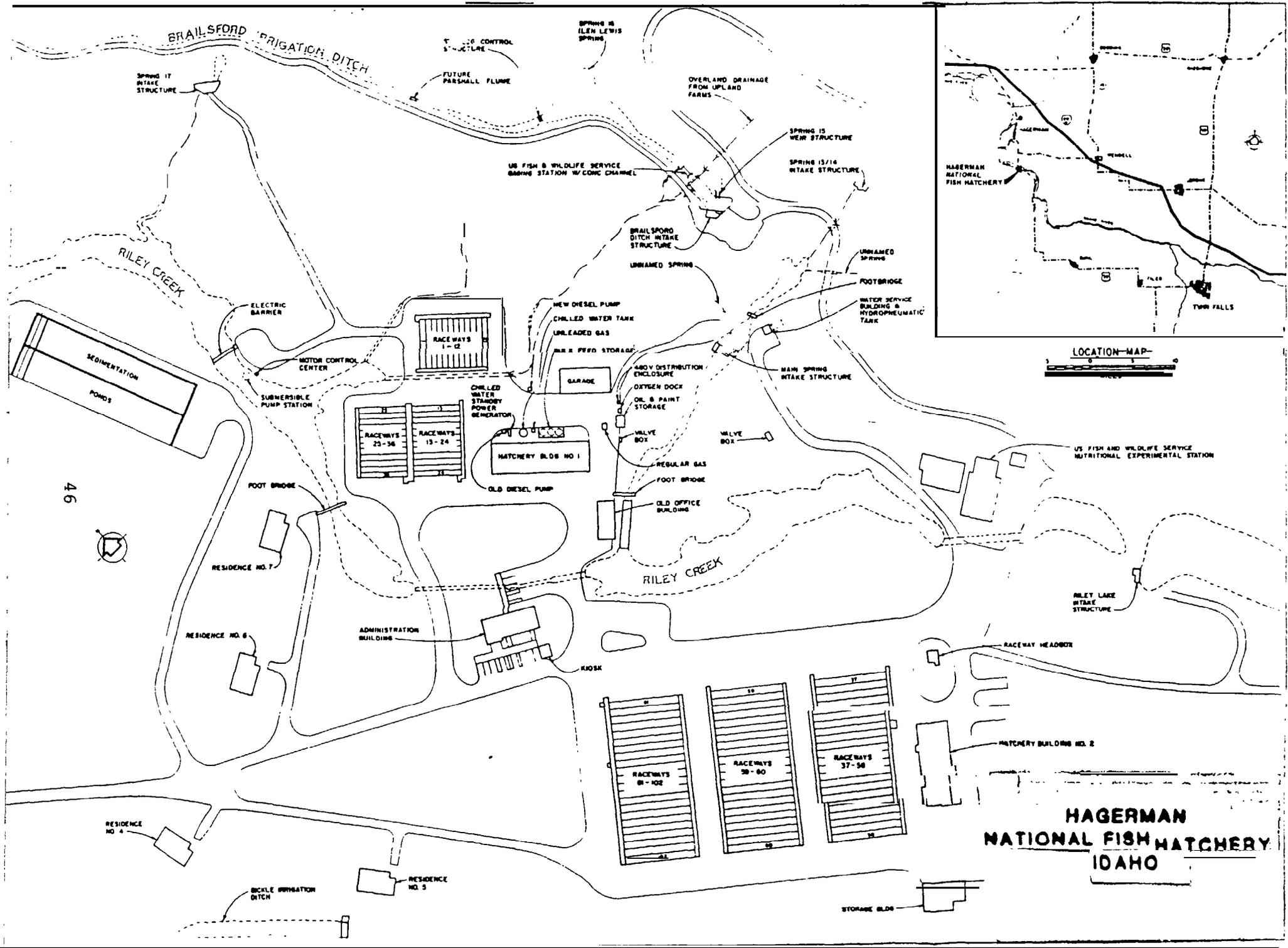
Note : All raceways and starter tanks were used in theoretical density calculation.

Comparison between the 2 theoretical calculations indicates that flow is probably the limiting factor in production. As indicated above, if additional water could be supplied then production could be increased in existing facilities.

## Hatchery Expansion Capability

The hatchery is situated on 303 acres owned by the USFWS. Approximately 80% of the area is being utilized. The remaining 60 acres are not suitable for expansion. No additional spring water is available. The potential for well water is not known. If an additional source of water could be developed then production could be increased in the existing rearing facilities.

No expansion capability is identified.



**HAGERMAN  
 NATIONAL FISH HATCHERY  
 IDAHO**

46

Kooskia NFH  
Route 1, Box 98-A  
Kooskia, Id 83539

Funding Agency: USFWS, COE  
Species Reared: Spring Chinook

Manager: Speros Doulos  
Phone #: (208) 926-4272

### Introduction

Kooskia NFH is located in north-central Idaho approximately 50 miles southeast of Lewiston in northwest Idaho County. The hatchery is situated in a narrow valley of Clear Creek just upstream of its confluence with the Middle Fork Clearwater River. Elevation of the facility is 1,295 feet above sea level. The hatchery was authorized in 1961, construction was initiated in 1968, and operations began in 1969. The facility is operated as a satellite facility of Dworshak NFH and is authorized 4.0 FTE's.

The rearing units are in fair to good condition and consist of 1 adult holding pond, 6 Burrows ponds, 12 standard raceways, 42 circular starter tanks, and 32 rectangular starter tanks. Spring chinook are the only smolts produced. Summer steelhead eyed eggs are received from Dworshak NFH, hatched, reared a short time, and then transferred back in an attempt to reduce mortality from IHN.

Adult spring chinook are collected throughout the summer. Adults are transferred to Dworshak NFH due to warm water temperatures in the summer. Adults are held and spawned at Dworshak NFH. Eggs are incubated at Dworshak NFH until the eyed stage and then transferred to Kooskia NFH. Fish are ponded in February and March and juveniles reared until release the following March. Smolts are released both on station and at off-site locations.

Water rights total 13,456 gpm from 6 wells and Clear Creek. The permit for well number 4 was canceled in 1973. Just over half the water right is from Clear Creek. Water available for hatchery use ranges from 4,389 gpm to 8,527 gpm, the majority is supplied from Clear Creek. The hatchery is operated with a water re-use system that incorporates bio-filters between uses.

### Current Production Constraints

Water temperatures are too high for successful adult holding during summer months. Well water is limited to 350 gpm and must be chilled and re-used in the summer for juvenile rearing.

New well/wells are required to provide additional water for quality rearing conditions.

The early rearing of Dworshak steelhead places some constraints on chinook production with Clear Creek's warm water temperatures. The

program also prevents changing chinook production regimes.

### Theoretical Production

Theoretical production based on the flow method is 109,056 pounds and with density is 45,096 pounds. Average production was 35,361 pounds and the 1987 agency goal was 40,000 pounds. Production increased each year of this evaluation so average is less than currently being produced. Theoretical calculations were computed for spring chinook as follows:

Flow Method  
 $2.0 \times 9,600 \text{ gpm} \times 5.68" = 109,056 \text{ lbs}$

Density Method \*  
 $.25 \times 31,758 \text{ cu ft} \times 5.68" = 45,096 \text{ lbs}$

\* Note: Cubic feet used in density calculation includes all Burrows ponds, raceways and the 42 circular starter tanks.

Comparison of the 2 theoretical calculations indicates that rearing space is the limiting factor in production. The water supply should be able to support additional rearing facilities, but due to warm water temperatures in the summer it will require more well water for tempering.

Actual production in 1987 was 46,385 pounds and is slightly greater than the density calculation. Hatchery capacity should be considered to be about 45,000 pounds based on the agency goal, 1987 production, and the density calculation all being in close agreement.

### Hatchery Expansion Capability

The hatchery is situated on 129 acres owned by the USFWS. An additional 7.28 acres in easement is held for the water intake structure, screen chamber, and pipeline. Approximately 10% of the area is being utilized. The remaining area is suitable for hatchery expansion if additional cool water can be located. The potential for expansion of well water supplies is unknown.

The USFWS identifies the following as needing to be accomplished:

1. Screen chamber improvements
2. Hatchery building rehabilitation
3. Raceway and pond rehabilitation
4. Pollution abatement system improvement

5. Covers for production facilities
6. Adult handling and loading facility
7. Residence
8. Visitor facilities/administration building
9. Raceway bio-filter
10. Two 1/4 acre smolt release ponds

Potential increase in smolt production is 580,000 spring chinook smolts weighing 29,000 pounds. The two 1/4 acre smolt release ponds would be required to rear this additional production. Water could be supplied to these ponds from the Middle Fork Clearwater River.

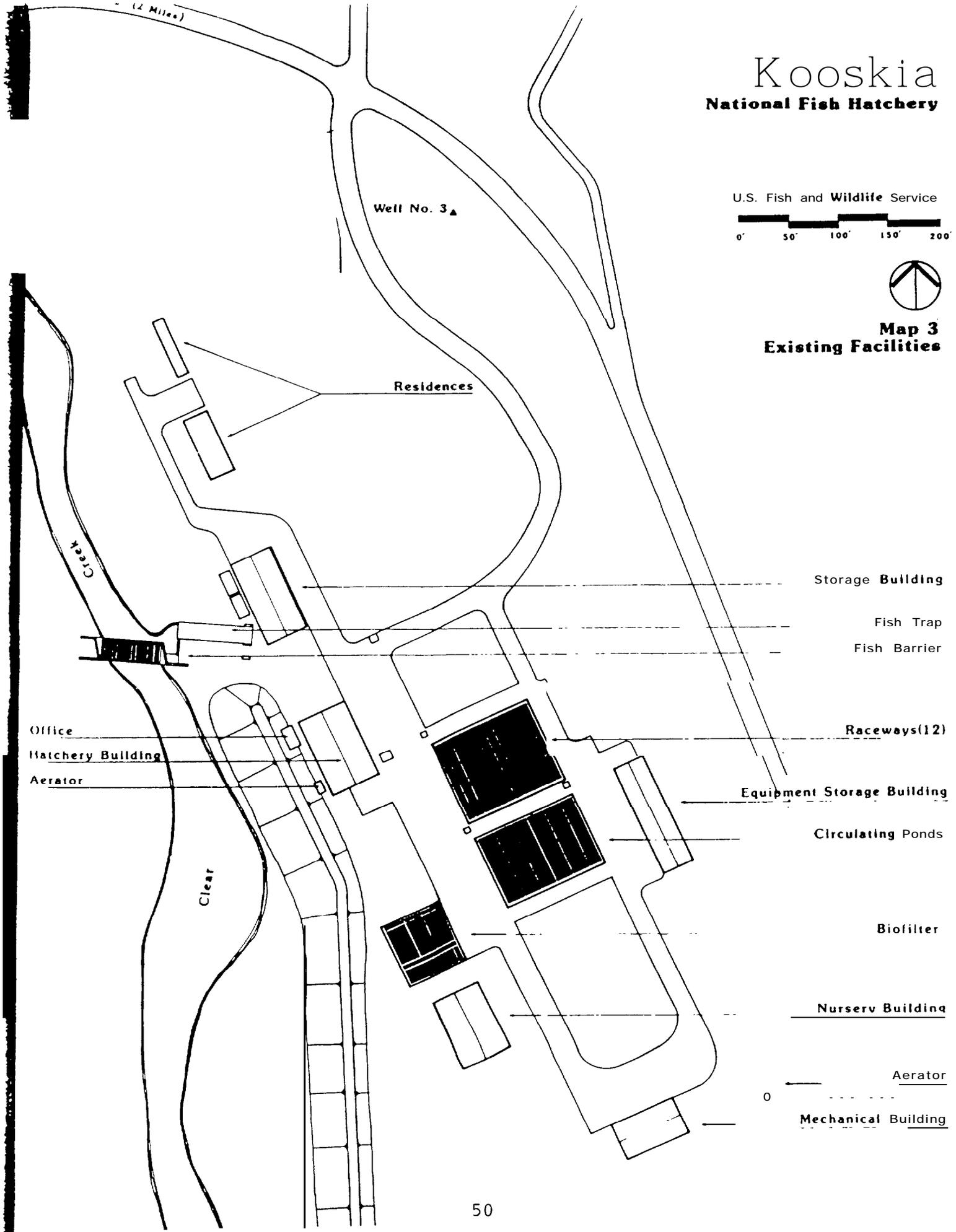
# Kooskia National Fish Hatchery

U.S. Fish and Wildlife Service

0' 50' 100' 150' 200'



### Map 3 Existing Facilities



Leavenworth NFH  
P.O. Box 549  
12790 Fish Hatchery Road  
Leavenworth, Wa. 98826

Funding Agency: USFWS  
Species Reared: Spring Chinook  
Summer Steelhead

Manager: Gregory A. Pratschner  
Phone #: (509) 548-7641

### Introduction

Leavenworth NFH is located along Icicle Creek, a tributary of the Wenatchee River, approximately 30 miles above its confluence with the Columbia River and about 40 miles northeast of the town of Leavenworth. Elevation of the site is 1,155 feet above sea level. The hatchery is located on fill within the Wenatchee River flood plain and flooding is an occasional concern during spring run-off. The hatchery was authorized by the Grand Coulee Fish Maintenance Project, April 3, 1937, and re-authorized by the Mitchell Act, May 11, 1938. It began operations in 1942. This facility is 1 of 3 mid-Columbia stations constructed by the Bureau of Reclamation as fish mitigation facilities for the Grand Coulee Dam, Columbia Basin Project. Entiat NFH and Winthrop NFH hatcheries are operated as satellite facilities. Leavenworth NFH is staffed with 9.0 FTE's.

The rearing units are in poor condition and consist of 2 adult holding ponds, 45 raceways, 40 Foster Lucas Raceways (36 are operational, 3 unusable, and 1 has been converted to standard raceway), 22 larger Foster Lucas Raceways, 198 troughs, and 90 starter tanks. The large Foster Lucas Raceways are in poor condition, should be replaced, and there is only sufficient water to operate 7 of them.

Both spring chinook and steelhead are collected, spawned, and reared to yearling smolt size for release. Smolts are normally released on-site.

Water rights total 25,551 gpm from 3 sources; 7 wells, Icicle Creek, and Snow and Nada Lakes. The hatchery receives water from Icicle Creek by gravity flow and wells by pumping. Average flow available to hatchery is 18,170 gpm. There is insufficient water to operate all rearing facilities. Snow and Nada Lakes are used to supplement Icicle Creek during low flow periods. Water is re-used in the serial raceways.

### Current Production Constraints

Water supply is limiting production potential at this facility. There is insufficient water to operate 15 of the large Foster Lucas Raceways.

Icicle Creek pipeline needs to be enlarged. Wells need to be

rehabilitated or new ones drilled.

Foster Lucas raceways should be replaced with standard flow-through raceways.

Adult holding facility is too small. It should be twice the size and handling equipment should be installed to increase efficiency and reduce handling stress.

### Theoretical Production

Theoretical production based on the flow method is 261,620 pounds and with density is 462,326 pounds. Average production was 159,976 pounds and the 1987 agency goal was not identified. The current agency goal is to produce 145,000 pounds. Theoretical calculations were computed as follows:

#### Flow Method

Spring Chinook:	2.16 X 19,500 gpm X 5.68"	= 239,242 lbs
Steelhead:	2.16 X 1,400 gpm X 7.40"	= <u>22,378 lbs</u>
		261,620 lbs

#### Density Method

Spring Chinook:	.25 X 317,244 cu ft X 5.68"	= 450,486 lbs
Steelhead:	.25 X 6,400 cu ft X 7.40"	= <u>11,840 lbs</u>
		462,326 lbs

Note : The USFWS indicates through rearing experience at this facility that the 2.16 flow index used in theoretical flow calculation is too high. To rear healthy fish the agency recommends a flow index of 1.3 be used which would provide a total theoretical capacity based on flow of 157,456 pounds.

Spring chinook calculations used 7 large Foster Lucas, 36 small Foster Lucas, and 45 standard raceways. Steelhead were calculated using 5 Foster Lucas. Fifteen of the large Foster Lucas raceways were not used in calculations as there is currently insufficient water to operate them. If they had been used in density formula it would increase density calculation for spring chinook by 289,000 pounds and make the total density figure about 750,000 pounds.

