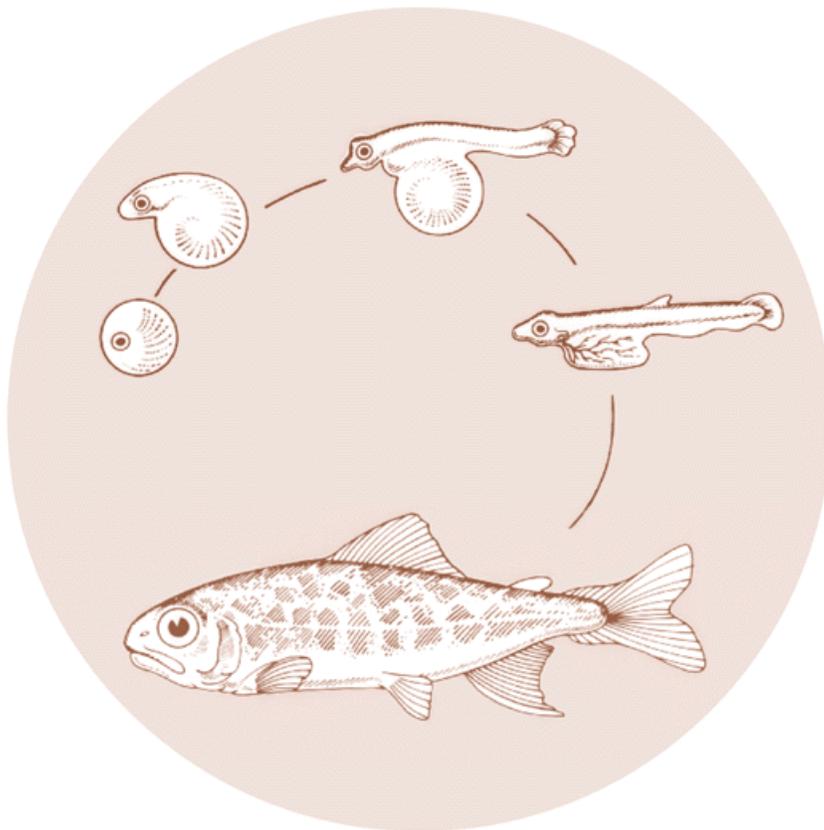


July 1990

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

Washington Department of Wildlife Hatcheries

Final Report



DOE/BP-98379-5



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

Washington Department of Wildlife 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:

Tom Rogers, Idaho Department of Fish and Game  
Tim Walters, Oregon Department of Fish and Game  
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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 **"A"** 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
<b>Total</b>	<b>85</b>	

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	<b>Riggins, Id</b>
Sawtooth	Snake River Basin	Stanley, Id

\* Will be operated as satellite facilities to the Clear-water 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.
<b>Leaburg</b>	Willamette Basin	<b>Leaburg, Or.</b>
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.
<b>Stayton Pond</b>	Willamette Basin	<b>Stayton, Or.</b>
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.
<b>Pelton Ladder</b>	Bon. Dam to Snake River	Madras, Or.
<b>Lookingglass</b>	<b>Snake River Basin</b>	<b>Palmer Junction, Or</b>
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	Innaha, 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	Longview, Wa.
Eagle Creek NFH	<b>Willamette</b> Basin	Estacada, Or.
Carson NFH	Bon. Dam to Snake River	Carson, <b>Wa.</b>
Little White Sal.	Bon. Dam to Snake River	Cook, <b>Wa.</b>
Willard NFH	Bon. Dam to Snake River	Cook, <b>Wa.</b>
Spring Creek	Bon. Dam to Snake River	Underwood, Wa.
Big White Pond *	Bon. Dam to Snake River	Underwood, <b>Wa.</b>
<b>Warm</b> Springs NFH	Bon. Dam to Snake River	<b>Warm</b> Springs, Or.
<b>Entiat</b> NFH	<b>Col.</b> Basin above Snake R.	<b>Entiat, Wa.</b>
Leavenworth NFH	<b>Col.</b> 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 <b>Basin</b>	Kooskia, Id.
<b>Hagerman</b> NFH	Snake River Basin	<b>Hagerman, Id.</b>

\* 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	<b>Salkum</b> , Wa.
Elokomin	Below Bonneville Dam	Cathlamet, Wa.
Grays River Weyco Pond *	Below Bonneville Dam Below Bonneville Dam	Grays River, Wa. Grays River, Wa.
Kalama Falls	Below Bonneville Dam	Kalama, Wa.
Lower Kalama	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	<b>Col.</b> Basin above Snake R.	<b>Mattawa</b> , Wa.
<b>Ringold</b> Salmon Pond	Col. Basin above Snake R.	Mesa, Wa.
Rocky Reach	<b>Col.</b> Basin above Snake R.	<b>E.</b> Wenatchee, Wa.
Wells Salmon	<b>Col.</b> Basin above Snake R.	<b>Pateros</b> , 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.
<b>Cowlitz</b> Trout.	Below Bonneville Dam	<b>Winlock</b> , Wa.
<b>Gobar</b> 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.
<b>Naches</b>	<b>Col.</b> Basin above Snake R.	<b>Naches</b> , Wa.
Nelson Springs *	Col. Basin above Snake R.	<b>Naches</b> , Wa.
<b>Ringold</b> Trout Pond	<b>Col.</b> Basin above Snake R.	Mesa, Wa.
Turtle Rock	<b>Col.</b> Basin above <b>Snake</b> R.	<b>E.</b> Wenatchee, Wa.
Wells Trout	<b>Col.</b> Basin above Snake R.	<b>Pateros</b> , 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
IDFG	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>
ODFW	36,566,439	2,211,795	42,703,334	2,202,552	46,593,424	2,350,680	41,954,399	2,255,009
USFWS	21,153,938	1,409,515	35,422,782	1,974,484	30,632,436	1,960,689	29,069,719	1,781,563
WDF	53,938,979	2,197,389	66,098,677	2,464,092	63,171,986	2,283,541	61,069,881	2,315,007
WDW	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.

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.

Washington Department of Wildlife

A total of 17 hatcheries or satellite facilities operated by WDW were evaluated. The WDW also operate additional hatcheries for their resident fish program: they have not been included in this evaluation. Only those facilities with a portion of their production in anadromous fish have been evaluated. Summary Tables 1 through 13 detail information supplied on data collection forms. Table 10 and Figure 1 show the approximate location within the Columbia Basin for each facility. They are scattered throughout the Basin with the majority located in the upper section of the Columbia Basin and in the Snake River Basin. These hatcheries produced an average of 4,381,049 smolts weighing 775,909 pounds during this evaluation period.

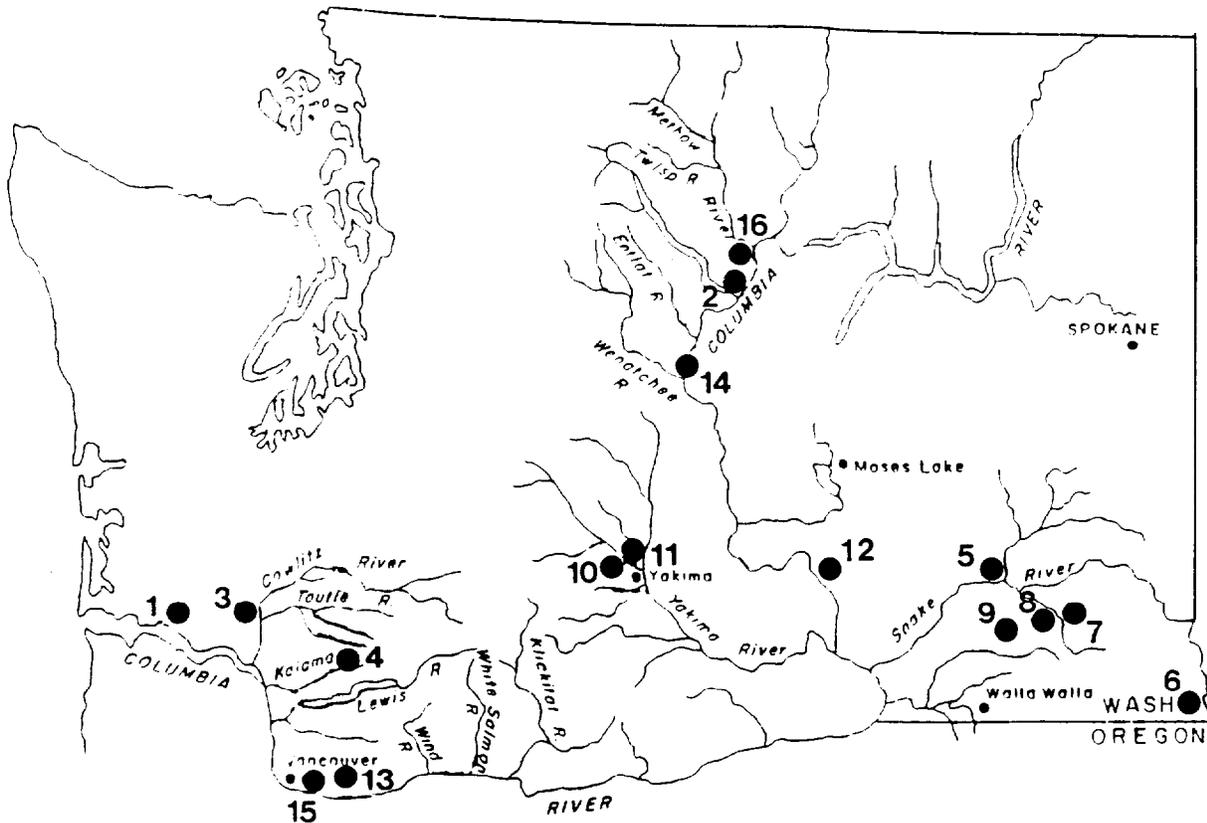
Table 10. Location Of Hatcheries And Satellite Facilities Operated By Washington Department Of Wildlife In The Columbia River Basin.

Below Bon. Dam	Bon. Dam to Snake River	col. Basin Above Snake R.	Snake River Basin
1. Beaver Creek		1. Chelan PUD	1. Lyons Ferry
2. cowlitz Trout		2. Naches	2. Cottonwood Pd
3. Gobar Pond		3. Nelson Springs	3. Curl Lake
4. Skamania		4. Ringold Springs	4. Dayton Pond
5. Vancouver		5. Turtle Rock	5. Tucannon
		6. Wells Trout	
		7. Yakima Trout	
		8. Eastbank *	

\* Eastbank Hatchery is a new facility completed in 1989. It has not been evaluated in this report.

Most of the facilities listed above have expansion capabilities. These are summarized in Tables 11 and 12. To obtain more detailed information refer to the individual hatchery discussions.

Figure 1. Approximate Location Of Hatcheries Operated By The Washington Department Of Wildlife Which Rear Anadromous Fish In The Columbia River Basin.



- |                               |                                  |
|-------------------------------|----------------------------------|
| 1. Beaver Creek Hatchery      | 9. Dayton Pond                   |
| 2. Chelan PUD Hatchery        | 10. Naches Hatchery              |
| 3. Cowlitz Trout Hatchery     | 11. Nelson Springs Raceway       |
| 4. Gobar Pond                 | 12. Ringold Springs Rearing Pond |
| 5. Lyons Ferry Trout Hatchery | 13. Skamania Hatchery            |
| 6. Cottonwood Pond            | 14. Turtle Rock                  |
| 7. Tucannon Hatchery          | 15. Vancouver Hatchery           |
| a. Curl Lake                  | 16. Wells Trout Hatchery         |

Table 11. List Of Hatcheries And Satellite Facilities Operated By The Washington Department Of Wildlife Where Production Could Be Increased By Providing Additional Budget, Flow, Rearing Space, Or Flow And Rearing Space.

Budget	Flow	Rearing Space	Flow and Space
1. <b>Gobar</b> Pond	1. Lyons Ferry*	1. Cottonwood Pond *	1. Beaver Cr.
2. Curl Lake			2. Cowlitz
3. Turtle Rock *			3. Lyons Ferry*
4. Vancouver *			4. Tucannon
5. Dayton Pond			5. Vancouver*
			6. Chelan PUD
			7. Skamania

\* Turtle Rock: Production from this facility was moved to the new **Eastbank** Hatchery beginning with the 1990 **smolt** release. Turtle Rock has been closed down and is potentially available for other uses.

Vancouver: After 1991, **PP&L** funding will stop. If additional funding is provided, production could continue in those ponds. Additional flow and replacement of existing ponds are required to increase production.

Lyons Ferry: Existing ponds could utilize additional water and there is room for additional ponds if water is available.

Cottonwood Pond: Only proposing an adult collection and egg taking facility to alleviate periodic egg shortages. Existing pond and water supply can acclimate an additional 200,000 steelhead **smolts**.

**Table 12. Expansion Capabilities for Hatcheries Operated By The Washington Department Of Wildlife Which Rear Anadromous Fish In The Columbia Basin.**

Hatchery	Addition Volume	Water Available Temp. Range	at Site Source	Delivery Method	Land Available	Potential Numbers	Production Pounds	Species
Beaver Creek	300-900 CPM	45-50	Springs	Gravity	Yes	72,000	12,000	Steelhead
Chelan PUD	3,500 CPM	37-65	Columbia River	Pump	Yes	127,000	21,168	Steelhead
Cottonwood Pond	Existing		Same	Gravity	No	200,000	34,000	Steelhead
Cowlitz Trout	Large volume	39-58	Cowlitz River	Pump	Yes	6,000,000	1,000,000	Steelhead
Gobar Pond	Existing		...	Gravity	No	100,000	17,000	Steelhead
Lyons Ferry	Unknown	52	Wells	Pump	Yes	918,000	153,000	Steelhead
Ringold	a cfs	38-65	Springs	Pump	Yes	184,000	30,666	Steelhead
Skamnia	Re-use	30-68	Reuse existing	Pump	Yes	90,000	15,000	Steelhead
Tucannon	Unknown	32-65	Surface Water	Gravity	Yes	170,000	28,500	Steelhead
Turtle Rock	Large volume	37-65	Columbia River	Pump	Yes	200,000	33,333	Steelhead
Vancouver	2,000 gpm	?	Wells	Pump	Yes	100,000	16,666	Steelhead
					<b>TOTAL</b>	8,161,000	1,361,333	

Beaver Creek Hatchery  
28 Beaver Creek Road  
Cathlamet, Wa. 98612

Funding Agency: NMFS

Species Reared: Winter Steelhead  
Summer Steelhead  
**Searun** Cutthroat

Manager: Stan Woody  
Phone #: (206) 795-3620

### Introduction

Beaver Creek is located on the Elochoman River near the town of Cathlamet. Elevation is 30 feet above sea level. It was constructed during the 1950's under the Mitchell Act and began operating in 1957. Four full time staff live on station and the facility is operated under the Columbia River Fisheries Development Program (CRFDP). It is staffed with 4.3 FTE's.

The rearing units are in good condition and consist of 1 earthen rearing pond, 20 raceways, and 2 adult holding ponds.

The facility is designed to collect and spawn adult steelhead and **searun** cutthroat and to allow full term rearing of yearling smolts of over .5 million fish annually. **Pre-smolts** are also transferred to several co-operative imprint ponds in the spring. Smolts are released both on-site and out-planted to several lower Columbia River tributaries.

The major disease concerns include Nanophyetus salmonicola parasite infections, infectious hematopoietic necrosis (IHN) virus, and **furunculosis**. **Icto** parasites and bacterial infections associated with stream water supplies are present in both the Elochoman River and Beaver Creek. The N. salmonicola parasite is controlled by use of electric grids at both stream intakes.

Water rights total 16,013 gpm from 3 sources: Elochoman River, Beaver Creek, and a well. Beaver Creek is supplied by gravity flow while the other 2 are pumped. The Elochoman River provides rearing water during the summer and fall (mid May through mid November). After the fall rains, when flow is sufficient, Beaver Creek replaces (mid November through mid-May) the Elochoman River supply. Elochoman River and Beaver Creek water supplies are not normally used simultaneously. The well water is used to incubate eggs and early rearing of fry and needs to be aerated and filtered to remove iron. The water table in the well drops during the summer. Water being discharged back into the river must be good as the domestic water supply for the town of Cathlamet is located below the hatchery outfall.

The hatchery water supply can be re-used from the rearing pond (1,800 gpm) through the raceways from October through May, except when the pond is being drawn down. Raceway water is re-used through the 2 adult holding ponds (1,650 gpm per pond) and is used continually for either adult holding or juvenile rearing. Some of this water is third pass by the time it reaches the adult pond. There is no aeration of water between uses.

### Current Production Constraints

High summer water temperatures of up to 72 degrees fahrenheit creates a problem from July through September. During this period, theoretical capacity is 32,000 pounds when 40,000 pounds are normally present on station. Oxygen depletions have occurred and standby aeration is needed for this time period.

The existing adult holding ponds are not designed to accommodate multiple broodstock groups.

Two 1,000 cubic foot circular ponds are present but not installed for use. These could be set up to use second pass well water from the hatchery building to reduce fry loading in the trough room.

### Theoretical Production

The theoretical production based on the flow method is 158,376 pounds and with density is 135,020 pounds. The 3 year average production was 146,009 pounds but includes only about 129,000 pounds of **smolts** released. The remaining pounds of production were transferred off station during the year. The 1987 goal was 116,667 pounds and the current goal is 99,278 pounds. Theoretical calculations were computed for **steelhead** as follows:

#### Flow Method

Raceways:	1.67	X	300	gpm	X	8"	20	ponds	=	80,160	lbs *	
Adult Ponds:	1.67	X	1,650	gpm	X	8"	X	2	ponds	=	44,088	lbs *
Rearing Pond:	2.37	X	1,800	gpm	X	8"		1	pond	=	<u>34,128</u>	<u>lbs</u>
											158,376	lbs

#### Density Method

Raceways:	.25	X	1,636	cu ft	X	8"	X	20	ponds	=	65,440	lbs *
Adult Ponds:	.25	X	4,327	cu ft	X	8"	X	2	ponds	=	17,308	lbs *
Rearing Pond:	.03	X	217,800	cu ft	X	8"	X	1	pond	=	<u>52,272</u>	<u>lbs</u>
											135,020	lbs

\* Note: Adult ponds are supplied with re-use water.  
Raceways supplied with partial re-use water. Normal hatchery practice would be to reduce pond loading.