Comparison between the 2 theoretical calculations indicates that flow is the limiting factor in production. This is even more pronounced if the flow index recommended by the USFWS is used and compared with all the rearing units. The existing rearing facilities could support far greater production if supplied with

sufficient water. Fifteen of the large Foster Lucas raceways are currently not being utilized due to insufficient water.

#### Hatchery Expansion Capability

The hatchery is situated on 876 acres owned by the USFWS. Approximately 160 acres of the total is suitable for fish culture operations. Approximately 5,386 gpm of additional Icicle Creek water is available during the spring when pounds held on station is greatest. This water is not available during low flow periods. Well water supplies could be increased 900 gpm or more.

The potential production increase at this facility is 1.8 million additional spring chinook smolts weighing about 100,000 pounds. Summer steelhead production would remain the same. To accomplish this expansion would require the following:

1. Drill and install new wells for ground water.
2. Modify intake structure on Icicle Creek by raising dam and adding control valve to ladder.
3. Enlarge Icicle Creek water supply pipeline.
4. Separate Cascade Irrigation Company pipeline from hatchery pipeline.
5. Replace large Foster Lucas raceways with 45 standard raceways.
6. Install water re-use pump-back system.
7. Enlarge pollution abatement pond.

# Existing Facilities

Pollution Abatement Facility  
Small Foster-Lucas Ponds  
Adult Holding Facility

Garage/Shop/Storage Building  
Cold Storage building

Hatchery Building  
Large Foster-Lucas Ponds

Residences

Raceways

Valve House  
Screen Chamber

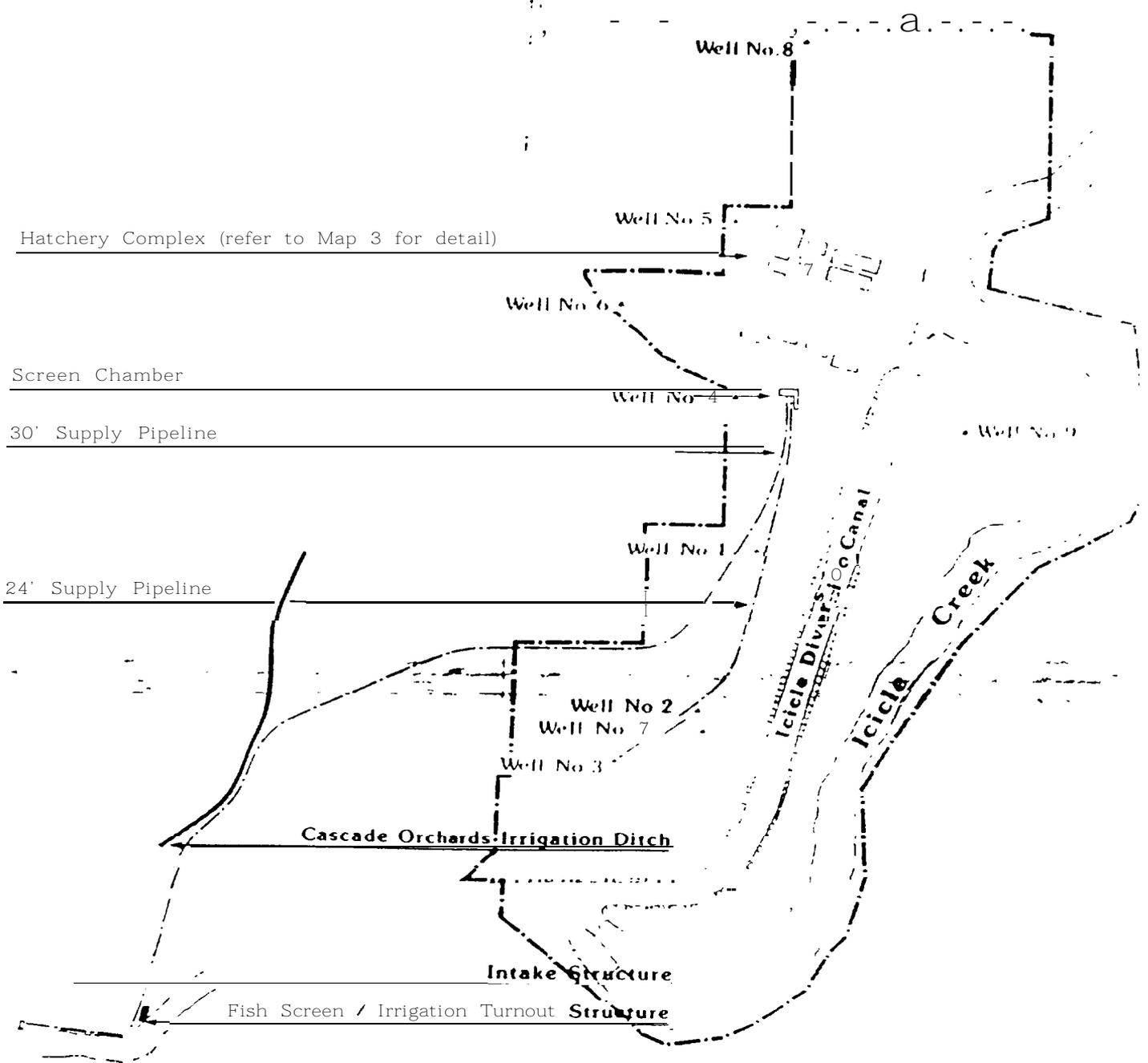


# Leavenworth

National Fish Hatchery

Station Development Plan

# Existing Facilities



## Leavenworth;

National Fish **Hatcher**

Station Development **Plan**

U.S. Fish and Wildlife Service

Little White Salmon NFH  
Box 17  
Cook, Wa. 98605

Funding Agency: USFWS, NMFS  
Species Reared: Spring Chinook  
Fall Chinook

Manager: Jack E. Bodle  
Phone #: (509) 538-2755

## Introduction

Little White Salmon NFH is located approximately 12 miles east of Stevenson, in Skamania County, Washington. It is situated just above Drano Lake, through which the Little White Salmon River joins the Columbia River. Elevation of the site is 90 feet above sea level. The hatchery was authorized in 1887 and construction was completed in 1898. The hatchery was remodeled and expanded in 1958 and is currently operated as part of the CRFDP. A water re-use system was constructed in 1977 for egg incubation and hatchery building. In recent years the lower area raceways have been enclosed and a new adult holding and spawning facility is nearing completion. This hatchery is operated as a complex with Willard NFH with the manager from Little White Salmon NFH responsible for both facilities. The facility is authorized a staffing level of about 9 **FTE's**.

Rearing facilities consist of 52 raceways of various sizes, 4 adult holding ponds and 10 starter tanks. All raceways are in poor condition and the remaining facilities are in fair to good condition. The current program produces Upriver Bright (URB) fall chinook and spring chinook. Lower river **tule** fall chinook were also reared during this evaluation, but this program has been phased out.

Spring chinook and URB fall chinook are the 2 stocks currently being reared. Spring chinook, URB fall chinook, and **coho** adults are collected and spawned. Spring and fall chinook eggs are incubated on-site. Coho eggs are transferred to Carson Depot for incubation and then transferred to Willard NFH where they are reared until release the following spring. Both yearling and accelerated zero age spring chinook smolts are produced with all released on-site during this evaluation. The **URB's** are released as yearlings and zero age smolts. The yearling smolts are released in the spring and the zero age smolts during the summer. All were released on-site during this study but the current program releases a large percentage into the Yakima River in Washington.

The water right totals 33,868 gpm from two sources, 2 unnamed springs and the Little White Salmon River. The river supplies the majority of flow used in the hatchery. Water is provided to the hatchery from both water rights and also from a well. Water use ranges from 11,221 gpm to 26,182 gpm. The adult holding ponds and raceways all receive single pass water. A re-use system is in place for incubation.

### Current Production Constraints

Raceways are in deteriorated condition and require considerable maintenance and rehabilitation. There is room for additional raceways and water from the Little White Salmon River is available.

Intake structure and piping need modification to fully utilize available water.

### Theoretical Production

Theoretical production based on the flow method is 203,938 pounds and with density is 90,272 pounds. Average production was 94,626 pounds and the 1987 agency goal was 103,030 pounds. Average production is less than normal due to IHN outbreak in URB's in 1987 (fish were destroyed). Theoretical calculations were computed for spring chinook as follows:

#### Flow Method

$$2.43 \times 22,500 \text{ gpm} \times 3.73" = 203,938 \text{ lbs}$$

#### Density Method

$$.25 \times 96,806 \text{ cu ft} \times 3.73" = 90,272 \text{ lbs}$$

Comparison of the 2 theoretical calculations indicates that pond space is the limiting factor in production. Average production and agency goal are both greater than theoretical density figure. This was accomplished by serial releases from the same ponds. The existing water supply should be able to support greater production given additional rearing space. The current agency production goal is:

Spring Chinook Yearlings:	1,000,000	66,660 pounds
Spring Chinook Zero Smolts:	1,000,000	22,222 pounds
URB Fall Chinook:	3,500,000	35,000 pounds
	<u>5,500,000</u>	<u>123,882 pounds</u>

### Hatchery Expansion Capability

The hatchery is situated on 407 acres owned by the USFWS. Suitable land for hatchery expansion is limited to 20 acres by steep slopes in the area. An additional 13,465 gpm is available from the Little White Salmon River. The potential for additional well water is unknown.

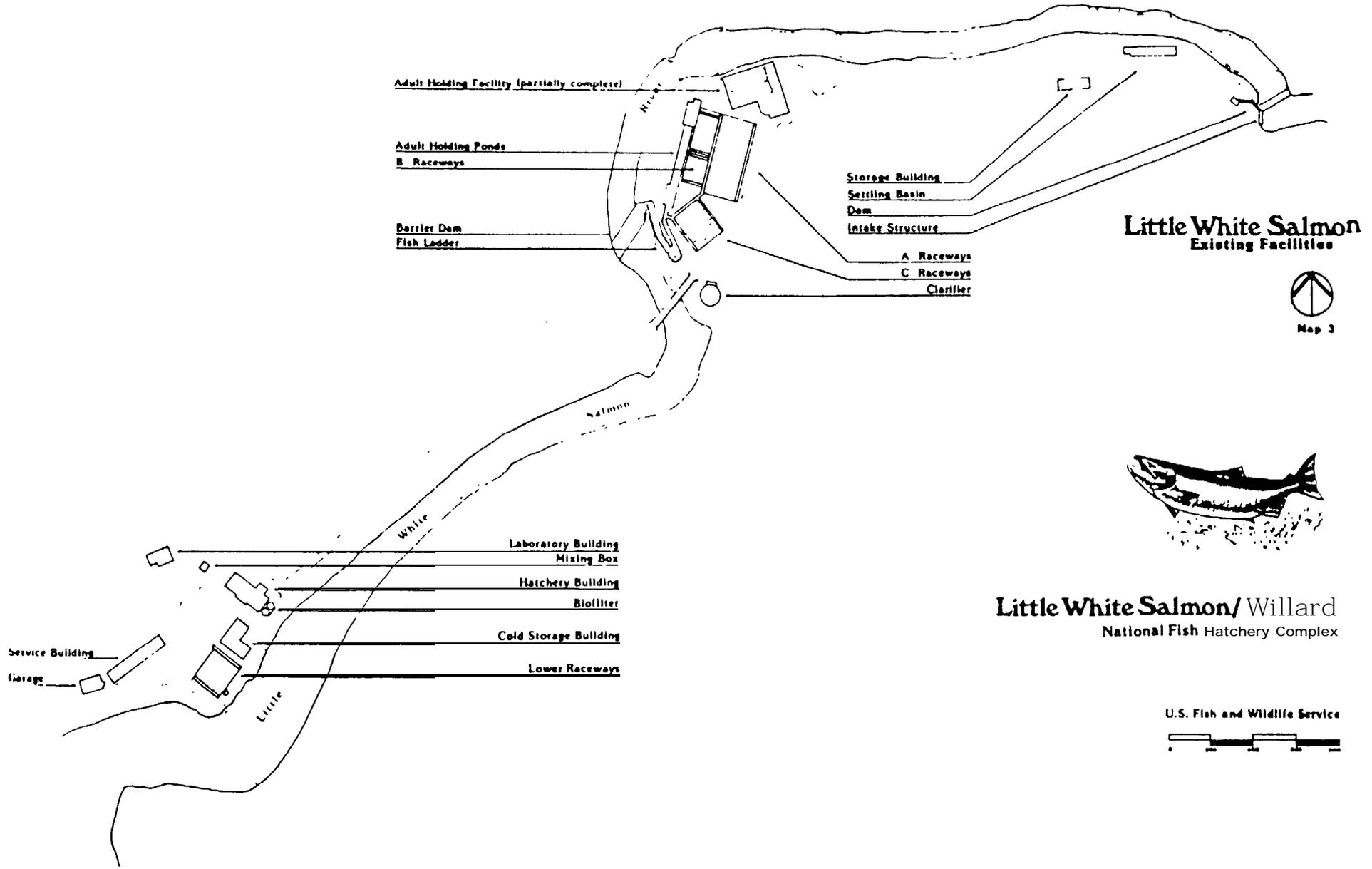
There is potential for considerable hatchery expansion at this

site. It would require the following:

1. Rehabilitate existing raceways
2. Add additional production facilities
3. Rehabilitate and enlarge existing water supply system
4. Pollution abatement facilities
5. Rehabilitate hatchery buildings
6. Rehabilitate roads and parking

Potential production increases total 4,500,000 smolts weighing approximately 65,000 pounds and is identified as follows:

	Number	Pounds
Spring Chinook	900,000	20,000
URB Fall Chinook	<u>3,600,000</u>	<u>45,000</u>
	4,500,000	65,000



### Little White Salmon Existing Facilities



### Little White Salmon/Willard National Fish Hatchery Complex

U.S. Fish and Wildlife Service



Spring Creek NFH  
Mile Post 6175 R.  
State Road 14  
Underwood, Wa. 98651

Funding Agency: USFWS, NMFS, COE

Species Reared: Fall Chinook

Manager: Ed LaMotte  
Phone #: (509) 493-1730

### Introduction

Spring Creek NFH is located along the Columbia River approximately 30 miles upstream of Bonneville Dam at Underwood, Washington. Elevation of the site is 93 feet above sea level. The station was originally constructed in 1900 and began operating in 1901. It was later remodeled in 1955 under the CRFDP. It was nearly completely razed and remodeled again in 1970 by the COE for mitigation of fish losses occurring from construction of John Day Dam. Currently NMFS, through the CRFDP is responsible for 50% of production costs and the COE the remaining 50%. The station is authorized 11 FTE's.

The rearing units are in good condition and consist of 44 Burrows ponds and 30 troughs. One circular pond is also present but is used for display purposes only. Fall chinook are the only species reared with both the lower river tule and URB stocks reared during this evaluation. Currently only the lower river tule stock is reared.

Tule fall chinook adults return in September and are spawned shortly thereafter. Eggs are incubated in Heath type incubators, ponded in December and January, and reared until release from March through May. By June in most years no fish are held on station. In recent years there has been a shortage of returning adults and egg takes have not met agency goals. Smolts are normally released on-site into the Columbia River with attempts made to coordinate operation of Bonneville Dam to ensure maximum survival past that project.

Water rights total 11,090 gpm from 3 sources; Unnamed Creek, 2 Unnamed Springs, and Columbia River. The Columbia River accounts for about 50% of water right and is only used as a heat source when production water requires heating to accelerate fish growth. Spring water is provided at a constant 46 degrees fahrenheit from a series of springs that emerge from the base of cliffs adjacent to the hatchery. This water supply has slowly decreased in recent years from a historical 4,000 gpm to a recent low of 2,250 gpm.

The hatchery features a 90% water re-use system with rock and oyster shell filters. Water is used up to 10 times prior to discharge to pollution abatement facilities and ultimately to the Columbia River.

### Current Production Constraints

The spring water supply has dwindled in recent years. Intakes need to be modified to utilize all available water and a deep well needs to be developed to insure adequate water supply.

Adult returns have not been sufficient to meet egg take and product goals. Protection for returning brood fish is needed.