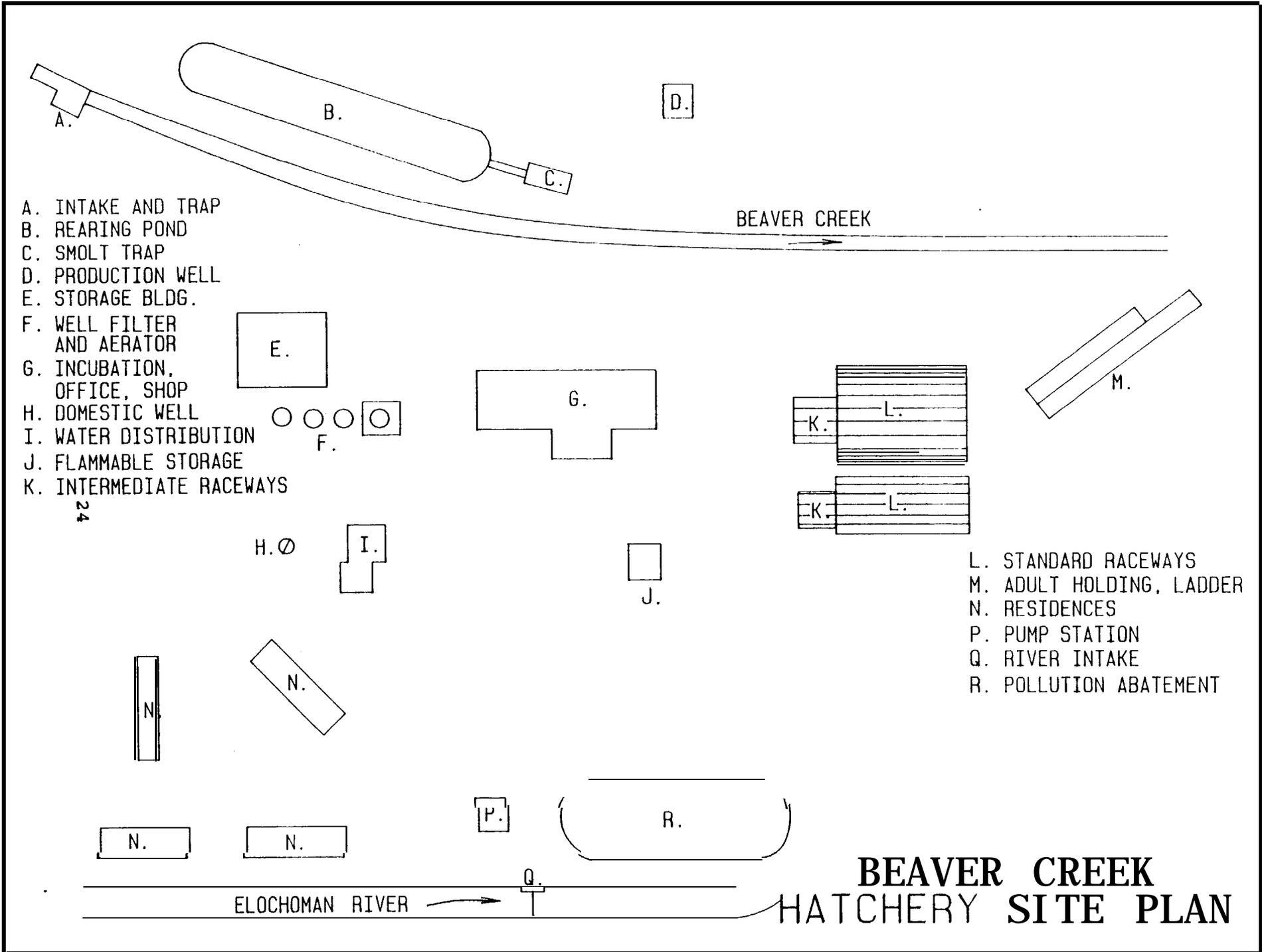
Comparison of the 2 theoretical calculations appears to indicate that rearing space is the limiting factor in production. This is misleading since the flow calculation does not factor in water which is being re-used. A portion of the raceway water supply and all of the adult ponds are supplied with re-use water and would normally not support the same production level as first use water. Thus, water would seem to be the limiting factor in production.

This is especially true during summer months. The agency goal has been reduced in recent years.

### Hatchery Expansion Capability

The hatchery is situated on 44 acres owned by WDW. **Approximately** 30 acres is undeveloped and available for expansion. **Surface water** in the form of an undeveloped spring is located on state land and a small stream borders the state property. The availability of the water right for these sources is unknown. **Approximately 300 gpm** with a temperature of 51 degrees fahrenheit was measured on June 21, 1989. About 900 gpm is estimated for the winter/spring period. Water temperature for the winter/spring period should be **45-50** degrees fahrenheit. The potential for water from wells is not known, but flow from existing well is reduced in summer and must be filtered.

A 10,000 cubic foot rearing pond would match the water supply if **900 gpm** is available. Site preparation, road, intake, inlet and outlet piping, new pond, predator netting, alarm system, and engineering are needed. An additional 72,000 **steelhead smolts** weighing 12,000 pounds could be produced per year.



- A. INTAKE AND TRAP
- B. REARING POND
- C. SMOLT TRAP
- D. PRODUCTION WELL
- E. STORAGE BLDG.
- F. WELL FILTER AND AERATOR
- G. INCUBATION, OFFICE, SHOP
- H. DOMESTIC WELL
- I. WATER DISTRIBUTION
- J. FLAMMABLE STORAGE
- K. INTERMEDIATE RACEWAYS

24

- L. STANDARD RACEWAYS
- M. ADULT HOLDING, LADDER
- N. RESIDENCES
- P. PUMP STATION
- Q. RIVER INTAKE
- R. POLLUTION ABATEMENT

# BEAVER CREEK HATCHERY SITE PLAN

BEAVER CREEK - PROPOSED DEVELOPMENT

SPRING FED CREEK

LOGGING ROAD

48" CULVER

PROPOSED

POND

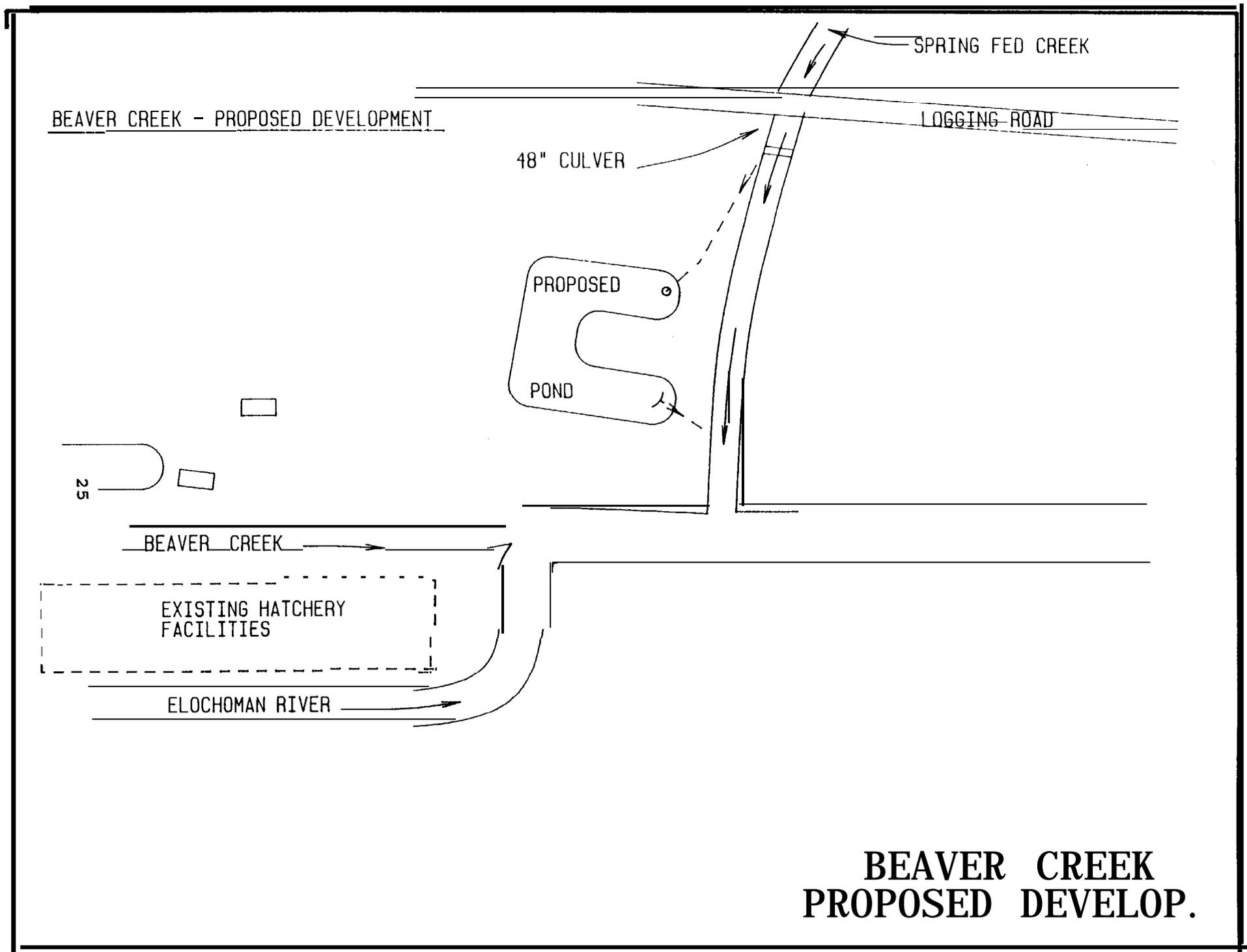
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BEAVER CREEK

EXISTING HATCHERY FACILITIES

ELOCHOMAN RIVER

**BEAVER CREEK  
PROPOSED DEVELOP.**



Chelan PUD Hatchery  
HCR Box 52  
Chelan, Wa. 98816

Funding Agency: Chelan County PUD No. 1  
Species Reared: Summer **Steelhead**  
Resident Fish

Manager: Steve Robards  
Phone #: (509) 682-5514

### Introduction

The Chelan PUD Hatchery is located along the Columbia River near the town of Chelan Falls. Elevation is 750 feet above sea level. The hatchery began operation in 1965 and is located adjacent to WDW's Chelan Trout Hatchery. The two are operated as a complex by the same staff. The Chelan complex is staffed with 4 FTE's with 50% of the time devoted to the Chelan PUD facility.

Rearing units are in good condition and consist of 2 portable vinyl raceways, 16 standard raceways, 8 intermediate raceways, and 1 adult holding raceway.

Adults and or eggs are transferred in from other stations. The PUD hatchery rears summer steelhead and resident trout for stocking the Wenatchee and Entiat Rivers and Kokanee for Lake Chelan. Only the anadromous fish production has been summarized in this report, but it only accounts for about 44% of pounds produced.

Disease problems include environmental gill disease (EGD) and other related disorders associated with overcrowding or lack of flow. The spring water supply is open and allows diseases to exist in and on fish and other organisms present. The potential for importing IHN from the river water supply also exists.

Water rights total 14,812 gpm from wells and Columbia River. Water can be supplied to the hatchery from 3 sources; well, Columbia River, and springs. Use of the Columbia River supply has been discontinued due to potential fish loss from importation of IHN. The spring supply averages about 500 gpm and is the surplus left over from the state trout hatchery program and local orchard needs. The average amount of water used by the hatchery is about 3,000 gpm. Being mostly well water, the water temperature remains a fairly constant 50-57 degrees fahrenheit.

Six wells have been installed with a design capacity of about 7,200 gpm, but only provides about 2,500 gpm. Both well and spring water supplies are used for incubation and rearing. The river pump station contains three 200 hp pumps with a 24-inch line which connects to the well water supply line for delivery to the hatchery. The river water supply can still be used if required.

The hatchery water re-use system includes a 2-pass trough system in the hatchery building. Water is also re-used from the upper raceways and/or trough room to lower raceways and/or adult holding pond. No fresh water is added to the adult pond. Water can also

be obtained from the state hatchery and pumped through the raceway system.

### Current Production Constraints

Fish production is constrained by available clean water supply. Water from the Columbia River is no longer used and the wells are only providing about 1/3 of designed capacity.

If used, river water is too warm in the summer and has to be mixed with well water for delivery to the hatchery. The river water has been abandoned due to potential disease problems. The spring water supply is exposed and a potential source for importing disease organisms.

The adult holding pond receives only re-use water from upper raceways and is not aerated between uses. During most years anadromous adults are not held at this facility. Eggs are imported mainly from Wells Trout Hatchery.

Chelan PUD owns the facility and the mitigation program is fixed. Any production increases would have to be negotiated with Chelan PUD.

### Theoretical Production

Theoretical production based on the flow method is 50,710 pounds and based on density is **84,011** pounds. This includes pond space used for resident program. Average anadromous production was 50,194 pounds (there was also 32,939 pounds of resident fish produced) and the 1987 goal was 32,500 pounds of **steelhead** and 28,523 pounds of resident fish. The **current** goal is to produce a total of 61,023 pounds (including 32,500 pounds of steelhead). Theoretical calculations were computed as follows:

#### Flow Method

<b>Steelhead/trout:</b>	1.55 X 250 gpm X a" X a raceways=	24,800 lbs
<b>Steelhead/trout:</b>	1.55 X 200 gpm X 8" X 8 raceways=	19,840 lbs *
<b>Steelhead/trout:</b>	1.55 X 400 gpm X a" X 1 adult pd=	4,960 lbs *
<b>Kokanee Fry:</b>	1.55 X 200 gpm X 1.79" X 2 port. pd=	<u>1,110 lbs</u>
		50,710 lbs

#### Density Method

<b>Steelhead/trout:</b>	.25 X 2,308 cu ft X 8" X 16 pd =	73,856 lbs **
<b>Steelhead/trout:</b>	.25 X 3,600 cu ft X 8" X 1 pond=	7,200 lbs
<b>Kokanee Fry:</b>	.5 X 1,651 cu ft X 1.79" X 2 pd =	<u>2,955 lbs</u>
		84,011 lbs

\* Note: Supplied with re-use water.

\*\* Note: Half of the raceways are supplied with re-use water.

Comparison of the 2 theoretical calculations indicate that flow is the limiting factor in production. Nearly half the production calculated in the theoretical flow formula utilized re-use water, which makes flow even more limiting than the numbers above indicate. Average production and the agency goal both exceed theoretical production based on flow. Environmental gill disease and other disease problems associated with high density and low flow have been prevalent at this station and may be an indication that production is set too high.

### Hatchery Expansion Capability

The hatchery is situated on 4 acres owned by Chelan County PUD #1. Approximately 80% of the land is currently in use. Expansion could occur on undeveloped land between residence and hatchery entrance, plus land near the wells and river intake.

A water right for 7,181 gpm of Columbia River water exists which is not currently being utilized. It would require disinfection with an ozone treatment plant to eliminate potential disease problems and would require pumping. Temperature of the river water ranges from 37-65 degrees fahrenheit and if treated should not have any disease related problems. The potential for development of additional water from wells is unknown, but existing wells are not providing water at designed capacity. A detailed analysis is needed to determine the most cost effective water source.

Facilities needed to expand production include:

1. Ozone treatment system for 3,500 gpm river water. The treated water would be split so that 1,750 gpm was delivered to existing rearing facilities to better balance water with space. The remaining 1,750 gpm would be provided to proposed rearing pond at river intake site.
2. Construct 88,200 cubic foot rearing pond with dimensions of approximately 70' X 210' X 6' (1/3 surface acre).

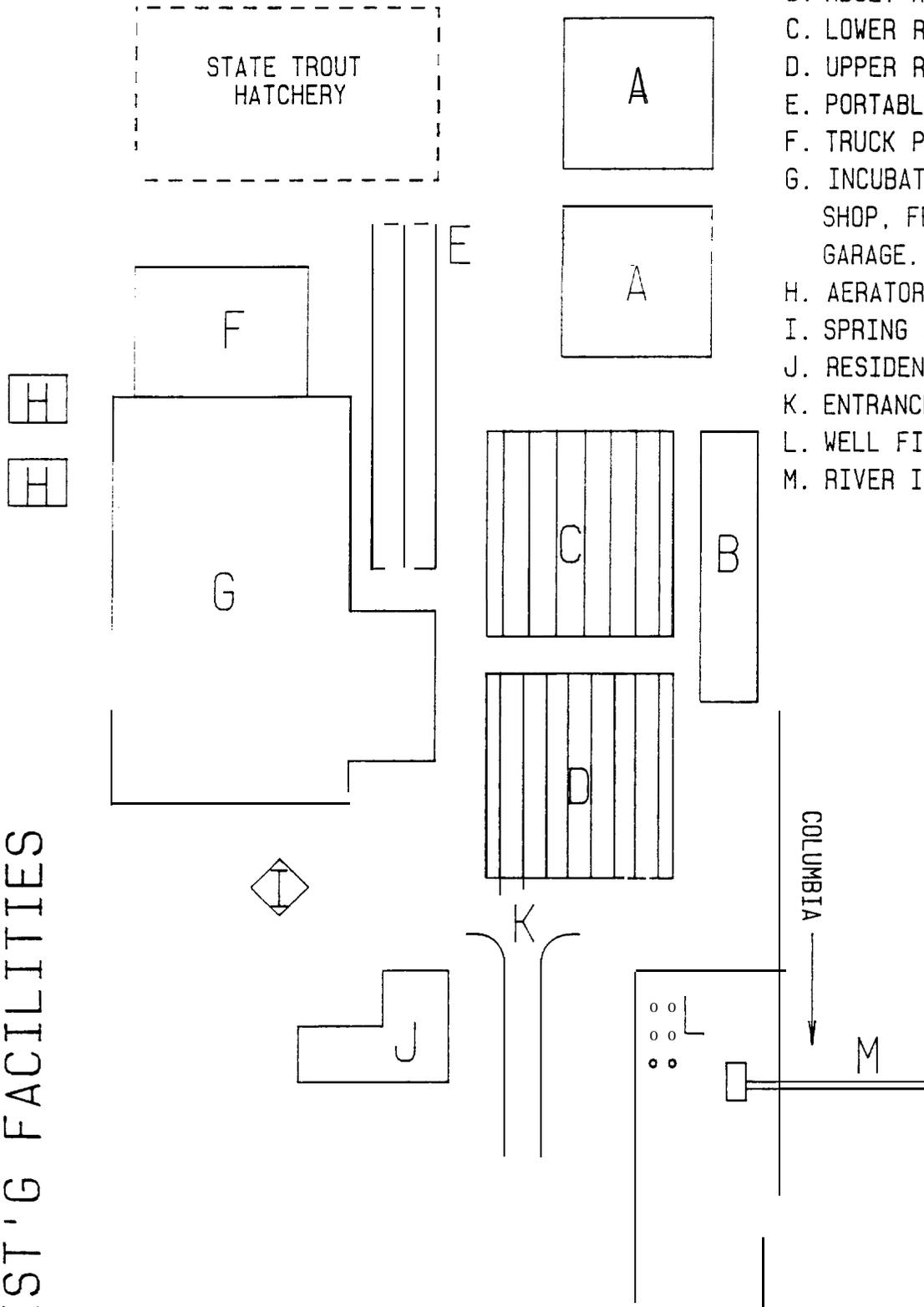
Increased production would total 127,000 smolts weighing 21,168 pounds. This production is limited by available space (density) and is calculated in the following manner:

Flow Method:  $1.61 \times 1,750 \text{ gpm} \times 8" = 22,540 \text{ lbs}$

Density Method:  $.03 \times 88,200 \text{ cu ft} \times 8" = 21,168 \text{ lbs}$

# CHELAN PUD HATCHERY

- A. POLLUTION ABATEMENT
- B. ADULT HOLDING POND
- C. LOWER RACEWAYS
- D. UPPER RACEWAYS
- E. PORTABLE RACEWAYS
- F. TRUCK PORT
- G. INCUBATION, OFFICE, SHOP, FEED, STORAGE, GARAGE.
- H. AERATORS
- I. SPRING PUMP STATION
- J. RESIDENCE
- K. ENTRANCE ROAD
- L. WELL FIELD
- M. RIVER INTAKE