### Theoretical Production

Theoretical production based on the flow method is 189,378 pounds and with density is 151,494 pounds. Average production was 162,772 pounds and the 1987 agency goal was 201,333 pounds. Average production is reduced due to early release of fish in 1985, caused by bacterial gill disease. Also, production numbers in recent years have been reduced because of less than required adult returns leading to egg shortfalls. Production in 1986 and 1987 averaged over 190,000 pounds. Theoretical calculations were computed for fall chinook as follows:

Flow Method \*  
 $1.67 \times 31,500 \text{ gpm} \times 3.6" = 189,378 \text{ lbs}$

Density Method  
44 ponds:  $.3 \times 140,272 \text{ cu ft} \times 3.6" = 151,494 \text{ lbs}$

\* Note: Flow used in calculation incorporates 90% re-use water and 10% fresh water.

Comparison of the 2 theoretical calculations indicates that rearing space may be limiting. This is a little misleading since this facility depends on an extensive water re-use system which may reduce production potential. Average production (1986 and 1987 average) and the agency goal are both greater than either theoretical calculation. This production is accomplished with serial releases in March, April, and May from the same ponds. This facility is not capable of holding 200,000 pounds on station at any one time.

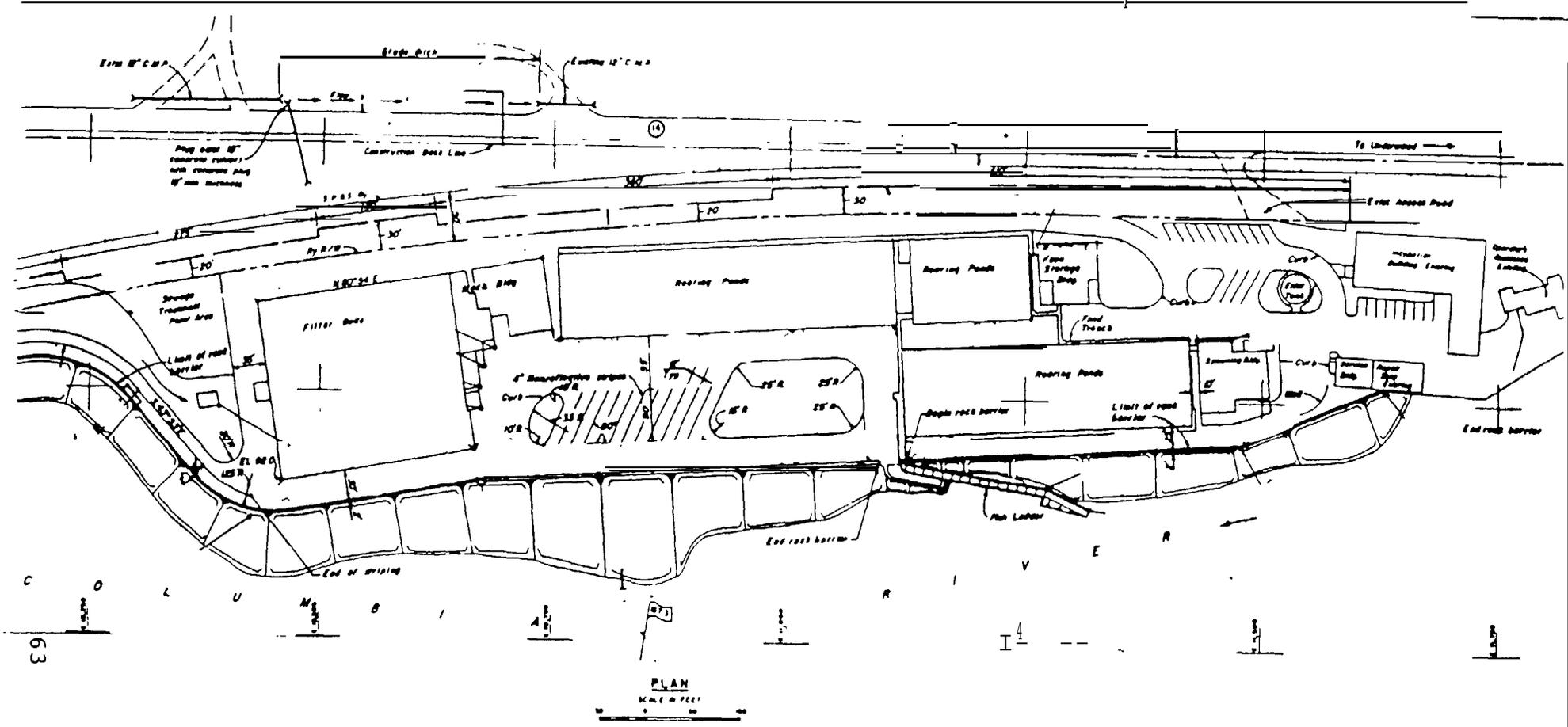
### Hatchery Expansion Capability

The hatchery is situated on 80 acres owned by the USFWS and COE. Approximately 60% of the area is being utilized. The remaining land is not suitable for hatchery expansion. There is little if any additional water available from the spring supply. Well water is currently being developed. Columbia River water is available in unlimited quantities but is considered a poor supply due to

temperature and potential disease problems. Columbia River water currently is not plumbed into the production system.

A small production increase may be possible when the planned deep well is developed. Any increase would be produced in existing ponds, but is highly speculative at this time. When deep wells are completed it will result in no increase in flow but will change the current 90% re-use system to a 70% or 80% re-use system. This should result in larger and healthier smolts and an increase in number of adults produced.

No expansion capability is identified.



SPRING CREEK NATIONAL FISH HATCHERY

Warm Springs NFH  
P.O. Box 790  
Warm Springs, Or. 97761

Funding Agency: USFWS  
Species Reared: Spring Chinook  
Resident Trout

Manager: Gary R. White  
Phone #: (503) 553-1692

### Introduction

Warm Springs NFH is located on the west bank of the Warm Springs River, approximately 14 miles north of Warm Springs, Oregon. The hatchery site is leased by the federal government from the Confederated Tribes of the Warm Springs Indian Reservation (CTWSIR). Elevation of the site is 1,525 feet above sea level. The hatchery is situated on gently to moderately sloping ground. Immediately upstream and downstream the banks of the river are high and steep. The hatchery was authorized in 1966 and began operation in 1978. The facility is authorized a staffing level of 5.0 FTE's.

The rearing units are in good condition and consist of 6 brood ponds, 20 Burrows ponds, 20 converted Burrows ponds, and 20 starter tanks. The original propagation program specified release of 57,000 pounds spring chinook, 20,000 pounds steelhead, and 87,500 pounds of rainbow trout. The production program has been modified since then and now consists of a goal of 1,200,000 spring chinook weighing 100,000 pounds.

Adult spring chinook are collected, spawned, and reared. Smolts are released in October and April of each year. All smolts are released on-site. Nearly all hatchery fish are marked to allow distinguishing between wild and hatchery fish upon return. Only wild adults are released above the hatchery weir and only enough to seed the habitat.

All water rights on the Warm Springs River are the property of the CTWSIR. Non-consumptive water use is included in the business lease (No. 1938) between the CTWSIR and USFWS. The lease specifies use of about 100 cfs (44,883 gpm) from the Warm Springs River. Water is supplied by pumping from the Warm Springs River and use ranges from 9,000 gpm to 13,500 gpm. All rearing ponds are supplied with single pass water.

### Current Production Constraints

The hatchery was originally conceived as a water re-use facility, but is now being operated as a single pass facility with pumping costs of \$100,000 per year.

Water supply has anadromous fish in it and there is potential for importation of disease organisms.

Adult holding ponds are too small to hold the desired number of fish.

Water temperature in summer is too warm and in winter too cold.

### Theoretical Production

Theoretical production based on the flow method is 156,330 pounds and with density is 81,000 pounds. Average production was 58,157 pounds and the 1987 agency goal was 66,708 pounds. These numbers do not include the small amount of resident trout produced during this evaluation. Theoretical calculations were computed for spring chinook as follows:

Flow Method

$$1.93 \times 13,500 \text{ gpm} \times 6.0" = 156,330 \text{ lbs}$$

Density Method

$$.25 \times 54,000 \text{ cu ft} \times 6.0" = 81,000 \text{ lbs}$$

Note: Theoretical calculations used 20 Burrows ponds and 20 converted Burrows ponds.

Comparison between the 2 theoretical calculations indicates that pond space is limiting factor in production. Average production and agency goal are both less than theoretical density calculation. This is misleading since the average production does not include the small resident trout program. Also, two brood years of spring chinook are held on station with the fingerlings taking up pond space.

The current agency goal is 1,200,000 spring chinook smolts weighing 100,000 pounds. This is far in excess of what was produced during this evaluation period. Even though this appears to be greater than the facility is capable of producing, serial releases in the fall and spring from the same ponds may allow this production to be achieved.

### Hatchery Expansion Capability

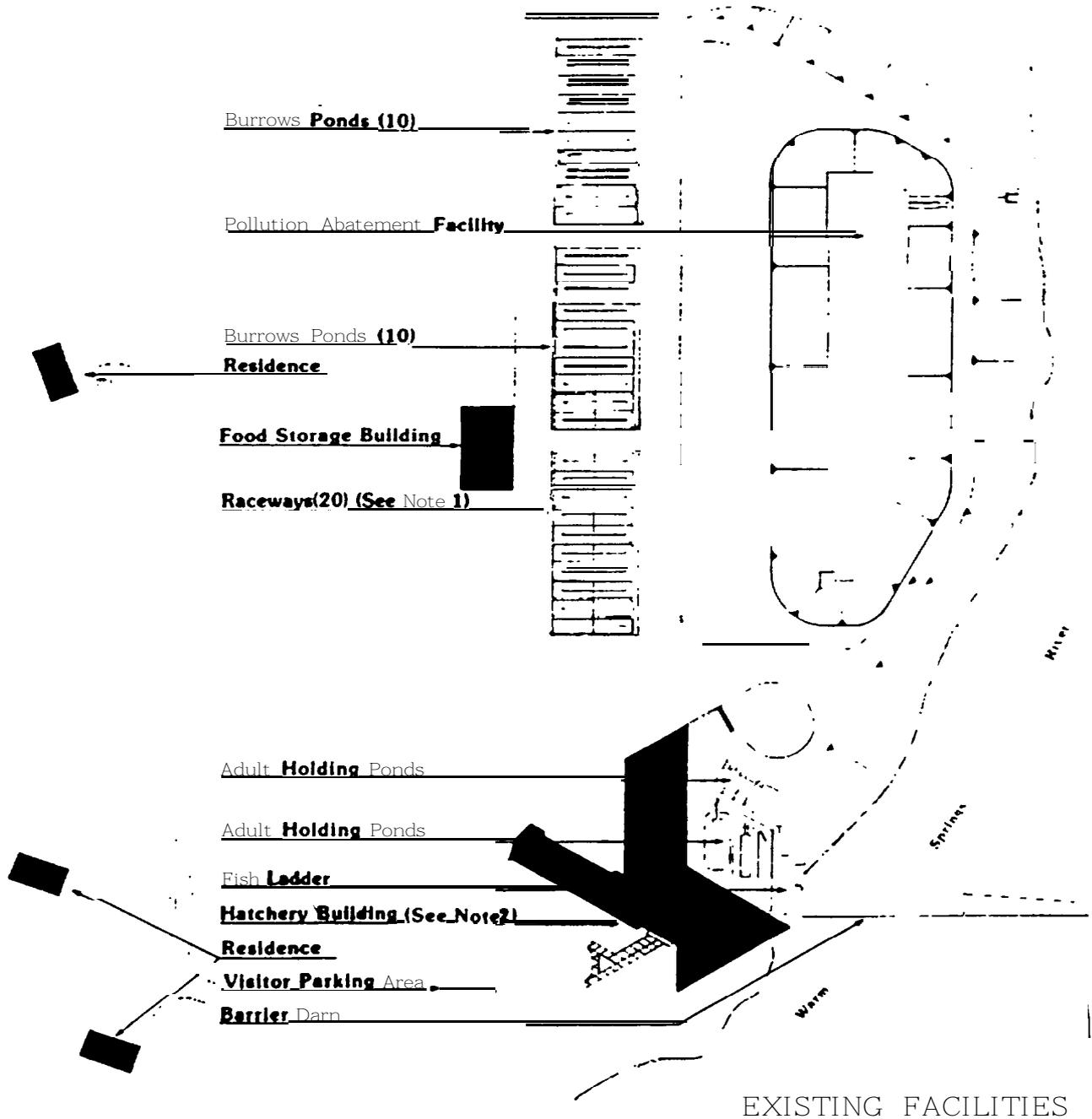
The hatchery is situated on 66 acres owned by the CTWSIR and leased by USFWS. Approximately 50% of the area is being utilized. There is nearly 18,000 gpm (40 cfs) of water available that the USFWS can utilize. Also, the water flow currently being used should be able to support additional production. The potential for well water is unknown.

The USFWS has identified this facility as needing major

modifications to improve smolt quality and should result in increased adult production. These modifications include:

1. Water intake modification
2. Fuel storage tanks
3. Lighting modifications
4. Adult holding facility modifications
5. Smoltification channel
6. Shade covers for ponds/raceways
7. Rearing pond conversion
8. Hatchery pavement
9. Low head hydro project to help pay pumping costs
10. Replacement of water treatment facilities

No expansion capability is identified.



Notes

- 1 Ten Burrows Ponds were converted to Raceways in 1984
- 2 The Intake Structure, Water Treatment Facilities, Tank Room, Administrative Area, Shop and Vehicle Storage are located within the Hatchery Building.

# WARM SPRINGS

NATIONAL FISH HATCHERY

U.S. FISH AND WILDLIFE SERVICE

Willard NFH  
Box 17  
cook, Wa. 98605

Funding Agency: USFWS, NMFS

Species Reared: Coho

Manager: Jerry Rogers  
Phone #: (509) 538,2305

### Introduction

Willard NFH is located on the Little White Salmon River approximately 4 miles upstream from the Little White Salmon NFH. Willard NFH and the Little White Salmon NFH are operated as a complex with management from the latter responsible for both facilities. Elevation of the site is 900 feet above sea level. The facility is authorized a staff of 5 FTE's.

Willard NFH was authorized by the Mitchell Act in 1946 and was constructed in 1952. The facility was originally planned as a fall chinook station but water temperatures were excessively cold and they were dropped from the rearing program. Spring chinook and coho were subsequently added to the rearing program. By the mid 1960's, it was decided to convert production entirely to coho salmon. Production has remained entirely coho since then. The current production goal is 2.5 million coho smolts weighing 166,600 pounds.

The rearing units are in fair to good condition and consist of 50 standard raceways and 52 starter tanks. No adults return to Willard NFH. Adult coho are collected at Little White Salmon NFH, spawned, eggs incubated at Carson Depot Springs, and then transferred to Willard to complete the rearing cycle. Smolts are normally all released on station.

Water rights total 24,685 gpm from 4 sources; Little White Salmon River, 3 wells, a spring (domestic/laboratory), and Carson Depot Springs. The majority of the water is supplied from the Little White Salmon River. Carson Depot Springs is located off station and is used for incubation. Well water is used for incubation and temperature control during early rearing. Water use at the hatchery ranges from 11,221 gpm to 24,442 gpm from the river and wells. All rearing facilities are normally supplied with single pass water, but in low flow years water from the upper bank of raceways is re-used in the lower bank.

### Current Production Constraints

During dry periods of the year (September-November), the supply of water from all sources is inadequate to meet Willard production and quality objectives.

Temperature of water supplied to the hatchery building is too cold

for efficient rearing of coho salmon fry. The cold water temperature is also responsible for cold water disease which results in a significant loss of fish at the fry stage.

### Theoretical Production

Theoretical production based on the flow method is 333,270 pounds and with density is 150,938 pounds. Average production was 173,391 pounds and the 1987 agency goal was 83,333 pounds. The current production goal is 160,600 pounds. Theoretical calculations were computed for coho as follows:

Flow Method

$$2.52 \times 23,000 \text{ gpm} \times 5.75" = 333,270 \text{ lbs}$$

Density Method \*

$$.3 \times 87,500 \text{ cuft} \times 5.75" = 150,938 \text{ lbs}$$

\* Note : The volume used in density calculation includes all raceways (80,000 cubic feet) and all starter tanks (7,488 cubic feet).

Comparison of the 2 theoretical calculations indicates that pond space appears to be the limiting factor in production. This is slightly misleading as calculations were computed for spring time high flow period. Production is constrained by available flow during September through November.

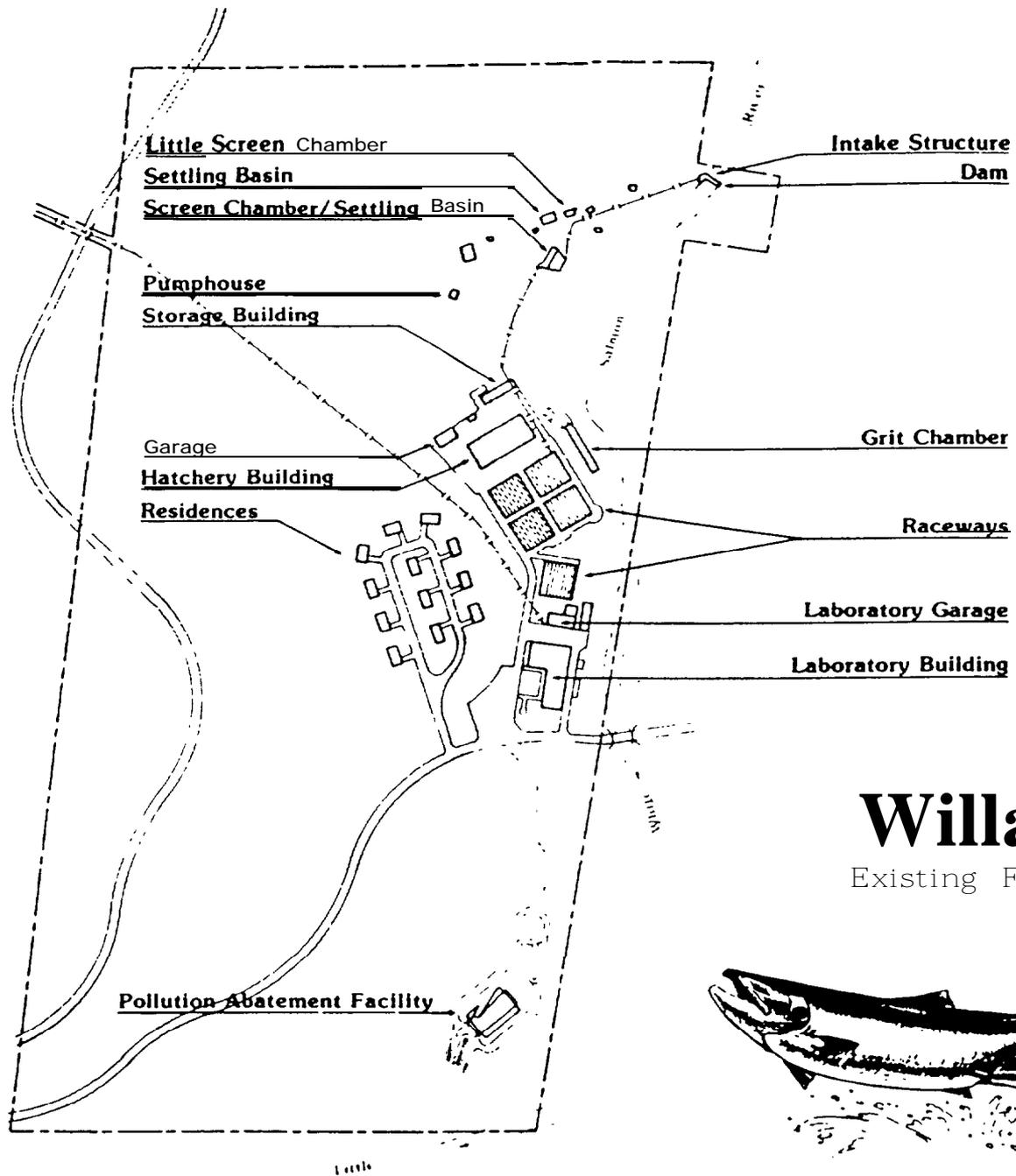
### Hatchery Expansion Capability

The hatchery is situated on 80 acres owned by the USFWS. Approximately 50% of the area is being utilized. The remaining area is not suitable for hatchery expansion. Additional water is available from the Little White Salmon River except from September to November. Additional well water is thought to be present.

Although it will not increase production the following items are need to improve smolt quality and insure production is maintained.

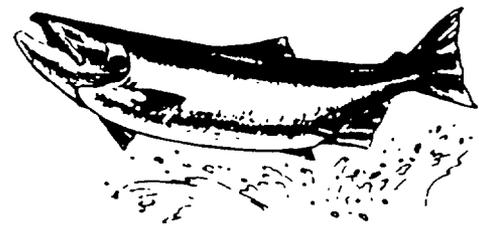
1. Install re-use system with capability to heat water
2. Drill production well
3. Rehabilitate raceways

No expansion capability is identified



# Willard

Existing Facilities



## Little White Salmon/ Willard National Fish Hatchery Complex

U.S. Fish and Wildlife Service



Winthrop NFH  
P.O. Box 429  
Winthrop, Wa. 98862

Funding Agency: USFWS  
Species Reared: Spring Chinook  
Resident Trout

Manager: William L. Wallien  
Phone #: (509) 996-2424

### Introduction

Winthrop NFH is located along the **Methow** River in north central Washington near the town of Winthrop. Elevation of the site is 1,760 feet above sea level. The hatchery was authorized as part of the Grand Coulee Fish Maintenance Project and began operation in 1942. The facility is operated as a satellite to Leavenworth NFH and is authorized a staff of 5.0 **FTE's**.

Condition of the rearing units ranges from poor to good and consists of 16 Foster Lucas raceways, 16 converted Foster Lucas raceways, 30 standard raceways, 1 adult holding pond (dirt), 32 troughs, and 46 starter tanks. The total rearing volume of the raceways is 109,400 cubic feet.

Fish cultural operations were initiated in 1942 by trapping adult sockeye salmon, chinook salmon, and steelhead at Rock Island Dam and transporting them to the hatchery. The first groups of fish were released in 1943. By 1951, the station was rearing sockeye, chinook, steelhead, kokanee, **coho**, and resident trout. During the 3 years evaluated in this report, spring chinook and resident trout were produced. The current long range production objective is to rear 2 million spring and summer chinook smolts to 15 or 20 fish per pound. Both species have an 18 month rearing cycle and will be **released** into the **Methow** River in April of each year.

Adult spring chinook are collected, spawned and reared. Large numbers of eggs have also been imported from other hatcheries to meet production goals. All anadromous fish are released on-site.

Water rights total 29,930 gpm from 3 sources; 2 infiltration galleries/wells, Spring Branch Spring, and **Methow** River. The hatchery utilizes water from all 3 sources, but the **Methow** River provides the majority of flow followed by the wells and spring. Water use ranges from 8,528 gpm to 27,686 gpm. Both river and spring water is supplied by gravity flow. All rearing facilities normally are supplied with single pass water, but in low flow years serial re-use occurs.

### Current Production Constraints

Foster Lucas Raceways and adult holding pond need to be connected to pollution abatement ponds.

New adult holding facility needs to be completed to allow rearing in holding pond. Pond space is currently limiting production potential, but if the adult pond is completed then water supply would be limiting factor.

River supply is low in summer months and water temperature reaches 65 degrees fahrenheit. Cold weather during winter months can cause ice problems on rotary screen at intake and in foghorn ditch with anchor ice.

Foghorn Dam needs rehabilitation on Methow River and the supply ditch (1 mile from dam to hatchery) should be replaced with a buried pipeline. Spring Branch springs needs rehabilitation also.

New brood facility needs to be completed and connected to pollution abatement facility. Facility is partially completed but can not be used at this time.

Foster Lucas ponds should be replaced with standard 8'X80' raceways.

#### Theoretical Production

Theoretical production based on the flow method is 321,942 pounds and with density is 155,355 pounds. Average production was 71,064 pounds and the 1987 agency goal was not identified. Theoretical calculations were computed for spring chinook as follows:

Flow Method:

$$2.18 \times 26,000 \text{ gpm} \times 5.68" = 321,942 \text{ lbs}$$

Density Method:

$$.25 \times 109,405 \text{ cu ft} \times 5.68" = 155,355 \text{ lbs}$$

Note : Calculations computed using all raceways.

Comparison between the 2 theoretical calculations appears to indicate that pond space is the limiting factor in production potential. If the adult holding/juvenile rearing pond was completed this would increase rearing space and better balance flow to pond space.

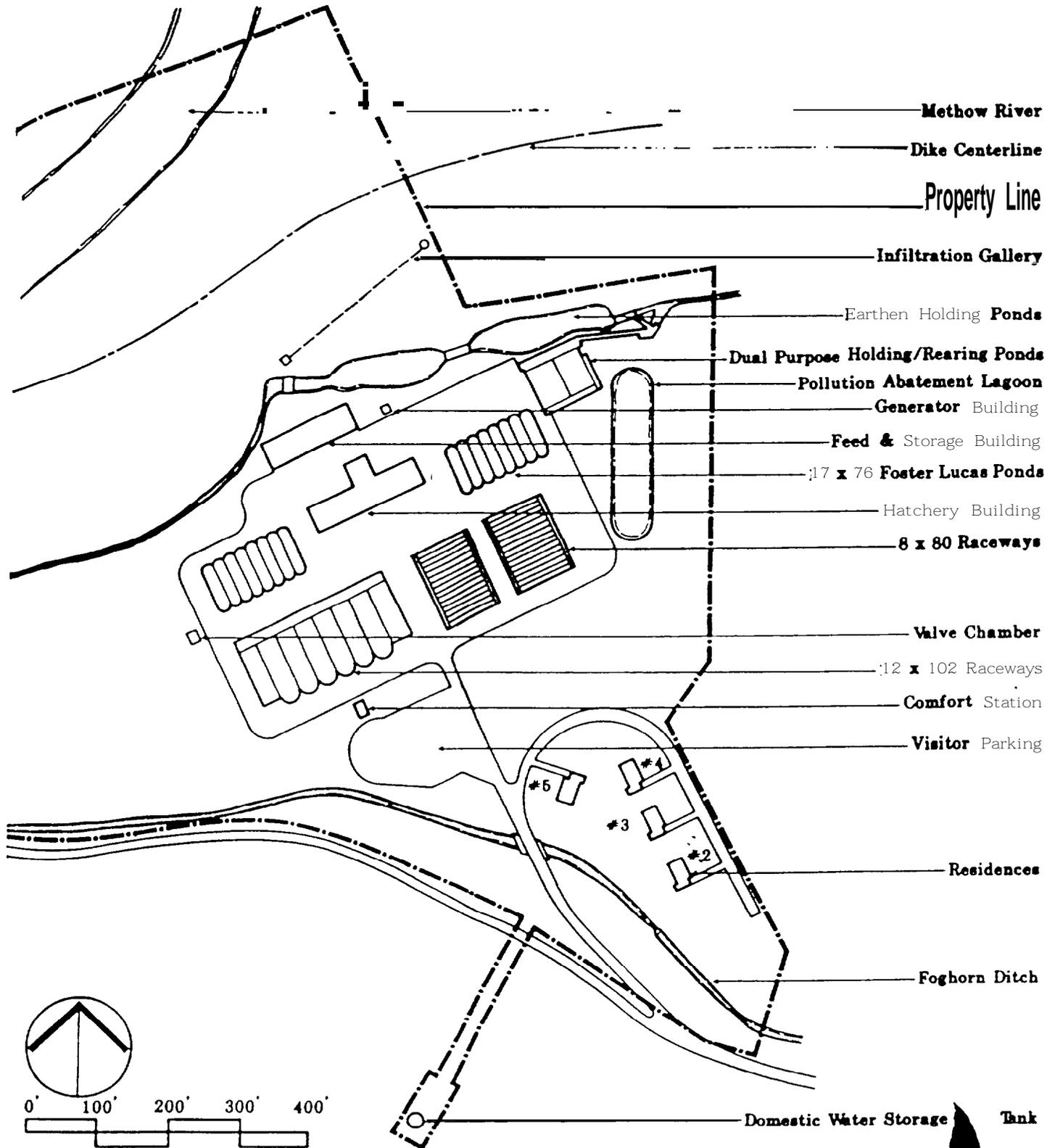
During this evaluation resident trout were reared but this program has been eliminated. The goal is currently to rear for release in the spring 2 million spring chinook smolts weighing approximately 111,000 pounds. This is less than theoretical density calculation, but is at least partially explained by the fact two brood years of chinook are held in the spring with fingerlings taking up pond space.

### Hatchery Expansion Capability

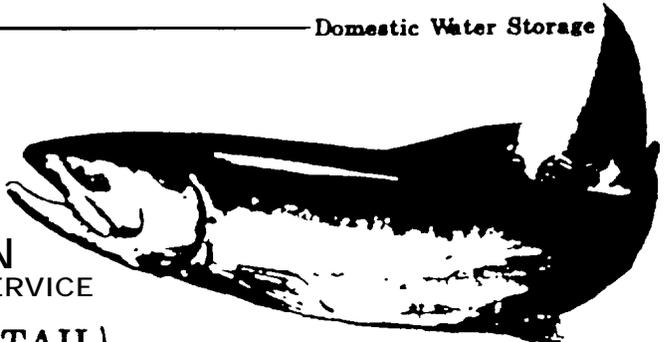
The hatchery is situated on 42 acres owned by the USFWS. Approximately 25% of the area is being utilized. The remaining property is not suitable for expansion. An estimated 2,500 gpm of additional ground water is available. The water right for this water is currently held or applied for. No additional river water is available.

Production could be increased by 1 million spring chinook smolts weighing 55,000 pounds. This would require the following:

1. Complete adult holding/juvenile rearing pond.
2. Connect pond to pollution abatement pond.
3. Rehabilitate Foghorn Dam and enclose ditch with pipeline.
4. Rehabilitate and enclose spring.
5. Pipe infiltration gallery water to valve chamber.
6. Rehabilitate incubation facilities.
7. Screen chamber
8. Replace Foster Lucas ponds with standard raceways.



**WINTHROP**  
 NATIONAL FISH HATCHERY  
 STATION DEVELOPMENT PLAN  
 REGION ONE U.S. FISH AND WILDLIFE SERVICE  
 MAP EXISTING FACILITIES (DETAIL)



## LITERATURE CITED

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- Washington, Dr. Percy, Survey of Artificial Production of Anadromous Salmonids in the Columbia River Basin. November 1985. Final Report Submitted to the Bonneville Power Administration, Contract No. DE-AI-7984BP17100, Project No. 84-51. Copies available from Bonneville Power Administration, Division of Fish and Wildlife, Public Information Officer - PJ, P.O. Box 3621, Portland Oregon 97208. 221 p.

Summary Tables  
For  
U.S. Fish And Wildlife

Summary Table 1. List Of Hatcheries, Staffing Levels, And Operation And Maintenance Costs For All Facilities Operated By The U.S. Fish And Wildlife Service Which Produce Anadromous Fish In The Columbia River Basin.

Hatchery	Staffing in FTE's	Operation and Maintenance Costs		
		1985	1986	1987
Abernathy SCTC	3.0	185,000	185,000	185,000
Big White Salmon Pond				10,000
Carson NFH	7.0	280,200	269,500	261,900
Dworshak NFH	23.0	586,000	662,000	697,000
Eagle Creek NFH	8.0	367,279	318,069	395,101
Entiat NFH	3.0	145,000	152,061	165,640
Hagerman NFH	9.5	447,307	490,359	543,497
Kooskia NFH	4.0	182,000	180,000	200,000
Leavenworth NFH	9.0			
Little White Salmon NFH	9.0	663,500	668,600	600,900
Spring Creek NFH	11.0	551,162	684,700	601,000
Warm Springs NFH	5.0	335,000	369,000	339,000
Willard NFH	5.0			
Winthrop NFH	5.0			

Summary Table 2. The Initial Year Hatchery Operated, Land Available, Percent Land In Use, And Land Ownership For Hatcheries Operated By The U.S. Fish And Wildlife Service Which Produce Anadromous Fish In The Columbia River Basin.