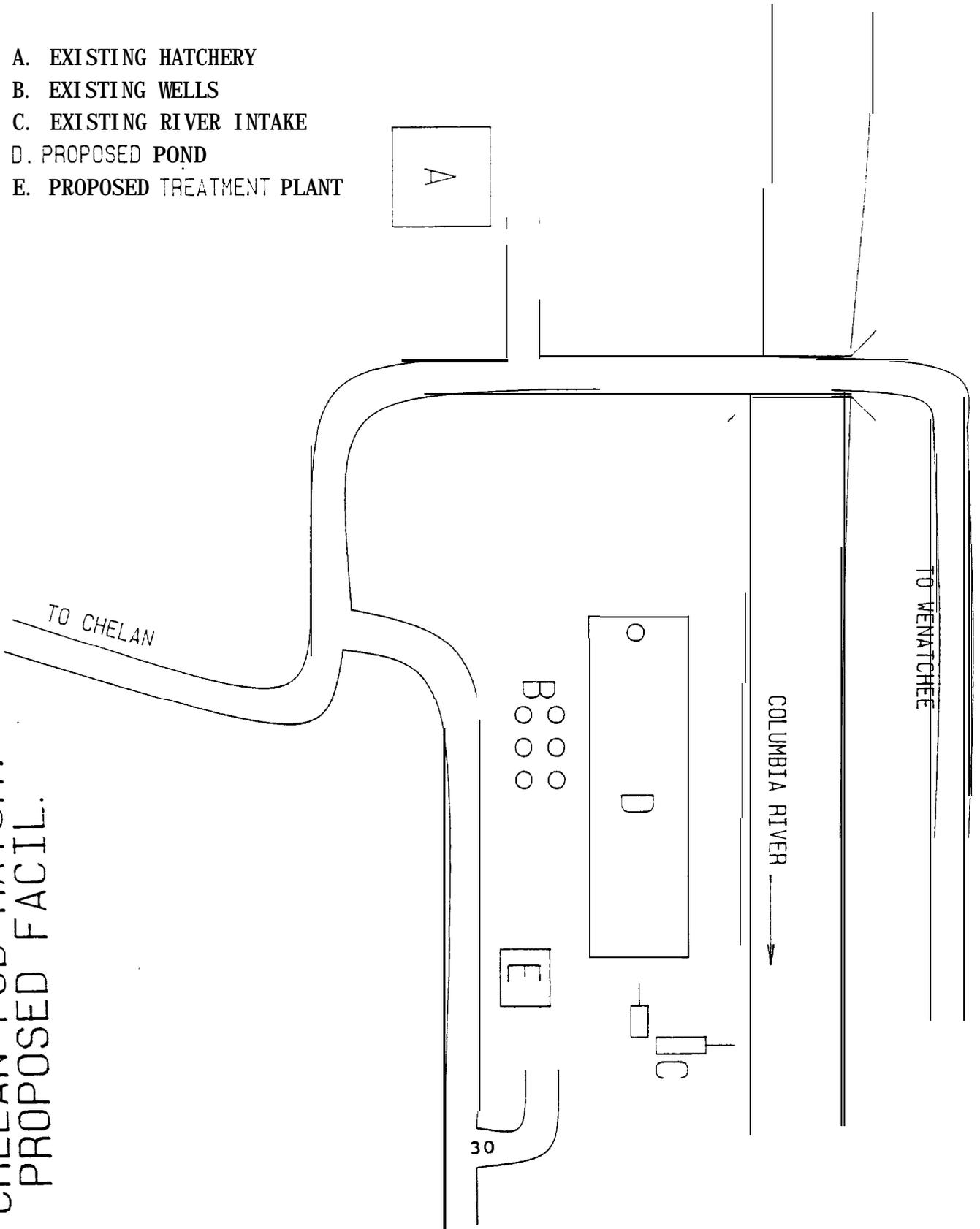


CHELAN PUD HATCH.  
EXIST'G FACILITIES

# CHELAN PUD HATCH.

- A. EXISTING HATCHERY
- B. EXISTING WELLS
- C. EXISTING RIVER INTAKE
- D. PROPOSED POND
- E. PROPOSED TREATMENT PLANT

CHELAN PUD HATCH.  
PROPOSED FACIL.



Cowlitz Trout Hatchery  
1181 Spencer Road  
Winlock, Wa. 98596

Funding Agency: City of Tacoma  
Species Reared: Summer **Steelhead**  
Winter **Steelhead**  
**Searun** Cutthroat

Manager: **Vince Janson**  
Phone #: (206) 864-6121

### Introduction

Cowlitz Trout Hatchery is located on the Cowlitz River just below Mayfield Dam. Elevation of the site is 157 feet above sea level. It is operated as a mitigation facility for dams constructed by the City of Tacoma on the Cowlitz River. The facility began operation in 1967 and is staffed with 6.66 FTE's. In addition, the City of Tacoma provides personnel for maintenance of grounds and equipment.

The rearing units are in fair condition and consist of 104 shallow troughs, 6 F Series raceways, 24 A, B, and C Series raceways, four 5-acre ponds and 3 adult holding raceways. There is also an adult trap set up.

Steelhead and searun cutthroat are reared for stocking into the Cowlitz River. The production goal, set by mitigation agreement with the City of Tacoma is 1,050,000 smolts. Adults are collected, spawned, and yearling smolts released.

Disease organisms, particularly IHN and Ceratomyxa Shasta have caused major problems in the past. If diseases were controlled this facility could rear high quality fish far in excess of the mitigation program. The disease problems are associated with the use of raw Cowlitz River water for fish rearing. An ozone treatment plant is being installed to treat up to 9,000 gpm of river water from June through December. It is hoped this will eliminate most disease problems.

Water rights total 30,855 gpm from 3 sources. These sources all must be pumped. The north well (there are 2 wells but only 1 is operating) supplying an average of 370 gpm is used in hatchery troughs and F-series raceways. The south well field is the second water source and is located across the Cowlitz River from the hatchery. There are 9 wells, 8 of which are currently operating and capable of delivering an average 1,500 gpm for use in raceways and adult holding ponds. The main water source, nearly 24,000 gpm, is supplied from the Cowlitz River. Four 75 hp pumps supply river water to the hatchery. These 3 sources supplied an average 25,870 gpm during this evaluation period.

The hatchery was designed to re-use water supplies. Troughs are in tandem. Water can be re-used from F-series raceways to A-series raceways to B-series raceways. C-series raceways can also receive re-use water from B-series raceways but usually is not operated in this manner. Adult raceways can receive re-use water from raceways

as well as fresh river water. The 5-acre ponds can also receive re-use water from raceways.

### Current Production Constraints

The main constraining factors are the disease organisms ~~Ceratomyxa Shasta~~ and IHN. Ceratomyxa is an annual problem in the summer. Densities are held to a minimum to reduce losses from the organism. If additional clean water supplies were available or river water could be treated to eliminate the ~~Ceratomyxa~~ organism during the summer, then production at this facility could be far in excess of the present mitigation program.

The 5-acre ponds are too large for good predator control and efficient feeding.

Drains for A, B, and C-series raceways are too small to handle the flow which should be provided.

Additional fry starting intermediate tanks or troughs are needed to reduce densities and help alleviate summer losses from the Ceratomyxa organism.

This is a mitigation facility and any increase in production would have to be negotiated with the City of Tacoma.

### Theoretical Production

Theoretical production based on the flow formula is 489,510 pounds and based on density is 1,820,955 pounds. Average production was 189,816 pounds and the 1987 and current agency goal 181,667 pounds. Until disease organisms are controlled, the production potential can not be met at this station. Theoretical calculations were computed for steelhead as follows:

#### Flow Method

F-series raceways:	1.89 X 200 gpm X 2.5" X 6 ponds=	5,670 lbs
A,B,C-series ponds:	1.89 X 800 gpm X 8" X 24 ponds =	290,304 lbs
Rearing Ponds:	1.89 X 3,200 gpm X 8" X 4 ponds=	<u>193,536 lbs</u>
		489,510 lbs

#### Density Method

F-series:	.25 X 2,388 cu ft X 2.5" X 6 ponds =	8,955 lbs
A,B,C-series:	.25 X 5,270 cu ft X 8" X 24 ponds =	252,960 lbs
Rearing Pond:	.03 X 1,624,00 cu ft X 8" X 4 ponds=	<u>1,559,040 lbs</u>
		1,820,955 lbs

Comparison of the two theoretical calculations indicates that flow is the limiting factor in production. The extensive re-use of water at this facility makes flow even more limiting than numbers

above indicate. Also, as described above, Ceratomyxa is lowering the production potential at this station. It is not possible for production to **equal** theoretical based on flow at this time. If disease problems were solved, then production based on theoretical flow calculations would be feasible but would require additional incubation and fry starter facilities.

Production based on theoretical density is not achievable with present rearing facilities. The four 5-acre ponds are inefficient and can not produce the 1,559,040 pounds the density formula predicts, even with sufficient flow. If the 5-acre ponds were subdivided into 24, .8 acre ponds then production based on the density formula could be achieved. It would also require an additional 90,000 gpm (approximately 200 cfs) of water.

### Expansion Capability

The hatchery is situated on 600 acres owned by the City of Tacoma. Approximately 20% of the area is being utilized. Some additional land is suitable for expansion, but most is managed for wildlife mitigation. Additional river water is available in the quantities discussed above, but would need to be treated to eliminate the Ceratomyxa organism. The availability of additional well water supplies is unknown.

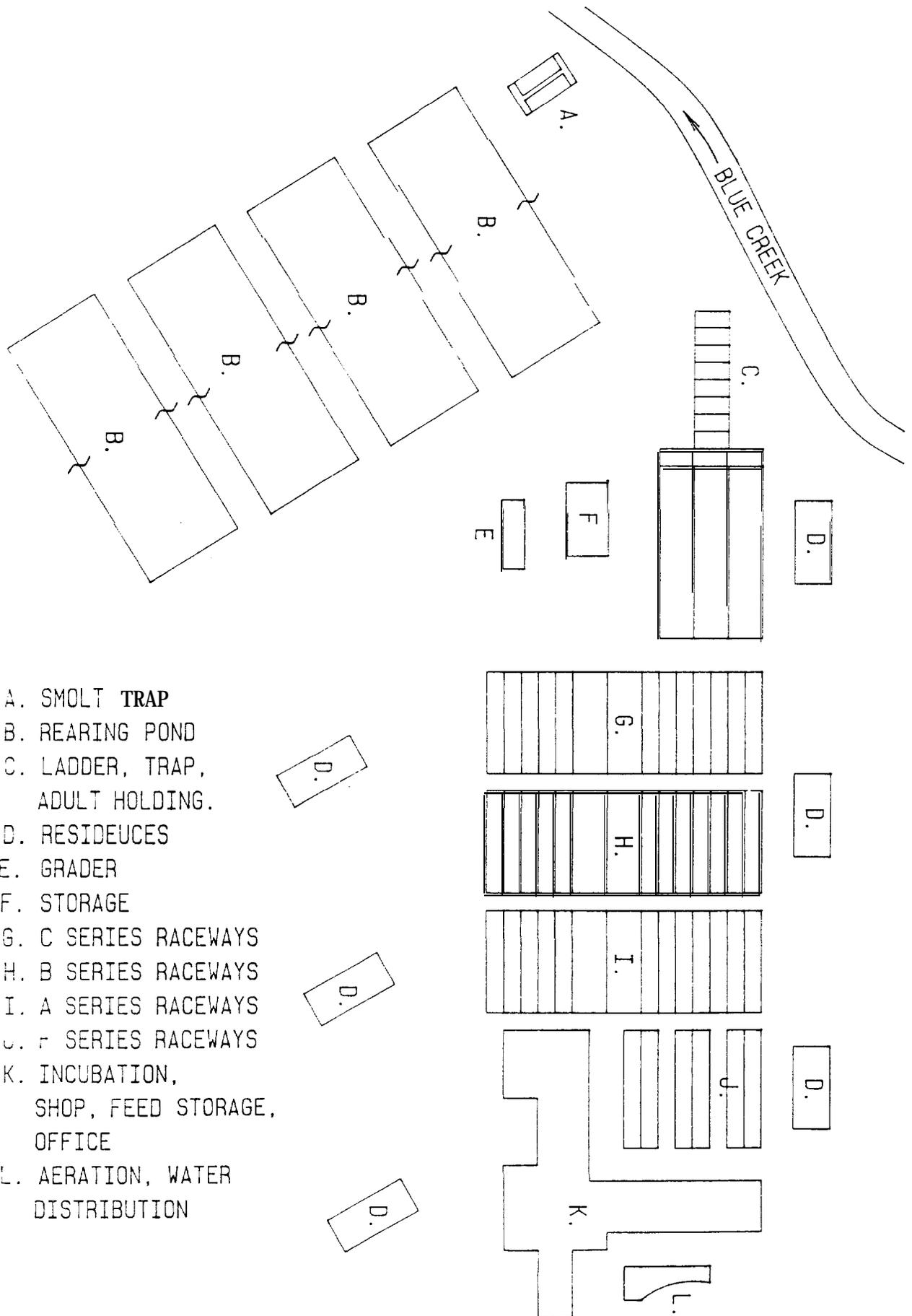
Currently an ozone treatment system is planned at this facility. If it is successful in controlling the Ceratomyxa organism, a remodeling plan could be developed to optimize production. This plan would have to include additional raw river water, additional treated river water, subdivision of the 5 acre ponds, pollution abatement facilities, additional fry starting raceways/troughs, and additional incubation capacity.