Hatchery	Initial Year of Operation	Hatchery Acres	Land Available % in Use	Land Ownership
Abernathy SCTC	1960	99	75	USFWS
Big White Pond	1939	40.85	5	USFWS
Carson NFH	1938	220	10	USFS
Dworshak NFH	1969	28	100	COE
Eagle Creek NFH	1956	126	20	USFWS
Entiat NFH	1941	34.4	100	USFWS
Hagerman NFH	1933	303	80	USFWS
Kooskia NFH	1969	129	10	USFWS
Leavenworth NFH	1942	876	4	USFWS
Little White Salmon	1898	407	5	USFWS
Spring Creek NFH	1901	80	60	USFWS, COE
Warm Springs NFH	1978	66	50	CTWSIR
Willard NFH	1952	80	50	USFWS
Winthrop NFH	1942	42	25	USFWS

Summary Table 3. List Of Existing Rearing Facilities For Each Hatchery Operated By The U.S. Fish And Wildlife Service Which Produce Anadromous Fish In The Columbia River Basin. Figures For Length, Width, And Depth Are Listed In Feet And Volumes Are Given In Cubic Feet.

Hatchery	Rearing Unit	Unit Dimension			Unit Volume	# of Units	Total Volume	Construction Material	Rearing Units		Comments
		Length	Width	Depth					Age	Condition	
<b>Abernathy SCTC</b>											
	Adult Holding Pond	110	35	1.64	6,314	1	6,314	Concrete	31	Poor	No mechanical sorting
	Circular Starter Tanks	6				32		Steel	28	Poor	
	Circular Starter Tanks	4				60		Fiberglas	16	Good	
	Heath Incubators					30		Fiberglas	17	Fair	
	Raceways	75	8	2.5	1,500	12	18,000	Concrete	32	Fair	
	Troughs					6		Fiberglas	23	Poor	
											30 stacks of 16 trays
											Walls/joints poor cond
<b>Big White Salmon Pond</b>											
	Rearing Pond				6,960	2	13,920	Concrete	49	Fair	Floods winter/spring
<b>Carson NFH</b>											
	Adult Holding Pond	146	40	4	23,360	2	46,720	Concrete	37	Fair	21 stacks
	Heath Incubators					21		16 FRP/5 wood	15	Good	
	Lower Earth Pond	270	78	3	63,180	1	63,180	Dirt	37	Good	
	Raceways	80	8	2	1,280	46	58,880	Concrete	37	Fair	
	Starter Tanks	15	3.5	2	105	24	2,520	FRP	15	Good	
	Upper Earth Pond	170	45	2.25	17,212	1	17,212	Dirt	37	Good	
											Joints leak
<b>Dworshak NFH</b>											
	Adult Holding Ponds	75	17	5	6,375	3	19,125	Concrete	20	Good	Adult holding only
	Burrows Raceways	75	17	2.5	3,188	84	267,792	Concrete	20	Good	Stacks
	Heath Incubators					45			10	Good	
	Raceways	80	8	2.5	1,600	30	48,000	Concrete	9	Good	
	Raceways	75	8	5	3,000	12	36,000	Concrete	20	Good	
	Starter Tanks	16	3	2.5	120	128	15,360	Concrete/Fiber.	20	Good	
<b>Eagle Creek NFH</b>											
	Adult Holding Pond	144	72	4	41,472	1	41,472	Concrete	34	Poor	Watts/bottom shifted
	Heath Incubators					43			23	Fair	Stacks/16 trays each
	Lower Raceways	80	8	2.5	1,600	39	62,400	Concrete	34	Good	Joints breaking away
	Starter Tanks	16	3	2	96	10	960	Fiberglas	13	Good	Bottom sags
	Upper Raceways	80	8	2.5	1,600	36	57,600	Concrete	26	Good	
<b>Entiat NFH</b>											
	Circular Tanks					49	1,323	Fiberglas	20	Good	16 trays per stack
	Rectangular Tanks					89	1,424	Fiberglas	20	Good	
	Heath Vert. Incubator					10		Fiberglas	26	Fair	
	Raceways	80	8		1,500	30	45,000	Concrete	15	Good	
	Rearing Pond	150	75	8	38,000	1	38,000	Concrete	15	Good	
	Troughs	16	1.33			16		Concrete	50	Fair	

Summary Table 3. Continued

Hatchery	Rearing Unit	Unit Length	Dimension Width	Dimension Depth	Unit Volume	# of Units	Total Volume	Construction Material	Rearing Units Age	Units Condition	Comments
<b>Hagerman NFH</b>											
	Heath Incubators					8				Good	8 stacks
	Jars, Incubation					70		Plastic	7	Good	
	Raceways	100	10	3	3,000	66	198,000	Concrete	8	Good	
	Raceways	70	8	2.3	1,288	36	46,368	Concrete	36	Good	
	Starter Tanks	15	2.6	2.6	140	20	2,800	Concrete	7	Good	
	Starter Tanks	16	2.5	2.5	100	46	4,600	Concrete	40	Good	
<b>Kooskia NFH</b>											
	Adult Holding Pond	72	16	4	4,608	1	4,608	Concrete	16	Good	
	Burrows Raceways	80	17	2	2,720	6	16,320	Concrete	23	Fair	
	Heath Incubators					32			5	Good	
	Raceways	80	8	1.6	1,024	12	12,288	Concrete	23	Fair	
	Circular Starter Tanks				75	42	3,150	Fiberglas	21	Good	
	Rectangular Starter Tanks					32					
<b>Leavenworth NFH</b>											
	Adult Holding Ponds	150	15		7,800	2	15,600	Concrete	10	Poor	2000 gpm flow each
	Standard Raceways				1,600	45	72,000	Concrete	10	Poor	350 gpm flow each
	Foster Lucas Raceways				3,876	40	155,040	Concrete	50	Poor	170 gpm flow each
	Foster Lucas Raceways				13,572	22	298,584	Concrete	50	Poor	500 gpm flow each
	Starter Tanks				90	44	3,960	Fiberglas	15	Poor	36 gpm flow each
	Troughs					198		Wood	40	Poor	8 gpm flow
<b>Little White Salmon NFH</b>											
	Adult Holding Ponds	90	30	6	16,200	2	32,400	Concrete	7	Good	
	Adult Holding Ponds	235	19	1.5	6,697	2	13,394	Concrete	40	Fair	
	Heath Incubators					122			15	Good	122 stacks of 16 trays
	Raceways	99	a	2	1,584			Concrete	36	Poor	Concrete/joints leak
	Raceways	74	8	3.5	2,072			Concrete	37	Poor	Concrete/joints leak
	Raceways	80	8	3	1,920			Concrete	43	Poor	Concrete/joints leak
	Raceways	77	8	3	1,848			Concrete	37	Poor	Concrete/joints leak
	Raceways	63	a	3	1,512			Concrete	37	Poor	Concrete/joints leak
	Starter Tanks	15	3	3	135	10	1,350		12	Good	
<b>Spring Creek NFH</b>											
	Burrows Raceways				3,188	44	140,272	Concrete	18	Good	
	Circular Pond				1,778	1	1,778	Concrete	36	Good	For Display Only
	Heath Incubators					277		Fiberglas	18	Good	
	Starter Tanks	16	1.16	1.17	21	30	651	Fiberglas	17	Good	

Summary Table 3. Continued

Hatchery	Rearing Unit	Unit Length	Dimension Width	Dimension Depth	Unit Volume	# of Units	Total Volume	Construction Material	Rearing Units Age	Units Condition	Comments
<b>Warm Springs NFH</b>											
	Brood Pond				448	4	1,792	Concrete	73	Good	
	Brood Pond				720	1	720	Concrete	10	Good	
	Brood Pond				800	1	800	Concrete	10	Good	
	Burrows Raceways				1,800	20	36,000	Concrete	10	Good	
	Converted Burrows				900	20	18,000	Concrete	10	Good	
	Heath Incubators					<i>lb</i>			14	Good	
	Starter Tanks				90	20	1,800		10	Good	
<b>Willard NFH</b>											
	Heath Incubators					24			14	Good	
	Raceways	80	8	2.5	1,600	50	80,000	Concrete	38	Fair	
	Starter Tanks	16	3	3	144	52	7,488		26	Good	
<b>Winthrop NFH</b>											
	Adult Pond	160	54		17,000	1	17,000	Dirt	42	Poor	
	Heath Vertical Incubator					128		Fiberglas	19	Fair	8 stacks of <i>lb</i> trays
	Raceways	80	a		1,300	30	39,000	Concrete	14	Good	
	Raceways	76	17		2,200	16	35,200	Concrete	49	Fair	
	Raceways	102	12		2,200	16	35,200	Concrete	49	Fair	
	Starter Tanks	16	3		120	46	5,520	Fiberglas	6	Good	
	Troughs	16	1.33			32		Concrete	49	Fair	

Note: Rearing unit volumes do not agree with dimensions in all cases due to rounding errors when converting inches to tenths of feet. Volumes provided by the agency have been used.

Summary Table 4. Water Right Information And Water Available Which Delivery System Can Supply For Use At Each Hatchery Operated By The U. S. Fish And Wildlife Service Which Rear Anadromous Fish In The Columbia River Basin.

Hatchery Permit #	Water Source	Date	Water Right GPM	Water Available in GPM During Year			Comments
				Low Flow	High Flow	Average Flow	
<b>Abernathy SCTC</b>							
8066	Abernathy Creek	02/10/50	6,732				Fish Culture/Fishway
7980	Abernathy Creek	01/23/58	13,465	3,000	7,500	6,000	Fish Culture
7768	Unnamed	07/13/50	112				Domestic
3791-A	Well No. 1	12/28/59	250				Not Used
4494-A	Well No. 1	10/19/61	200				Not Used
4102-A	Well No. 2	08/24/60	1,000				Not Used
G2-00656C	Well No. 3	04/08/71	300	100	300	300	Rearing/Domes/Resear.
		<b>Total</b>	<b>22,059</b>	<b>3,100</b>	<b>7,800</b>	<b>6,300</b>	
<b>Sig White Salmon Pond</b>							
6483	White Salmon River	02/26/53	13,465	0	12,567	3,591	Fish Culture
		<b>Total</b>	<b>13,465</b>	<b>0</b>	<b>12,567</b>	<b>3,591</b>	
<b>Carson NFH</b>							
9144	Tyee Creek	01/12/53	23,788	14,811	23,788		Fish Culture
9025	Tyee Springs	01/12/53	898				Incubation/Domestic
7378	Wind River	09/28/50	17,953	4,488	17,953		Fish Culture
		<b>Total</b>	<b>42,639</b>	<b>19,299</b>	<b>41,741</b>	<b>20,000</b>	
<b>Dworshak NFH</b>							
	N.F. Clearwater Riv.			27,000	83,000	69,570	Fish Culture
		<b>Total</b>	<b>0</b>	<b>27,000</b>	<b>83,000</b>	<b>69,570</b>	
<b>Eagle Creek NFH</b>							
	Eagle Creek	05/01/83	67,325				Power Generation
27878	Eagle Creek	03/01/62	12,118				Middle Falls Fishway
22518	Eagle Creek	06/30/53	11				Domestic
28681	Eagle Creek	03/27/63	15,260				Fish Culture
22132	Eagle Creek	02/17/53	9,874	3,591	25,134	19,749	Fish Culture
24297	Eagle Creek	05/14/56	12,118				Lower Falls Fishway
23508	Spring	03/11/55	11	12	12	12	Domestic/Incubation
G-3334	Well	06/20/66	13				Domestic
		<b>Total</b>	<b>116,730</b>	<b>3,603</b>	<b>25,146</b>	<b>19,761</b>	
<b>Entiat NFH</b>							
G4-25874C	3 Wells	04/19/78	1,300	400	2,000	1,800	Fish Culture
5391	Well	08/25/60	800				Fish Culture
3058	Entiat River	06/04/43	10,098	4,039	8,528	5,386	Fish Culture
3059	Packwood Spring	06/04/43	3,142	600	600	600	Fish Culture
		<b>Total</b>	<b>15,340</b>	<b>5,039</b>	<b>11,128</b>	<b>7,786</b>	

Summary Table 4. Continued

Hatchery Permit #	Water Source	Date	Water Right GPM	Water Available in GPM During Year			Comments
				Low Flow	High Flow	Average Flow	
<b>Hagerman NFH</b>							
Statutory	Bickel Ditch	09/27/56	3,456				
Constitutional	Brailsford Ditch		8,079				Non-Irrigat. Season
Constitutional	Brailsford Ditch		3,591				During Irrig. Season
Constitutional	Misc. Springs/Seeps		2,244				
Decreed	Riley Creek	01118189	2,020				
Decreed	Riley Creek	06/15/10	3,142				
Constitutional	Springs No. 13		8,079	18,900	31,500	26,000	From all sources
Constitutional	Springs No. 17		1,346				
		<b>Total</b>	<b>31,957</b>	<b>18,900</b>	<b>31,500</b>	<b>26,000</b>	
<b>Kooskia NFH</b>							
33416181-2028	Clear Creek	10106166	7,181	4,039	7,181	5,835	Fish Culture
31081/85-2157	Well No. 1	04/05/63	857	350	1,346	449	Fish Culture
32551181-2032	Well No. 2	09113165	817				Domestic
32552/81-2033	Well No. 3	09/27/65	498				Not used
32553181-2026	Well No. 4		1,571				Permit Canceled 1973
32554/81-2034	Well No. 5	09/13/65	512				Fish Culture
81-2034	Well No. 6		2,020				Not used
		<b>Total</b>	<b>13,456</b>	<b>4,389</b>	<b>8,527</b>	<b>6,284</b>	
<b>Leavenworth NFH</b>							
1824	Icicle Creek	03/26/42	18,851	4,488	18,900	11,670	Fish Culture
1825	Snow & Nada Lakes	03/26/42					16,000 Acre Feet
3101-A	Well	10/16/57	1,200				Fish Culture
016379	Well	06/01/40	900				Fish Culture
016378	Well	08/01/39	700				Fish Culture
G4-27115C	Well	10/20/80	3,900	6,500	6,500	6,500	All wells combined
		<b>Total</b>	<b>25,551</b>	<b>10,988</b>	<b>25,400</b>	<b>18,170</b>	
<b>Little White Salmon</b>							
11795	2 Unnamed Springs	01/07/58	1,346	0	1,346	1,346	Fish Culture
2914	Lit. White Sal. R.	06/12/39	7,002				Fish Culture
10423	Lit. White Sal. R.	07/20/56	8,080				Fish Culture
6042	Lit. White Sal. R.	03108149	15,440	11,221	24,686	22,442	Fish Culture
235	Lit. White Sal. R.	12/12/21	2,000				Fish Culture
	Well			0	150	150	Fish Culture
		<b>Total</b>	<b>33,868</b>	<b>11,221</b>	<b>26,182</b>	<b>23,938</b>	

Summary Table 4. Continued

Hatchery Permit #	Water Source	Date	Water Right GPM	Water Available in GPM During Year			Comments
				Low Flow	High Flow	Average Flow	
<b>Spring Creek</b>							
S2-14840C	Columbia River	04/23/58	5,027				Fish Culture
	Recirculation System			12,118	31,418	17,504	Fish Culture
S2-13889C	Unnamed Creek	05114156	673				Fish Culture
S208897CAW	Unnamed Spring	11/04/53	5,386	2,693	2,693	2,693	Fish Culture/Domestic
S2-11381C	Unnamed Spring	11/03/52	4				Domestic
	<b>Total</b>		<b>11,090</b>	<b>14,811</b>	<b>34,111</b>	<b>20,197</b>	
<b>Warm Springs NFH</b>							
	Warm Springs River		100,000	9,000	13,500		Fish Culture
	<b>Total</b>		<b>100,000</b>	<b>9,000</b>	<b>13,500</b>		
<b>Willard NFH</b>							
S2-01077C	Carson Depot Sprs	07/07/58	153				Incubation
5013	Lit. White Sal. R.	07/30/49	22,442	11,221	22,442	17,953	Fish Culture
5010	Spring	02/24/51	90				Domestic/Laboratory
3024-A	Well No. 1	05/22/65	500	0	2,000	500	Fish Culture
3027-A	Well No. 2	05/06/57	500				Fish Laboratory
4855-A	Well No. 3	01/17/61	1,000				Fish Culture
	<b>Total</b>		<b>24,685</b>	<b>11,221</b>	<b>24,442</b>	<b>18,453</b>	
<b>Winthrop NFH</b>							
7209	Gallery & Well	04/06/67	1,500	0	1,500	1,500	Fish Culture
7590-A	Gallery & Well	02/17/71	1,500	0	1,500	1,500	Fish Culture
848	Methow River	01/10/22	22,442	7,630	22,442	21,544	Fish Culture
3203	Springs Branch Spr.	07/23/81	4,488	898	2,244	1,795	Fish Culture
	<b>Total</b>		<b>29,930</b>	<b>8,528</b>	<b>27,686</b>	<b>26,339</b>	

Summary Table 5. Summary Of Water Used By Hatcheries Operated By The U.S. Fish And Wildlife Service Which Rear Anadromous Fish In The Columbia River Basin. Flow Is Listed In Gallons Per Minute (GPM) And Temperature Is Listed In Degrees Fahrenheit.

Hatchery	Water Source	Delivery Method	Average		High Flow		Low Flow		Highest Water		Lowest Water	
			Flow	Temp.	Volume	Mnth	Volume	Mnth	Temp.	Mnth	Temp.	Mnth
<b>Abernathy SCTC</b>												
Abernathy Creek Well No. 3	Gravity	6,000	40	7,500	Sept. - May	3,000	August	59	August	39	December	
	Pumped	300	53	300	May	100	October	53	Constant	53	Constant	
<b>Big White Salmon Pond</b>												
White Salmon River	Gravity	3,591	44	12,567	May	0	June	49	August	38	January	
<b>Carson NFH</b>												
Tyee Creek	Gravity		44	23,788	April	14,811	June	46	August	44	January	
Wind River	Gravity		47	17,953	December	4,488	September	66	August	31	January	
<b>Dworshak NFH</b>												
NF Clearwater River	Pumped	69,570	45	83,000	April	27,000		52	October	38	March	
<b>Eagle Creek NFH</b>												
Eagle Creek	Gravity	19,749	48	25,134	April	3,591	August	63	August	34	January	
Spring	Pumped	12	51	12	Constant	12	Constant	53	August	48	January	
<b>Entiat NFH</b>												
3 Wells	Pumped	1,800	48	2,000	April	400	May	49	July	47	January	
Entiat River	Gravity	5,386	44	8,528	April	4,039	May	70	July	32	February	
Packwood Spring	Pumped	600	48	600	Constant	600	Constant	49	July	47	January	
<b>Hagerman NFH</b>												
Springs No. 13	Gravity	26,000	59	31,500	January	18,900	July	59	Constant	59	Constant	
<b>Kooskia NFH</b>												
Clear Creek	Gravity	5,835	47	7,181		4,039	August	66	August	34	January	
Wells	Pumped	449	53	1,346		350		57	May	49	August	
<b>Leavenworth NFH</b>												
Icicle Creek	Gravity	11,670	42	18,900	March	4,488	April	64	July	32	December	
Well	Pumped	6,500	47	6,500	Constant	6,500	Constant	50	July	43	December	

Summary Table 5. Continued

Hatchery Water Source	Delivery Method	Average		High Flow		Low Flow		Highest Water		Lowest Water	
		Flow	Temp.	Volume	Month	Volume	Month	Temp.	Month	Temp.	Month
<b>Little White Salmon NFH</b>											
2 Unnamed Springs	Gravity	1,346	47	1,346		0		47	Constant	47	Constant
Lit. White Sal. River	Gravity	22,442	43	24,606	May	11,221	July	51	August	31	January
Well	Pumped	150	50	150		0		50	Constant	50	Constant
<b>Spring Creek</b>											
Recirculation	Pumped	17,504	52	31,418		12,118					
Unnamed Spring	Pump/Gra	2,693	46	2,693	Constant	2,693	Constant	46	Constant	46	Constant
<b>Warm Springs NFH</b>											
Warm Springs River	Pumped		47	13,500	April	9,000	May	75	August	32	January
<b>Willard NFH</b>											
Lit. White Sal. River	Gravity	17,953	41	22,442	May	11,221	June	46	August	31	January
Wells	Pumped	500	42	2,000	December	0		42	Constant	42	Constant
<b>Winthrop NFH</b>											
Gallery & Well	Pumped	1,500	50	1,500	April	0	October	52	July	48	December
Gallery & Well	Pumped	1,500	50	1,500	April	0	October	52	July	48	December
Methow River	Gravity	21,544	44	22,442	April	7,630	April	65	July	32	December
Springs Branch Spring	Gravity	1,795	49	2,244	April	898	April	49	Constant	49	Constant

Summary Table 6. Adult Return Information For Hatcheries Operated By The U.S. Fish And Wildlife Service Which Rear Anadromous Fish In The Columbia River Basin. Adult Holding Inflow Is Given In Gallon Per Minute (GPM).

Hatchery Species	Stock	Brood Year	Adult Inflow	Holding Period	Miles	Adult Females	Returns Jacks	Total	# Females Spawned	Adult Mrts.	Adult Releases
<b>Abernathy</b>											
<b>Fall Chinook</b>											
Abernathy		1984	3,200	September	339	297	106	742	271	112	0
Abernathy		1985	3,300	September	1,071	943	207	2,221	887	596	0
Abernathy		1986	2,500	September	177	276	1,805	2,258	243	112	0
<b>Carson NFH</b>											
<b>Spring Chinook</b>											
Carson		1983	6,000	May-Aug.	955	1,515	4	2,474	1,418	111	0
Carson		1984	6,000	May-Aug.	945	1,163	45	2,153	1,068	95	0
Carson		1985	6,000	May-Aug.	2,026	2,646	62	4,734	2,324	123	0
<b>Dworshak NFH</b>											
<b>Spring Chinook</b>											
Clearwater		1985		June-Sept	46	235	19	300			
Rapid Riv/Clearwater		1984		June-Sept	71	0	0	71			
<b>Summer Steelhead</b>											
B Run		1984		Jan-May	1,543	1,735	0	3,278			
B Run		1985		Jan-May	3,519	10,499	0	14,018			
B Run		1986		Jan-May	1,584	2,878	0	4,462			
<b>Eagle Creek</b>											
<b>Coho</b>											
Eagle Creek		1983	4,000	Ott-Dec.	1,709	989	127	2,825			
Eagle Creek		1984	4,000	Ott-Dec.	1,158	1,008	239	2,405			
Eagle Creek		1985	4,000	Ott-Dec.	2,034	1,957	964	4,955			
<b>Spring Chinook</b>											
Willamette River		1983	4,000	May-Oct.	275	191	56	522			
Willamette River		1984	4,000	May-Oct.	530	447	55	1,032			
Willamette River		1985	4,000	May-Oct.	324	346	56	726			
<b>Winter Steelhead</b>											
Eagle Creek		1984	4,000	Jan-April	553	510	0	1,063			
Eagle Creek		1985	4,000	Jan-April	698	590	0	1,288			
Eagle Creek		1986	4,000	Jan-April	296	206	0	502			
<b>Entiat NFH</b>											
<b>Spring Chinook</b>											
Entiat		1983		June-Sept	233	427	0	660			
Entiat		1984		June-Sept	220	533	55	808			
Entiat		1985		June-Sept	381	531	0	912			

Summary Table 6. Continued

Hatchery	Brood	Adult	Holding	Adult	Returns	# Femles	Adult	Adult		
Species Stock	Year	Inflow	Period	Males	Females	Jacks	Total	Spawned	Mbrts.	Releases
<b>Kooskia NFH</b>										
<b>Spring Chinook</b>										
Clearwater	1983	2,000	June-Aug.	145	216	0	373	*		
Clearwater	1984	2,000	June-Aug.	226	281	26	533			
Clearwater	1985	2,000	June-Aug.	167	192	55	414			
<b>Summer Steelhead</b>										
	1985						964	*		
	1986			174	199	0	373			
<b>Leavenworth NFH</b>										
<b>Spring Chinook</b>										
Leavenworth	1983		June-Aug.	1,361	1,687	42	3,090			
Leavenworth	1984		June-Aug.	1,133	1,942	166	3,591	*		
Leavenworth	1985		June-Aug.	1,412	1,806	77	6,635	*		
<b>Little White Salmon NFH</b>										
<b>Coho</b>										
Little White Salmon	1983	4,000	Oct.-Nov.	1,711	929	287	2,927			
Little White Salmon	1984	4,000	Oct.-Nov.	3,356	3,263	444	7,063			
Little White Salmon	1985	4,000	Oct.-Nov.	4,528	6,063	907	11,498			
<b>Fall Chinook</b>										
Little White Salmon	1984	4,000	Sept-Oct.	153	407	17	577			
Little White Salmon	1985	4,000	Sept-Oct.	112	96	36	244			
Little White Salmon	1986	4,000	Sept-Oct.	347	303	80	730			
URB	1984	4,000	Oct.-Nov.	28	40	164	232			
URB	1985	4,000	Oct.-Nov.	269	143	441	853			
URB	1986	4,000	Oct.-Nov.	673	868	286	1,827			
<b>Spring Chinook</b>										
Little White/Carson	1983	4,000	May-Aug.	849	1,573	a	2,608	*		
Little White/Carson	1984	4,000	May-Aug.	226	326	25	577			
Little White/Carson	1985	4,000	May-Aug.	470	887	0	1,357			
<b>Spring Creek NFH</b>										
<b>Fall Chinook</b>										
Tule	1984		Sept-Oct	3,435	5,273	799	9,507			
Tule	1985		Sept-Oct	2,139	3,258	a4	5,481			
Tule	1986		Sept-Oct	1,040	2,259	90	3,389			
<b>Warm Spring NFH</b>										
<b>Spring Chinook</b>										
Warm Springs	1983	2,000	June-Sept	0	0	34	1,912	*		
Warm Springs	1984	2,000	June-Sept	0	0	301	2,282	*		
Warm Springs	1985	2,000	June-Sept	0	0	62	2,261	*		

Summary Table 6. Continued

Hatchery	Brood	Adult	Holding		Adult	Returns	# Femles	Adult	Adult	
Species	Year	Inflow	Period	Males	Females	Jacks	Total	Spawnd	Mbrts.	Releases
<b>Winthrop NFH</b>										
<b>Spring Chinook</b>										
Winthrop	1983		June- Aug	229	502	24	755			
Winthrop	1984		June- Aug	179	332	a	900 *			
Winthrop	1985		June- Aug	443	738	20	1,201			

\* Includes adult returns which were unsexed.

Summary Table 7. Total Egg Take And Fish Pondered For Hatcheries operated By U.S. Fish And Wildlife Service Which Rear Anadromous Fish In The Columbia River Basin.

Hatchery Species	Stock	# Female Spawmed	Spawning Date Begin	Date End	Release Year	Egg Take	Egg Transfers In	out	Fingerlings No.	Pondered Date	Transfer Of Fish In
<b>Abernathy</b>											
Fall Chinook											
Abernathy		271	09/12/84	10/15/84	1985	1,104,000	0	0	835,600	Dec. 1984	
Abernathy		887	09/12/85	10/07/85	1986	4,359,000	0	2,150,000	1,631,500	Dec. 1985	
Abernathy		243	09/15/86	10/06/86	1987	1,202,000	0	0	1,048,600	Dec. 1986	
<b>Carson NFH</b>											
Spring Chinook											
Carson		1,418	09/10/83	09/07/83	1985	6,222,900	0	2,170,560	3,703,000	Jan. 1984	
Carson		1,068	08/08/84	08/28/84	1986	4,922,600	0	1,110,500	3,301,180	Jan. 1985	
Carson		2,324	08/07/85	09/03/85	1987	10,026,900	0	4,191,400	3,852,150	Jan. 1986	
<b>Dworshak NFH</b>											
Spring Chinook											
Clearwater			08/24/85	09/08/85	1987	3,300,000				Nov-Apr 86	
Leavenworth					1985		3,780,000				
Rapid R./Clearwater			08/18/84		1986	4,100,000				Jan-Apr 85	
Summer Steelhead											
B Run			01/29/84	05/07/84	1985	7,536,000					
B Run			02/15/85	05/10/85	1986	6,500,000					
B Run			02/15/86	05/10/86	1987	7,500,000				Mar-Aug 86	
<b>Eagle Creek</b>											
Coho											
Eagle Creek			11/02/83	12/05/83	1985	1,267,053					
Eagle Creek			10/17/84	11/07/84	1986	1,621,619					
Eagle Creek			10/07/85	10/22/85	1987	1,937,306			1,011,085	Feb-Mar 86	
Spring Chinook											
Willanette Riv.			08/11/83	11/23/83	1985	848,396					
Willanette Riv.			09/06/84	09/20/84	1986	971,671					
Willanette Riv.			09/12/85	10/08/85	1987	1,259,948			1,084,444	Nov-Feb 86	
Winter Steelhead											
Eagle Creek			01/30/84	04/09/84	1985	1,248,479					
Eagle Creek			02/20/85	04/04/85	1986	1,795,574			209,410	My-Jun 85	
Eagle Creek			02/06/86	04/03/86	1987	458,478			202,619	Apr-May 86	
<b>Entiat NFH</b>											
Spring Chinook											
Entiat					1985	1,400,000					
Entiat					1986	1,618,000					
Entiat			08/19/85	09/10/85	1987	1,089,000			1,078,100	11-19-85	

Summary Table 7. Continued

Hatchery Species	# Female Stock	Spawning Date Begin End	Release Year	Egg Take	Egg Transfers In out	Fingerlings No.	Ponded Date	Transfer Of Fish In
<b>Kooskia NFH</b>								
<b>Spring Chinook</b>								
Clearwater			1985		552,000	552,000	Feb-Mar 84	
Clearwater			1986		606,000	606,000	Feb-Mar 86	
Clearwater			1987					
Rapid River			1986		913,500	913,000	Feb-Mar 85	
<b>Leavenworth NFH</b>								
<b>Spring Chinook</b>								
Leavenworth			1985	5,800,000				
Leavenworth			1986	5,740,000				
Leavenworth			1987	4,296,000				
<b>Little White Salmon NFH</b>								
<b>Coho</b>								
Little White		10/19/83 11/22/83	1985	1,310,764			Jan-Feb 84	
Little White		10/31/84 11/26/84	1986	7,029,210			Jan-Feb 85	
Little White		10/28/85 11/06/85	1987	9,230,618			Feb. 1986	
<b>Fall Chinook</b>								
Little White		09/26/84 10/09/84	1985	1,792,629			Jan. 1985	
Little White		09/26/85 10/04/85	1986	392,709		364,634	Jan. 1986	
Little White		09/25/86 10/09/86	1987	1,186,992		1,096,564		
URB			1985		1,124,142		1,110,286	Feb. 1985
URB		10/28/85 11/18/85	1986	610,000	1,606,000			Feb-Mar 86
URB		11/03/86 11/26/86	1987	3,357,003	3,576,419			Feb-Mar 87
<b>Spring Chinook</b>								
Lit. White/Carson		07/18/83 09/02/83	1985	6,167,368			Nov-Dec 83	
Lit. White/Carson		07/23/84 08/20/84	1986	1,236,722			Nov. 1984	
Lit. White/Carson		07/23/85 08/05/85	1987	1,809,684	1,200,000		Nov-Dec a5	
<b>Spring Creek NFH</b>								
<b>Fall Chinook</b>								
Tule		09/14/84 10/05/84	1985	20,470,076		15,971,722		
Tule		09/16/85 10/04/85	1986	113,544,748		11,499,229		
Tule		09/16/86 10/29/86	1987	12,215,330		10,950,315		
URB		12/20/84 01/18/85	1985	4,004,880		3,838,108		
URB			1986		3,861,200	3,565,121		
<b>Warm Spring NFH</b>								
<b>Spring Chinook</b>								
Warm Springs			1985					
Warm Springs		08/23/84 09/18/84	1986	1,059,000		873,000	March 1985	
Warm Springs		08/22/85 09/17/85	1987	1,301,989		890,000	March 1986	

Summary Table 7. Continued

Hatchery	# Female	Spawning Date	Release	Egg	Egg Transfers	Fingerlings	Ponded	Transfer	Of
Species	Spawmed	Begin	Year	Take	In out	No.	Date	Fish	In
<b>Winthrop NFH</b>									
<b>Spring Chinook</b>									
<b>Winthrop</b>			1985	1,700,000					
<b>Winthrop</b>			1986	662,000					
<b>Winthrop</b>			1987	2,292,000					

Summary Table 8. Releases And Production Goals For Each Hatchery Operated By The U.S. Fish And Wildlife Service Which Reared Anadromous Fish In The Columbia River Basin In 1985.