The estimated expansion capability is 6,006,000 steelhead or sea-run cutthroat smolts weighing 1,000,000 pounds.

# COWLITZ TROUT HATCHERY EXISTING FACILITIES

COWLITZ RIVER

- A. SMOLT TRAP
- B. REARING POND
- C. LADDER, TRAP, ADULT HOLDING.
- D. RESIDEUCES
- E. GRADER
- F. STORAGE
- G. C SERIES RACEWAYS
- H. B SERIES RACEWAYS
- I. A SERIES RACEWAYS
- J. F SERIES RACEWAYS
- K. INCUBATION, SHOP, FEED STORAGE, OFFICE
- L. AERATION, WATER DISTRIBUTION



**Gobar Pond**  
P.O. Box 188  
Longview, Wa. 98632

Funding Agency: Weyerhaeuser Corp.  
NMFS

Manager: Stan Woody  
Phone #: (206) 795-3620

Species Reared: Summer Steelhead  
Winter **Steelhead**

### Introduction

Gobar Pond is located on Gobar Creek, a tributary of the Kalama River. Elevation of the pond is about 1,000 feet above sea level. The pond began operation in 1975 in cooperation between Weyerhaeuser Corporation and WDF to imprint steelhead to the Kalama River system. The WDF also used the pond during winter months for spring chinook rearing. The pond is staffed with **.25 FTE's**.

The rearing unit is in fair condition and consists of a .93 surface acre pond and 1 smolt trap. The smolt trap is not used for rearing. A normal operating cycle during this evaluation had WDF transferring spring chinook into the pond in the fall. The chinook were reared until February when they were released to make room for steelhead being transferred in by WDF. After steelhead are released in the spring, Weyerhaeuser uses the pond for fire protection water storage in the summer.

The steelhead rearing program calls for 120,000 **smolts** annually. Normally, summer **steelhead** from Skamania Hatchery and winter steelhead from Beaver Creek Hatchery are stocked into the pond in late February in equal numbers. Fish are reared until April or May and either volitionally released or trucked to stocking sites downstream. No adult collection or spawning occurs at this site.

A water right of 3,142 gpm from Gobar Creek is held. This amount of water is supplied to the pond throughout the period steelhead are reared. Little or no water quality information is available for summer and fall months, although on August 9, 1989 about 1,346 gpm was being diverted through the pond and water temperature was 58 degrees fahrenheit.

Single pass water is used in the pond. Water from the pond drains through the smolt trap.

### Current Production Constraints

There are no major constraints with this pond. Pond bottom could be re-shaped to facilitate draining and creek bank needs rip rap to protect intake.

Weyerhaeuser uses pond in summer for fire protection water storage and WDF uses pond in fall and winter months making year round steelhead production impossible.

## Theoretical Production

Theoretical production based on the flow method is 48,132 pounds and with density is 58,320 pounds. Average production was 22,816 pounds and the 1987 and current agency goal is 20,000 pounds. Theoretical calculations were computed for steelhead as follows:

Flow Method  
Steelhead:  $1.91 \times 3,150 \text{ gpm} \times 8" = 48,132 \text{ lbs}$   
Density Method:  $.03 \times 243,000 \text{ cu ft} \times 8" = 58,320 \text{ lbs}$

Comparison between the two theoretical calculations indicates that flow may be the limiting factor in production. This pond is loaded at less than theoretical flow or density calculations. A production increase of an additional 17,000 pounds (100,000 smolts) is feasible within the existing pond according to WDW. This is an earthen pond with vegetation growing along edges. This may reduce production potential and theoretical production based on flow may not be possible.

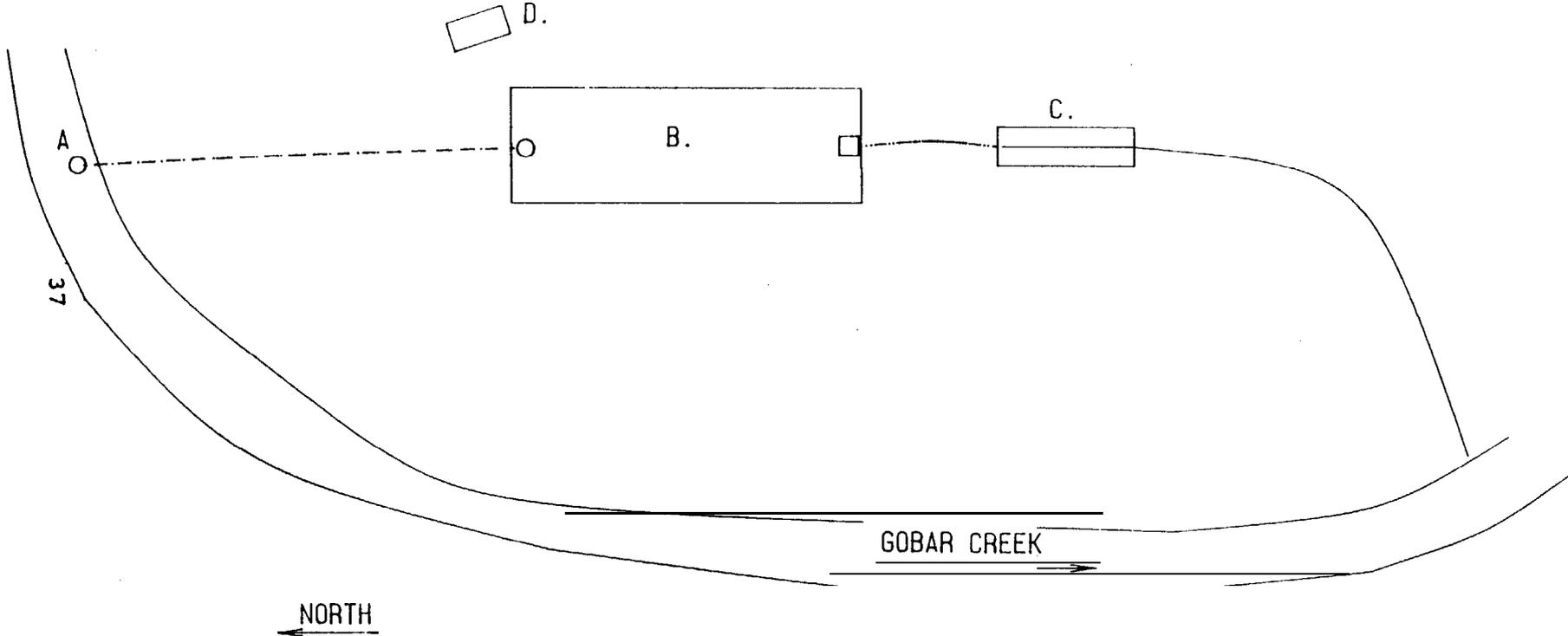
Management goals for the Kalama River system indicate that a winter steelhead production increase of 40,000 smolts (6,667 pounds) is warranted. Sub-basin planning efforts call for an acclimation pond in the lower Kalama River (downstream of Kalama Falls Hatchery) to be constructed to accomplish this production goal.

## Hatchery Expansion Capability

The pond is situated on 8 acres owned by Weyerhaeuser Corporation. Approximately 100% of the usable area is being utilized. There is no room for expansion and the availability of additional water supplies is questionable.

As indicated above, an additional 100,000 steelhead smolts weighing 17,000 pounds could be produced within existing pond space and water.

- A. INTAKE
- B. REARING POND
- C. SMOLT TRAP
- D. FOOD STORAGE



**GOBAR POND  
EXISTING FACILITIES**

Lyons Ferry Trout Hatchery  
P.O. Box 278  
Starbuck, Wa. 99359

Funding Agency: USFWS  
Species Reared: Summer Steelhead  
Resident Trout

Manager: Harold Harty  
Phone #: (509) 646-3454

### Introduction

Lyons Ferry Trout Hatchery is located along the Snake River above Lower Monumental Dam near the town of Starbuck. Elevation of the facility is 526 feet above sea level. This hatchery was constructed by the U.S. Army Corp of Engineers (COE) in 1982 under the Lower Snake River Compensation Program (LSRCP). The COE has granted a **5-year** operating permit to USFWS who in turn provides operating funds through cooperative agreement to WDW. A separate hatchery operated by WDF is also located at this site. The hatchery is staffed with 6.5 FTE's.

Four satellite facilities are operated as part of the Lyons Ferry Hatchery complex and include Tucannon Hatchery, Curl Lake, Cottonwood Pond, and Dayton Pond. Each of the satellite sites is reported on in separate sections of this report.

The hatchery consists of a main hatchery building, 19 raceways, 3 large rearing ponds (2 surface acres each), adult holding and spawning facilities, 5 residences and water supply facilities (which are shared with the WDF hatchery). All rearing units are in good to excellent condition. Steelhead are reared in the large rearing ponds and resident trout in raceways. Only the steelhead production has been summarized in this report.

Wallowa stock steelhead are reared. They were originally obtained from ODFW's Wallowa Hatchery located on the Grande Ronde River system in Oregon. Eggs are now taken from returning adults and received from Oregon only to make up shortfalls. Wells stock has also been reared but this program has been phased out. Steelhead smolts are planted into various southeast Washington streams. They are also transferred to the 4 satellite acclimation sites 4 to 6 weeks prior to release.

Water rights total 53,200 gpm from wells. This water right is held jointly for used by both WDW and WDF. Two well fields are in production: the first consists of 6 wells (27,000 gpm water right) and the second consists of 3 wells (26,200 gpm water right). A constant 22,100 gpm is available for use by WDW. An additional 27,000 gpm is used by WDF.

Single pass water is normally used in rearing units. In an emergency it is possible to re-use water through rearing ponds and adult ponds.

### Current Production Constraints

Hatchery was not designed for evaluation studies and require handling pre-smolts in rearing ponds. The evaluation study is driving program at present. Additional raceways are needed to accommodate tagging/branding programs.

Water, supplied through the supplemental aeration tower to hatchery building is inadequate. A larger pump is needed to allow all facilities to be operated at capacity.

Additional water is needed to balance with rearing space. Increased production would be possible in existing facilities given additional water.

Current program is set by mitigation levels.

### Theoretical Production

Theoretical production for steelhead in the 3 large rearing ponds based on the flow method is 279,534 pounds and based on density is 444,960 pounds. For the entire hatchery the theoretical production is 468,530 pounds (flow method) and 598,076 pounds (density method). Summary Table 12 lists only the **steelhead** poundage, Average production was 151,930 pounds (does not include 49,329 pounds of resident trout) and the 1987 agency goal was 137,015 pounds of steelhead. The current agency goal is 116,400 pounds of steelhead. Approximately 35% to 60% of steelhead production at this facility was transferred to satellite sites in February or March for final rearing and acclimation. Theoretical calculations were computed as follows:

#### Flow Method

Steelhead:	2.59 X 4,497 gpm X 8" X 3 ponds	= 279,534 lbs
Rainbow:	1.64 X 648.7 gpm X 9.35" X 19 raceways	= <u>188,996 lbs</u>
		468,534 lbs

#### Density Method

Steelhead:	.03 X 618,000 cu ft X 8" X 3 ponds	= 444,960 lbs
Rainbow:	.3 X 2,873 cu ft X 9.35" X 19 raceways	= <u>153,116 lbs</u>
		598,076 lbs

Comparison of the 2 theoretical calculations indicates that flow may be the limiting factor in production. This is true only for the 3 large rearing ponds, as production in raceways rearing rainbow trout appear to be limited by space. According to WDW, the 3 rearing ponds could rear up to the theoretical flow calculation with no additional water or pond space. This would total an additional 918,000 steelhead **smolts** weighing 153,000 pounds with existing water supply and space.

Theoretical production based on density is not achievable even with sufficient water to balance flow with rearing space. Large rearing ponds do not permit maximum loading based on density.

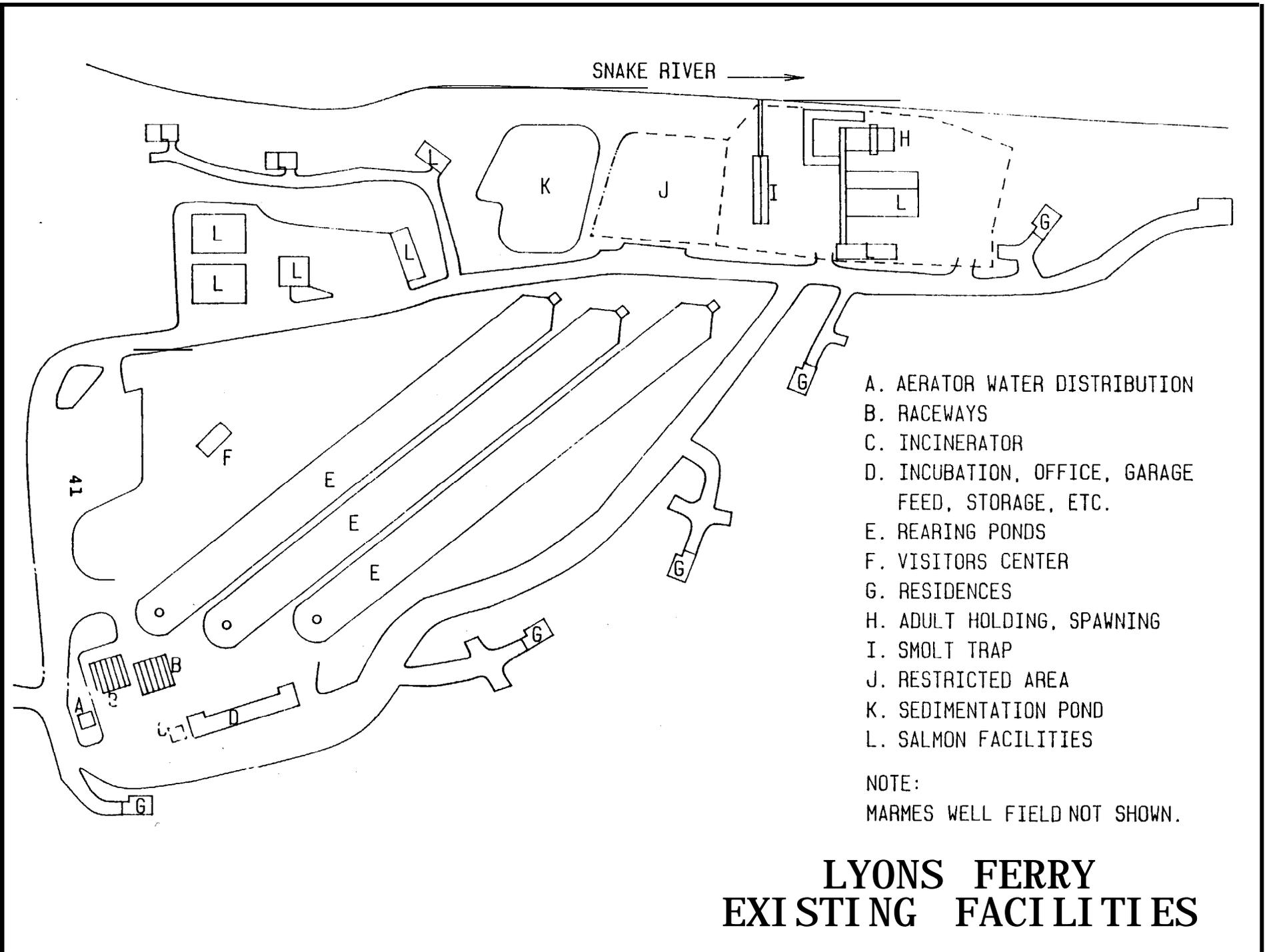
Theoretical production for the raceways based on flow is 189,000 pounds and with density is 153,116 pounds. All 19 raceways can not be used for rainbow production as some are needed to pond fry and hold **steelhead** for marking. Theoretical production in raceways based on density is about 30% greater than the practical loading rate according to WDW. The raceways are designed to meet mitigation goals for resident trout. Steelhead to be marked are held in these raceways which reduces trout production.

### Hatchery Expansion Capability

The hatchery is situated on 101.19 acres owned by the COE. Approximately 35% of the area is currently in use for fish culture. This includes the WDF facility also. A large area is available for expansion between the state park and hatchery. Snake River water in unlimited quantities is available, but temperature, disease, and other water quality problems eliminate this supply for hatchery use. Additional well water would be required for any expansion.. The amount of additional well water available is unknown.

There is room to construct additional raceways and rearing pond. No construction costs or production potential is possible until potential for water is evaluated. If additional water were supplied to existing rearing ponds production should also be able to be increased.

The WDW indicated that production should be able to be increased by an additional 918,000 steelhead smolts weighing 153,000 pounds in the existing rearing ponds. Additional raceways are needed to hold marked steelhead for evaluation studies.



Cottonwood Pond  
C/O Lyons Ferry Hatchery  
P.O. Box 278  
Starbuck, Wa. 99359

Funding Agency: USFWS  
Species Reared: Summer Steelhead

Manager: Harold (Butch) Harty  
Phone #: (509) 646-3454

### Introduction

This facility is located on the Grande Ronde River near the town of Asotin. Elevation is 1,290 feet above sea level. It is operated as a satellite of Lyons Ferry Hatchery and is used as an imprint and acclimation pond for **Wallowa** stock summer steelhead in the Washington portion of the Grande Ronde River. The acclimation pond was constructed and began operation in 1984 as part of the LSRCP. The facility is normally operated from late February to May with about .25 FTE's.

The 1.25 surface acre pond has approximately 380,000 cubic feet of rearing area. It is in excellent condition.

No adults are collected nor is there any incubation capability at this facility. **Pre-smolt** steelhead are transferred in from Lyons Ferry Hatchery in late February or early March and held until ready for release in April and May. The pond is not utilized during the remainder of the year. Smolts are **volitionally** released from the pond.

The water right for fish propagation totals 2,693 gpm from Cottonwood Creek. An additional 20 gpm of well water is also held for domestic use. The water right is only good for the period January 1 to July 1 annually. Water is delivered by gravity flow and ranges from 2,693 gpm in March to 1,795 gpm in May. Water is used only once through the pond. Water temperature ranges from 43 to 53 degrees fahrenheit for the months of February to May. There is little data on water quality and quantity for the period pond is not operating. On July 12, 1989 the water temperature was 60 degrees fahrenheit. It is doubtful that this pond would be usable during summer or winter months due to water temperature and flow constraints.

### Current Production Constraints

Production at this pond relies on adequate adult returns and egg takes from **Wallowa** Hatchery. When egg shortfalls occur at **Wallowa** Hatchery it means a reduction in production. Shortfalls occurred in 1989. A means of collecting and holding adults and incubating eggs to the eyed stage at this site could alleviate shortages which can be expected to occur occasionally.

This facility is capable of rearing an additional 200,000 smolts weighing 34,000 pounds over existing production. If the goal was maximum production then flow would be the limiting factor.