Hatchery	Species	Stock	Smolt Releases No.	Lbs.	Fingerling Releases No.	Lbs.	Transfers No.	Lbs.	Smolt Production No.	Lbs.	Goal	Nonsmolt No.	Goal Lbs.
<b>Abernathy SCTC</b>													
<b>Fall Chinook</b>													
	<b>Abernathy</b>		<b>628,978</b>	<b>25,038</b>					<b>1,500,000</b>	<b>42,857</b>			
	<b>TOTAL</b>		<b>628,978</b>	<b>25,038</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,500,000</b>	<b>42,857</b>		<b>0</b>	<b>0</b>
<b>Carson NFH</b>													
<b>Spring Chinook</b>													
	<b>Carson</b>		<b>2,491,301</b>	<b>120,981</b>	<b>122,699</b>	<b>229</b>			<b>2,500,000</b>	<b>138,889</b>			
	<b>TOTAL</b>		<b>2,491,301</b>	<b>120,981</b>	<b>122,699</b>	<b>229</b>	<b>0</b>	<b>0</b>	<b>2,500,000</b>	<b>138,889</b>		<b>0</b>	<b>0</b>
<b>Dworshak NFH</b>													
<b>Spring Chinook</b>													
	<b>Leavenworth</b>		<b>1,137,000</b>	<b>51,966</b>					<b>1,200,000</b>	<b>60,000</b>			
<b>Summer Steelhead</b>													
	<b>B Run</b>		<b>1,601,495</b>	<b>222,000</b>					<b>2,300,000</b>	<b>403,500</b>			
	<b>TOTAL</b>		<b>2,738,495</b>	<b>273,966</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3,500,000</b>	<b>463,500</b>		<b>0</b>	<b>0</b>
<b>Eagle Creek NFH</b>													
<b>Coho</b>													
	<b>Eagle Creek</b>		<b>1,024,055</b>	<b>60,050</b>	<b>329,459</b>	<b>2,277</b>			<b>1,000,000</b>	<b>66,667</b>			
<b>Spring Chinook</b>													
	<b>Willamette River</b>		<b>613,673</b>	<b>59,526</b>					<b>600,000</b>	<b>54,545</b>			
<b>Winter Steelhead</b>													
	<b>Eagle Creek</b>		<b>153,800</b>	<b>12,654</b>					<b>150,000</b>	<b>21,430</b>			
	<b>TOTAL</b>		<b>1,791,528</b>	<b>140,230</b>	<b>329,459</b>	<b>2,277</b>	<b>0</b>	<b>0</b>	<b>1,750,000</b>	<b>142,642</b>		<b>0</b>	<b>0</b>
<b>Entiat NFH</b>													
<b>Spring Chinook</b>													
	<b>Entiat</b>		<b>894,600</b>	<b>47,800</b>					<b>800,000</b>	<b>47,000</b>			
	<b>TOTAL</b>		<b>894,600</b>	<b>47,800</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>800,000</b>	<b>47,000</b>		<b>0</b>	<b>0</b>
<b>Hagerman NFH</b>													
<b>Fall Chinook</b>													
	<b>Snake River</b>		<b>128,000</b>	<b>2,625</b>									
<b>Summer Steelhead</b>													
	<b>A Run</b>		<b>1,094,000</b>	<b>249,000</b>					<b>1,200,000</b>	<b>210,000</b>			
	<b>B Run</b>		<b>270,000</b>	<b>56,900</b>					<b>306,000</b>	<b>52,044</b>			
	<b>TOTAL</b>		<b>1,492,000</b>	<b>308,525</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,506,000</b>	<b>262,044</b>		<b>0</b>	<b>0</b>

Summary Table 8. Continued

Hatchery		Smolt Releases		Fingerling Releases		Transfers		Smolt Production Goal		Nonsmolt Goal	
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
<b>Kooskia NFH</b>											
Spring Chinook											
Clearwater		301,953	16,061					800,000	40,000		
Summer Steelhead											
B Run						3,200,000	11,600				
<b>TOTAL</b>		<b>301,953</b>	<b>16,061</b>	<b>0</b>	<b>0</b>	<b>3,200,000</b>	<b>11,600</b>	<b>800,000</b>	<b>40,000</b>	<b>0</b>	<b>0</b>
<b>Leavenworth NFH</b>											
Spring Chinook											
Leavenworth		2,285,165	134,339	287,216	a,579						
Summer Steelhead											
Wenatchee River		111,600	10,835								
<b>TOTAL</b>		<b>2,396,765</b>	<b>145,174</b>	<b>287,216</b>	<b>a,579</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Little White Salmon NFH</b>											
Fall Chinook											
Little White Salmon		1,600,008	14,510					1,100,000	11,000		
URB		1,141,122	17,980								
Spring Chinook											
Little White/Carson		1,354,959	94,138	665,949	12,171			1,369,000	80,530	682,000	13,640
<b>TOTAL</b>		<b>4,096,089</b>	<b>126,628</b>	<b>665,949</b>	<b>12,171</b>	<b>0</b>	<b>0</b>	<b>2,469,000</b>	<b>91,530</b>	<b>682,000</b>	<b>13,640</b>
<b>Spring Creek NFH</b>											
Fall Chinook											
Tule				14,387,049	84,532			10,100,000	134,667		
URB		1,404,127	15,764	779,535	2,012			5,000,000	40,000		
<b>TOTAL</b>		<b>1,404,127</b>	<b>15,764</b>	<b>15,166,584</b>	<b>86,544</b>	<b>0</b>	<b>0</b>	<b>15,100,000</b>	<b>174,667</b>	<b>0</b>	<b>0</b>
<b>Warm Springs NFH</b>											
Spring Chinook											
Warm Springs		713,667	55,851					811,335	66,500		
<b>TOTAL</b>		<b>713,667</b>	<b>55,851</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>811,335</b>	<b>66,500</b>	<b>0</b>	<b>0</b>
<b>Willard NFH</b>											
Coho											
Little White Salmon		999,358	64,061	244,914	2,264			1,000,000	55,555		
<b>TOTAL</b>		<b>999,358</b>	<b>64,061</b>	<b>244,914</b>	<b>2,264</b>	<b>0</b>	<b>0</b>	<b>1,000,000</b>	<b>55,555</b>	<b>0</b>	<b>0</b>

Summary Table 8. Continued

Hatchery		Smolt Releases		Fingerling Releases		Transfers		Smolt Production Goal		Nonsmolt Goal	
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
<b>Winthrop NEH</b>											
<b>Spring Chinook</b>											
	<b>Winthrop</b>	1,205,077	69,436								
<b>TOTAL</b>		1,205,077	69,436	0	0	0	0	0	0	0	0

Summary Table 9. Releases And Production Goals For Each Hatchery Operated By The U.S. Fish And Wildlife Service Which Reared Anadromous Fish In The Columbia River Basin In 1986.

Hatchery		Smolt Releases		Fingerling Releases		Transfers		Smolt Production Goal		Nonsmolt Goat	
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
<b>Abernathy SCTC</b>											
Fall Chinook											
Abernathy		1,609,300	47,050					1,500,000	42,857		
<b>TOTAL</b>		1,609,300	47,050	0	0	0	0	1,500,000	42,857	0	0
<b>Carson NFH</b>											
Spring Chinook											
Carson		2,486,400	126,150	300,000	3,000			2,500,000	138,889		
<b>TOTAL</b>		2,486,400	126,150	300,000	3,000	0	0	2,500,000	138,889	0	0
<b>Dworshak NFH</b>											
Spring Chinook											
Rapid River		671,000	33,081			200,000	5,700	1,200,000	60,000		
Summer Steelhead											
B Run		2,960,000	439,700					2,300,000	403,500		
<b>TOTAL</b>		3,631,000	472,781	0	0	200,000	5,700	3,500,000	463,500	0	0
<b>Eagle Creek NFH</b>											
Coho											
Eagle Creek		971,329	68,835					1,000,000	66,667		
Spring Chinook											
Willanette River		493,425	65,662					600,000	66,667		
Winter Steelhead											
Eagle Creek		156,144	19,114					150,000	21,430		
<b>TOTAL</b>		1,620,898	153,611	0	0	0	0	1,750,000	154,764	0	0
<b>Entiat NFH</b>											
Spring Chinook											
Entiat		853,090	42,825					800,000	40,000		
<b>TOTAL</b>		853,090	42,825	0	0	0	0	800,000	40,000	0	0
<b>Hagerman NFH</b>											
Summer Steelhead											
A Run		1,002,000	231,000					1,009,000	175,050		
B Run		525,000	112,000					521,000	91,170		
<b>TOTAL</b>		1,527,000	343,000	0	0	0	0	1,530,000	266,220	0	0

Summary Table 9. Continued

Hatchery		Smolt Releases		Fingerling Releases		Transfers		Smolt Production		Goal	Nonsmolt	Goal
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	No.	Lbs.
<b>Kooskia NFH</b>												
<b>Spring Chinook</b>												
Rapid River		351,405	22,237					800,000	40,000			
<b>Summer Steelhead</b>												
B Run						2,800,000	9,800					
<b>TOTAL</b>		<b>351,405</b>	<b>22,237</b>	<b>0</b>	<b>0</b>	<b>2,800,000</b>	<b>9,800</b>	<b>800,000</b>	<b>40,000</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Leavenworth NFH</b>												
<b>Spring Chinook</b>												
Leavenworth		2,149,529	128,824	477,974	7,622							
<b>Summer Steelhead</b>												
Wenatchee River		40,578	5,605									
<b>TOTAL</b>		<b>2,190,107</b>	<b>134,429</b>	<b>477,974</b>	<b>7,622</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Little White Salmon NFH</b>												
<b>Fall Chinook</b>												
Little White Salmon						361,965	1,472	2,000,000	18,182			
URB		1,065,292	14,049	190,363	1,154			1,200,000	19,757			
<b>Spring Chinook</b>												
Little White/Carson		412,212	36,403	1,432,090	23,564	500,000	8,953	400,000	33,333	500,000	7,576	
<b>TOTAL</b>		<b>1,477,504</b>	<b>50,452</b>	<b>1,622,453</b>	<b>24,718</b>	<b>861,965</b>	<b>10,425</b>	<b>3,600,000</b>	<b>71,272</b>	<b>500,000</b>	<b>7,576</b>	<b>0</b>
<b>Spring Creek NFH</b>												
<b>Fall Chinook</b>												
Tule		10,594,893	166,031					10,100,000	134,667			
URB		2,274,207	20,837	1,034,346	1,743			5,000,000	40,000			
<b>TOTAL</b>		<b>12,869,100</b>	<b>186,868</b>	<b>1,034,346</b>	<b>1,743</b>	<b>0</b>	<b>0</b>	<b>15,100,000</b>	<b>174,667</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Warm Springs NFH</b>												
<b>Spring Chinook</b>												
Warm Springs		720,328	51,911					720,328	51,911			
<b>TOTAL</b>		<b>720,328</b>	<b>51,911</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>720,328</b>	<b>51,911</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Willard NFH</b>												
<b>Coho</b>												
Little White Salmon		4,996,450	276,359	515,404	4,190	151,300	1,681	3,700,000	205,555			
<b>TOTAL</b>		<b>4,996,450</b>	<b>276,359</b>	<b>515,404</b>	<b>4,190</b>	<b>151,300</b>	<b>1,681</b>	<b>3,700,000</b>	<b>205,555</b>	<b>0</b>	<b>0</b>	<b>0</b>

Summary Table 9. Continued

Hatchery		Smolt Releases		Fingerling Releases		Transfers		Smolt Production Goal		Nonsmolt Goal	
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
<b>Winthrop NFH</b>											
<b>Spring Chinook</b>											
	<b>Winthrop</b>	1,090,200	66,811								
	<b>TOTAL</b>	1,090,200	66,811	0	0	0	0	0	0	0	0

Summary Table 10. Releases And Production Goals For Each Hatchery Operated By The U.S. Fish And Wildlife Service Which Reared Anadromous Fish In The Columbia River Basin In 1987.

Hatchery		Smolt Releases		Fingerling Releases		Transfers		Smolt Production Goal		Nonsmolt Goal	
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
<b>Abernathy SCTC</b>											
<b>Fall Chinook</b>											
	Abernathy	1,023,700	43,300					1,500,000	42,857		
	<b>TOTAL</b>	1,023,700	43,300	0	0	0	0	1,500,000	42,857	0	0
<b>Big White Salmon Pond</b>											
<b>Spring Chinook</b>											
	Carson	335,662	16,535					600,000	30,000		
	<b>TOTAL</b>	335,662	16,535	0	0	0	0	600,000	30,000	0	0
<b>Carson NFH</b>											
<b>Spring Chinook</b>											
	Carson	2,439,000	133,300	680,000	10,200			2,500,000	138,889		
	<b>TOTAL</b>	2,439,000	133,300	680,000	10,200	0	0	2,500,000	138,889	0	0
<b>Dworshak NFH</b>											
<b>Spring Chinook</b>											
	Clearwater	1,700,000	92,600	444,000	6,375	200,000	6,800	1,600,000	80,000		
	Summer Steelhead										
	B Run	2,100,000	382,800					2,300,000	403,000		
	<b>TOTAL</b>	3,800,000	475,400	444,000	6,375	200,000	6,800	3,900,000	483,000	0	0
<b>Eagle Creek NFH</b>											
<b>Coho</b>											
	Eagle Creek	806,461	52,443					1,000,000	66,667		
<b>Spring Chinook</b>											
	Willamette River	516,962	59,933					600,000	66,667		
<b>Winter Steelhead</b>											
	Eagle Creek	169,412	22,535	229,524	894	70,155	308	150,000	21,430		
	<b>TOTAL</b>	1,492,835	134,911	229,524	894	70,155	308	1,750,000	154,764	0	0
<b>Entiat NFH</b>											
<b>Spring Chinook</b>											
	Entiat	925,000	54,094					800,000	47,060		
	<b>TOTAL</b>	925,000	54,094	0	0	0	0	800,000	47,060	0	0

Summary Table 10. Continued

Hatchery		Smolt Releases		Fingerling Releases		Transfers		Smolt Production Goal		Nonsmolt Goal	
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
<b>Hagerman NFH</b>											
<b>Summer Steelhead</b>											
A Run		1,001,000	217,900					995,000	172,910		
B Run		535,000	119,000					535,000	93,310		
<b>TOTAL</b>		1,536,000	336,900	0	0	0	0	1,530,000	266,220	0	0
<b>Kooskia NFH</b>											
<b>Spring Chinook</b>											
Clearwater		763,900	38,385					800,000	40,000		
<b>Summer Steelhead</b>											
B Run						2,700,000	8,000				
<b>TOTAL</b>		763,900	38,385	0	0	2,700,000	8,000	800,000	40,000	0	0
<b>Leavenworth NFH</b>											
<b>Spring Chinook</b>											
Leavenworth		2,556,977	157,409	1,375,531	10,215						
<b>Summer Steelhead</b>											
Wenatchee River		104,400	16,500								
<b>TOTAL</b>		2,661,377	173,909	1,375,531	10,215	0	0	0	0	0	0
<b>Little White Salmon NFH</b>											
<b>Fall Chinook</b>											
URB		93,734	5,663	303,900	268	606,029	863	5,400,000	49,090		
<b>Spring Chinook</b>											
Little White/Carson		519,252	38,155	1,413,864	14,536			400,000	26,667	1,500,000	27,273
<b>TOTAL</b>		612,986	43,818	1,717,764	14,804	606,029	863	5,800,000	75,757	1,500,000	27,273
<b>Spring Creek NFH</b>											
<b>Fall Chinook</b>											
Tule		10,640,406	197,397					15,100,000	201,333		
<b>TOTAL</b>		10,640,406	197,397	0	0	0	0	15,100,000	201,333	0	0
<b>Warm Springs NFH</b>											
<b>Spring Chinook</b>											
Warm Springs		811,335	66,708					811,335	66,708		
<b>TOTAL</b>		811,335	66,708	0	0	0	0	811,335	66,708	0	0

Summary Table 10. Continued

Hatchery		Smolt Releases		Fingerling Releases		Transfers		Smolt Production Goal		Nonsmolt Goal	
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
<b>Willard NFH</b>											
<b>Coho</b>											
Little White Salmon		2,485,669	169,086	624,657	2,434	30,282	98	1,500	83,333		
		.....									
	<b>TOTAL</b>	2,485,669	169,086	624,657	2,434	30,282	98	1,500	83,333	<b>0</b>	<b>0</b>
<b>Winthrop NFH</b>											
<b>Spring Chinook</b>											
Winthrop		1,104,566	76,946								
		.....									
	<b>TOTAL</b>	1,104,566	76,946	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

Summary Table 11. Production In Pounds During The Three Year Period 1985-1987 For Hatcheries Operated By The U.S. Fish And Wildlife Service Which Reared Anadromous Fish In The Columbia River Basin. Smolts Include Pounds Of Smolts Released, Fingerling Includes Pounds Of Non-smolting Fish Released, And Trans. Includes The Pounds Of Fish Transferred To Other Rearing Facilities.