### Theoretical Production

Theoretical production based on the flow method is 50,580 pounds and with density is 91,200 pounds. Average production was 29,121 pounds and the 1987 agency goal was 33,333 pounds. Production increased each year of this evaluation. Theoretical calculations were computed for steelhead as follows:

Flow Method

$$2.81 \times 2,250 \text{ gpm} \times 8" = 50,580 \text{ lbs}$$

Density Method

$$.03 \times 380,000 \text{ cu ft} \times 8" = 91,200 \text{ lbs}$$

Comparison of the 2 theoretical calculations indicates that flow is probably the limiting factor at this site. Production appears to be set by management objectives. As indicated above this rearing pond is capable of acclimating an additional 34,000 pounds of steelhead smolts during February to May.

### Hatchery Expansion Capability

The acclimation pond is situated on 8.71 acres owned by the COE. The site is considered to be 100% in use and no expansion is feasible. Even if expansion was possible, there is no known water supply for additional ponds. Cottonwood Creek does not have sufficient flow to supply the existing pond to production capacity. The potential for water from wells is unknown.

Although it would not increase production at this site, an adult collection and egg incubation facility would alleviate program shortfalls which will occasionally occur at **Wallowa** Hatchery. Trapping and incubation facilities for 300 adults and 500,000 eggs could be developed adjacent to diversion structure. With the existing water right, adults could not be collected prior to January 1 or eggs incubated past the end of June. Adults are spawned at **Wallowa** hatchery in April and May and should be similar at this site. Construction of an adult holding pond, incubation facilities, and plumbing the existing water supply would be required. No additional smolts would be produced, but shortfalls caused by lack of eggs from **Wallowa** Hatchery would be prevented.

According to WDW, this pond is capable of acclimating an additional 200,000 steelhead smolts weighing 34,000 pounds during the spring. To allow this increase may require expansion of early rearing facilities at Lyons Ferry Trout Hatchery.

NORTH

COTTONWOOD CREEK

GRAND RONDE RIVER

- A. STORAGE BLDG.
- B. TRAILER PAD
- C. IMPRINT POND
- D. DIVERSION STRUETURE

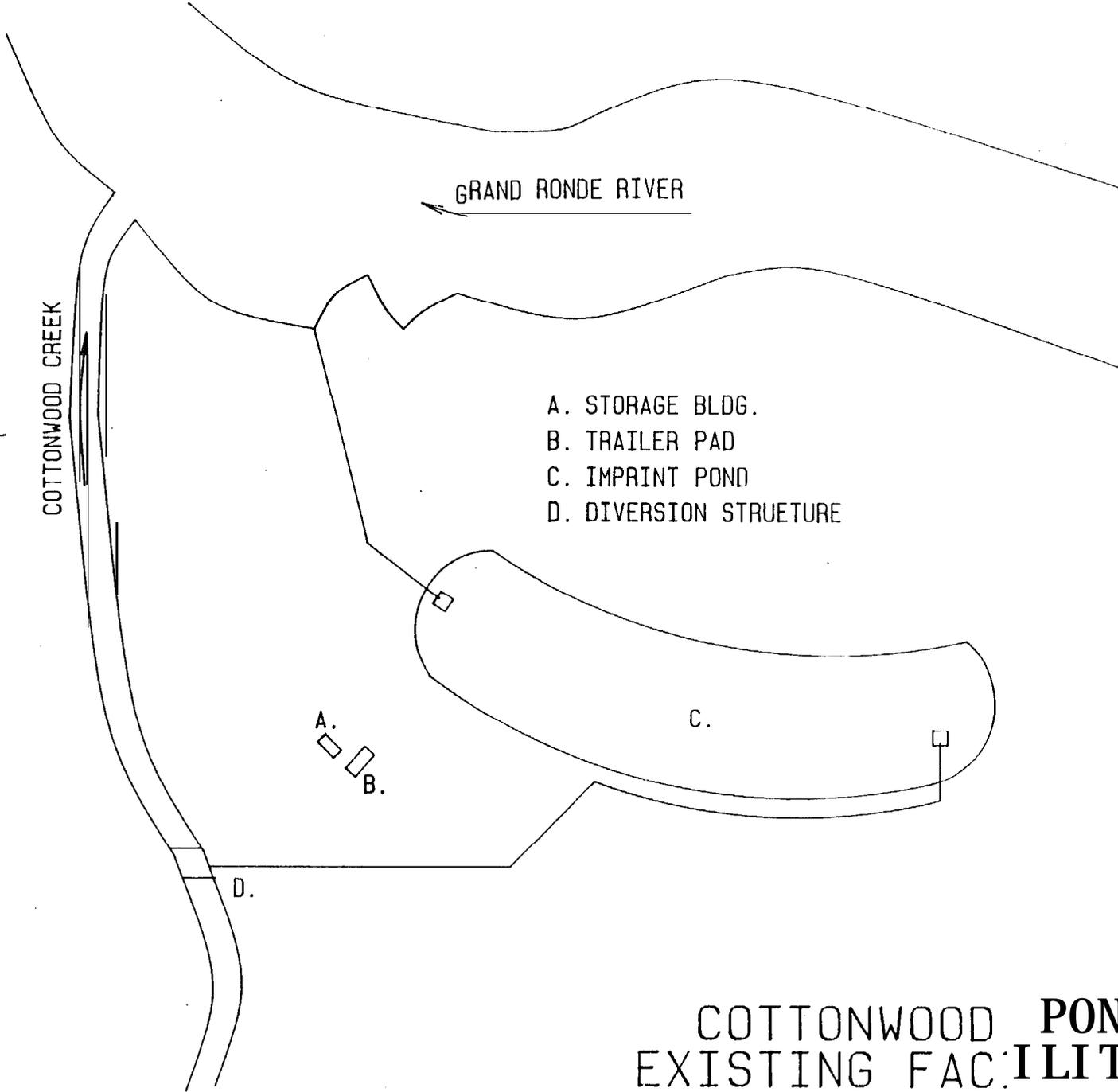
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A. B.

C.

D.

COTTONWOOD POND  
EXISTING FACILITIES



NORTH

COTTONWOOD CREEK

GRAND RONDE RIVER

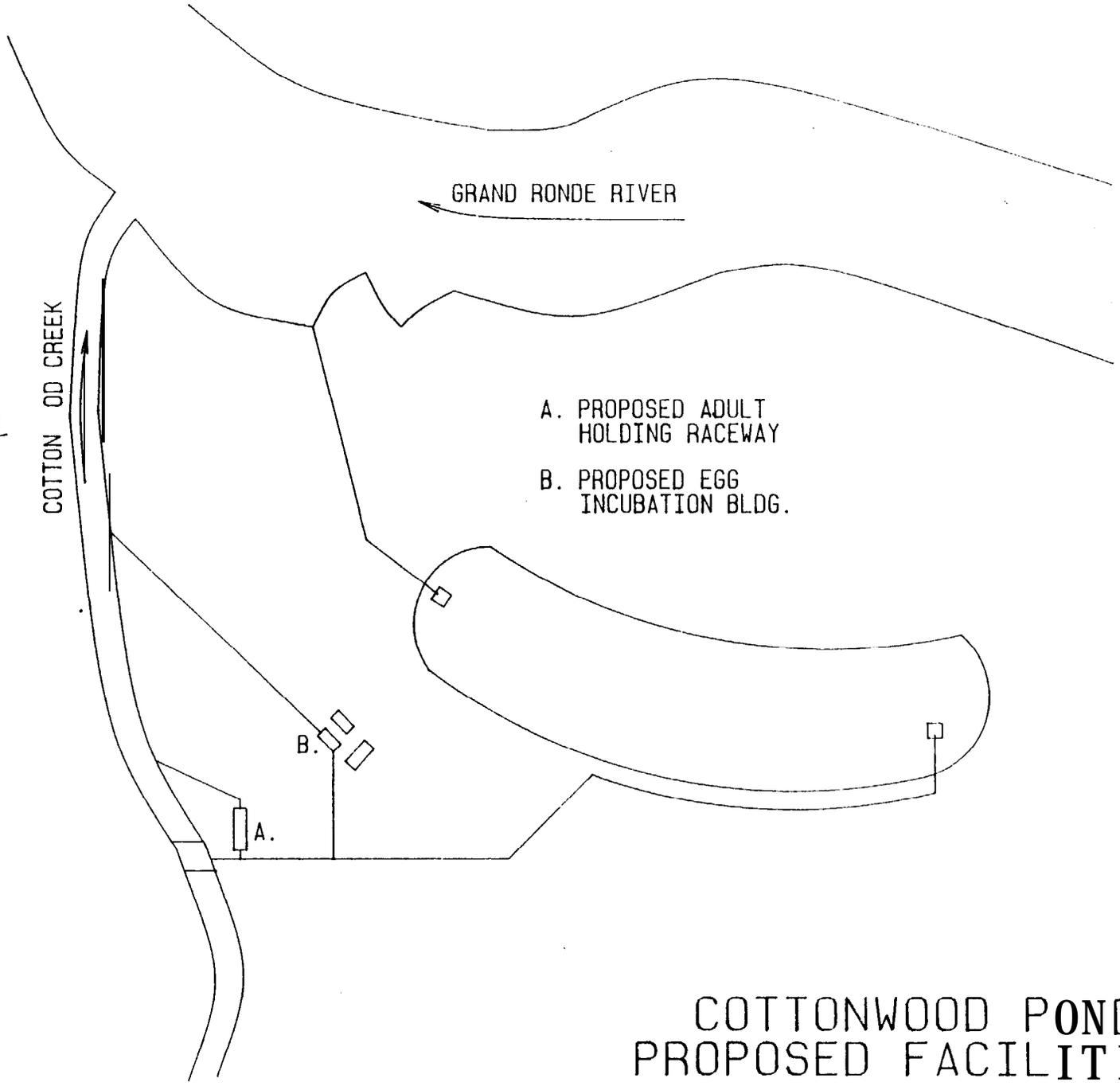
A. PROPOSED ADULT HOLDING RACEWAY

B. PROPOSED EGG INCUBATION BLDG.

B.

A.

# COTTONWOOD POND PROPOSED FACILITIES



Tucannon Hatchery  
Route 1, Box 32  
Pomeroy, Wa. 99347

Funding Agency: USFWS, WDW  
Species Reared: Resident Trout  
Spring Chinook

Manager: Bill Hubbard  
Phone #: (509) 843-1430

### Introduction

The Tucannon Hatchery is located on the Tucannon River near the town of Pomeroy. Elevation of the site is 2,160 feet above sea level. The hatchery began operation in 1949 after construction with state