Hatchery Species Stock	1985			1986			1987			3 Year Average
	Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	
<b>Abernathy SCTC</b>										
<b>Fall Chinook</b>										
Abernathy	25,038			47,050			43,300			
	25,038	0	0	47,050	0	0	43,300	0	0	38,463
<b>Big White Salmon Pond</b>										
<b>Spring Chinook</b>										
Carson							16,535			
	0	0	0	0	0	0	16,535	0	0	5,512
<b>Carson NFH</b>										
<b>Spring Chinook</b>										
Carson	120,981	229		126,150	3,000		133,300	10,200		
	120,981	229	0	126,150	3,000	0	133,300	10,200	0	131,287
<b>Dworshak NFH</b>										
<b>Spring Chinook</b>										
Clearwater							92,600	6,375	6,800	
Leavenworth	51,966									
Rapid River				33,081	5,700					
<b>Summer Steelhead</b>										
B Run	222,000			439,700			382,800			
	273,966	0	0	472,781	0	5,700	475,400	6,375	6,800	413,674
<b>Eagle Creek NFH</b>										
<b>Coho</b>										
Eagle Creek	68,050	2,277		68,835			52,443			
<b>Spring Chinook</b>										
Willamette River	59,526			65,662			59,933			
<b>Winter Steelhead</b>										
Eagle Creek	12,654			19,114			22,535	894	308	
	140,230	2,277	0	153,611	0	0	134,911	894	308	144,077

Summary Table 11. Continued

Hatchery Species	Stock	1985			1986			1987			3 Year Average
		Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	
<b>Entiat NFH</b>											
<b>Spring Chinook</b>											
Entiat		47,800			42,825			54,094			
		-----			-----			-----			
		47,800	0	0	42,825	0	0	54,094	0	0	48,240
<b>Hagerman NFH</b>											
<b>Fall Chinook</b>											
Snake River		2,625									
<b>Summer Steelhead</b>											
A Run		249,000			231,000			217,900			
B Run		56,900			112,000			119,000			
		-----			-----			-----			
		308,525	0	0	343,000	0	0	336,900	0	0	329,475
<b>Kooskia NFH</b>											
<b>Spring Chinook</b>											
Clearwater		16,061						38,385			
Rapid River					22,237						
<b>Summer Steelhead</b>											
B Run				11,600			9,800			8,000	
		-----			-----			-----			
		16,061	0	11,600	22,237	0	9,800	38,385	0	8,000	35,361
<b>Leavenworth NFH</b>											
<b>Spring Chinook</b>											
Leavenworth		134,339	8,579		128,824	7,622		157,409	10,215		
<b>Summer Steelhead</b>											
Wenatchee River		10,835			5,605			16,500			
		-----			-----			-----			
		145,174	8,579	0	134,429	7,622	0	173,909	10,215	0	159,976
<b>Little White Salmon NFH</b>											
<b>Fall Chinook</b>											
Little White Salmon		14,510					1,472				
URB		17,980			14,049	1,154		5,663	268	863	
<b>Spring Chinook</b>											
Little White/Carson		94,138	12,171		36,403	23,564	8,953	38,155	14,536		
		-----			-----			-----			
		126,628	12,171	0	50,452	24,718	10,425	43,818	14,804	863	94,626

Summary Table 11. Continued

Hatchery	Species	Stock	1985			1986			1987			3 Year Average
			Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	
<b>Spring Creek NFH</b>												
<b>Fall Chinook</b>												
	Tule			84,532		166,031			197,397			
	URB		15,764	2,012		20,837	1,743					
			-----									
			15,764	86,544	0	186,868	1,743	0	197,397	0	0	162,772
<b>Warm Springs NFH</b>												
<b>Spring Chinook</b>												
	Warm Springs		55,851			51,911			66,708			
			-----									
			55,851	0	0	51,911	0	0	66,708	0	0	58,157
<b>Willard NFH</b>												
<b>Coho</b>												
	Little White Salmon		64,061	2,264		276,359	4,190	1,681	169,086	2,434	98	
			-----									
			64,061	2,264	0	276,359	4,190	1,681	169,086	2,434	98	173,391
<b>Winthrop NFH</b>												
<b>Spring Chinook</b>												
	Winthrop		69,436			66,811			76,946			
			-----									
			69,436	0	0	66,811	0	0	76,946	0	0	71,064

**Summary Table 12. Total Anadromous Fish Production In Pounds (Includes Smolt And Fingerling Releases And Transfers), Theoretical Production In Pounds Calculated For Flow And Density Methods, And 1987 Agency Production Goals (Smolts Plus Fingerlings) For Hatcheries Operated By The U.S. Fish And Wildlife Service In The Columbia River Basin.**

Hatchery	Total Hatchery Production in Pounds				Theoretical Productions in Lbs		1987 Agency
	1985	1986	1987	Average	Flow Method	Density Method	Goal in Lbs
Abernathy SCTC	25,038	47,050	43,300	38,463	38,976	32,659	42,857
Big White Salmon Pond	0	0	16,535	5,512	173,324	19,769	30,000
Carson NFH	121,210	129,150	143,500	131,287	198,169	199,678	138,889
Dworshak NFH	273,966	478,481	488,575	413,674	1,144,316	525,852	483,000
Eagle Creek NFH	142,507	153,611	136,113	144,077	222,324	209,520	154,764
Entiat NFH	47,800	42,825	54,094	48,240	104,358	62,764	47,060
Hagerman NFH	308,525	343,000	336,900	329,475	321,996	540,672	266,220
Kooskia NFH	27,661	32,037	46,385	35,361	109,056	45,096	40,000
Leavenworth NFH	153,753	142,051	183,974	159,926	261,620	462,326	145,000 *
Little White Salmon NFH	138,799	85,595	59,485	94,626	203,938	90,272	103,030
Spring Creek NFH	102,308	188,611	197,397	162,772	189,378	151,494	201,333
Warm Springs NFH	55,851	51,911	66,708	58,157	156,330	81,000	66,708
Willard NFH	66,325	282,230	171,618	173,391	333,270	150,938	83,333
Winthrop NFH	69,436	66,811	76,946	71,064	321,942	155,355	111,000 *
<b>TOTAL</b>	<b>1,533,179</b>	<b>2,043,363</b>	<b>2,021,530</b>	<b>1,866,074</b>	<b>3,778,997</b>	<b>2,727,395</b>	<b>1,913,194</b>

\* The 1987 agency goal was not provided. Number used in table is current agency goal in pounds.

Summary Table 13. Anadromous Species Which Can Be Reared at Individual Hatcheries Operated By The U. S. Fish And Wildlife Service In The Columbia River Basin. An "0" Indicates Species Currently Being Reared And A "X" Designates Species Which Potentially Could Be Reared.

Hatchery	Fall	Spring	Summer	Coho	Steelhead	Searun		
	Chinook	Chinook	Chinook			Cutthroat	Sockeye	Chum
Abernathy SCTC	0							X
Big White Salmon Pond	X	0	X	X	X	X		
Carson NFH		0	X	X	X			X
Dworshak NFH	X	0	X		0			
Eagle Creek NFH	X	X	X	0	0	X		X
Entiat NFH	X	0	X		X		X	
Hagerman	X				0			
Kooskia NFH	X	0	X		X		X	
Leavenworth NFH	X	0	X		0		X	
Little White Salmon NFH	0	0	X	X	X	X	X	X
Spring Creek NFH	0							X
Warm Springs NFH	X	0	X	X				
Willard NFH		X	X	0				X
Winthrop NFH	X	0	X		X		X	

APPENDIX A  
ADDRESSES AND PHONE NUMBERS FOR  
AGENCIES WHICH ANADROMOUS FISH HATCHERIES

Appendix A. Addresses And Phone Numbers Of Agencies Which Operate  
Anadromous Fish Hatcheries In The Columbia River Basin.

Idaho Department Of Fish and Game (206) 334-3791  
PO Box 25  
Boise, Idaho 93707

Oregon Department Of Fish And Wildlife (503) 229-5400  
PO Box 59  
Portland, Oregon 97207

U.S. Fish And Wildlife Service (503) 231-6119  
911 NE 11th Ave.  
Portland, Oregon 97232-4181

Washington Department Of Fisheries (206) 234-6600  
115 General Admin. Building  
Olympia, Washington 98501

Washington Department Of Wildlife (206) 753-5710  
600 N. Capital Way  
Olympia, Washington 98504

APPENDIX B  
DATA COLLECTION FORMS

HATCHERY SUMMARY

Hatchery Name: \_\_\_\_\_ Hatchery Code: \_\_\_\_\_

Operating Agency: \_\_\_\_\_

Funding Agency/Agencies: \_\_\_\_\_

Initial Year of Operation: \_\_\_\_\_ Current Date: \_\_\_\_\_

Address: \_\_\_\_\_ Phone Number: \_\_\_\_\_

\_\_\_\_\_ Hatchery Manager: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Facility and Operating Synopsis (Use continuation sheet if necessary):

SITE DATA

Hatchery Name: \_\_\_\_\_ Hatchery Code: \_\_\_\_\_

Location of Hatchery/:

Basin Subregion: \_\_\_\_\_ River: \_\_\_\_\_  
Tributary System to Mainstream: \_\_\_\_\_  
Elevation of Hatchery in Feet: \_\_\_\_\_  
Nearest Town: \_\_\_\_\_

Legal Covenants and Conditions:

Land Owner: \_\_\_\_\_  
Land Area: \_\_\_\_\_ Percent in use: \_\_\_\_\_  
Terms of Lease (if any): \_\_\_\_\_  
Easements / Rights of Way (if any): \_\_\_\_\_  
Special Operation or Construction Permits: \_\_\_\_\_  
Pollution Control Requirements / Permits: \_\_\_\_\_

Water Rights:

	Permit/ Certificate Number	Source	Purpose of Use	Priority Date	Amount
1.	_____	_____	_____	_____	_____
2.	_____	_____	_____	_____	_____
3.	_____	_____	_____	_____	_____
4.	_____	_____	_____	_____	_____
5.	_____	_____	_____	_____	_____

NOTE: Provide the above information for each Satellite location on a separate form and attach to corresponding hatchery. Include a brief description of each satellite's function in relation to the parent hatchery.

WATER SUPPLY SUMMARY

Hatchery: \_\_\_\_\_ Location Code: \_\_\_\_\_

	Source #1	Source #2	Source #3
Delivery (P/G)*	_____	_____	_____
Use	_____	_____	_____
Average Flow	_____	_____	_____
Average Temp.	_____	_____	_____
High Flow/Month	_____	_____	_____
Low Flow/Month	_____	_____	_____
High Temp./Month	_____	_____	_____
Low Temp./Month	_____	_____	_____

\* Pumped or gravity

Comments:

Reuse System (Description):

NOTE: Attach a separate form for each satellite location.

**FACILITY INVENTORY**

**Hatchery:** \_\_\_\_\_ **Hatchery Code:** \_\_\_\_\_

	<b>Type/ Dimensions</b>	<b>Usable Volume</b>	<b>Number</b>	<b>Age</b>	<b>Material</b>	<b>Condition</b>	<b>Comments</b>
<b><u>COMPONENT 1/:</u></b>							
<b>Incubation:</b>	_____		_____	_____	_____	_____	_____
	_____		_____	_____	_____	_____	_____
	_____		_____	_____	_____	_____	_____
	_____		_____	_____	_____	_____	_____
<b>Start Tanks:</b>	_____		_____	_____	_____	_____	_____
	_____		_____	_____	_____	_____	_____
	_____		_____	_____	_____	_____	_____
	_____		_____	_____	_____	_____	_____
<b>Raceways:</b>	_____		_____	_____	_____	_____	_____
	_____		_____	_____	_____	_____	_____
	_____		_____	_____	_____	_____	_____
	_____		_____	_____	_____	_____	_____
<b>Ponds:</b>	_____		_____	_____	_____	_____	_____
	_____		_____	_____	_____	_____	_____
	_____		_____	_____	_____	_____	_____
	_____		_____	_____	_____	_____	_____
	_____		_____	_____	_____	_____	_____

1/Correct for irregular shapes.

**LAYOUT:** Attach a layout drawing of the hatchery showing major features such as buildings, raceways, ponds, etc.

STAFFING SUMMARY

Hatchery: \_\_\_\_\_ Hatchery Code: \_\_\_\_\_

(Description of normal facility staffing practices. Include breakdown of full time, part time, and temporary staff by type of position/title.)

ADULT CAPTURING/HANDLING

Hatchery: \_\_\_\_\_

Hatchery Code: \_\_\_\_\_

Species: \_\_\_\_\_

Spawning:

Method of Adult Return to Site:

Adult Holding Pond:

Ladder:  
Off-site capture:  
Other:

Flow:  
Volume:  
Holding Density:

Method of Adult Holding:

Description of holding ponds:

Method of separating males and females:

Method of holding/handling with mixed species/stock returns:

Typical time of adult holding:

Spawning procedure:

Method of fertilization:

Hatchery Return Information

	# Returned	# Spawned	# Released *	# Other
Males	_____	_____	_____	_____
Females	_____	_____	_____	_____
Jacks	_____	_____	_____	_____
Total	_____	_____	_____	_____

\*Note: Describe release strategy/goal:



HATCHERY PRODUCTION SUMMARY  
FOR FISCAL YEARS 1985 TO 1987

Hatchery Name: \_\_\_\_\_ Hatchery Code: \_\_\_\_\_  
Fiscal Year: \_\_\_\_\_

A. Total Releases For Hatchery By Species:

Species	Stock	# of Fish	Lbs of Fish
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Total For The Year (All Species)		_____	_____

B. Total Interim Production For Hatchery By Species:  
(Fish reared for a period of time and transferred to other stations, increase in pounds during the period fish were on station)

Species	Stock	# of Fish	Lbs of Fish
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Total For The Year (All Species)		_____	_____

HATCHERY PRODUCTION SUMMARY  
FOR FISCAL YEARS 1985 TO 1987

Hatchery Name: \_\_\_\_\_ Hatchery Code: \_\_\_\_\_

Fiscal Year: \_\_\_\_\_

C. Total Production For Hatchery By Species:  
(Part "A" plus part "B")

Species	Stock	# of Fish	Lbs of Fish
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Total For The Year (All Species)		_____	_____

D. Total Operating Cost For Hatchery  
cost: \_\_\_\_\_

PRODUCTION CONSTRAINTS

Hatchery: \_\_\_\_\_

Hatchery Code: \_\_\_\_\_

Describe Current Restraints to Production relating to:

Physical Hatchery Layout:

Water Sources/Supplies/Delivery System/Quality/Water Rights:

Adult Holding/Spawning Capabilities:

Egg Related Constraints:

Fish Rearing Constraints:

Administrative Constraints (ie. mixed species hatchery):

HATCHERY PRODUCTION SMOLT CAPACITY

Hatchery Name: \_\_\_\_\_

Hatchery Code: \_\_\_\_\_

Species	Actual Hatchery Production		Smolt Production Goal	
	Number	Pounds	Number	Pounds
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Theoretical Production:

Piper's 1982 Flow Method:

Piper's 1982 Density Method:

HATCHERY EXPANSION CAPABILITY

Hatchery Name: \_\_\_\_\_

Hatchery Code: \_\_\_\_\_

Land:

Describe Land Available:

Land Ownership:

Water:

Quantity:

Amount Available (Actual or Potential):

Type: Ground: \_\_\_\_\_ Surface: \_\_\_\_\_

Description/Method of Acquisition:

Quality:

Temperature Range:

Possible Chemical Limitations:

Potential Disease Problems:

Feasibility:

Distance from Hatchery:

Availability of Water Right:

Type Delivery: Pump: \_\_\_\_\_ Gravity: \_\_\_\_\_

Type of Construction:

Estimate of Cost (use conceptual design information):

	Description	cost
Land Acquisition:		
Construction:		
Water Related:		
O&M:		

Potential Smolt Production: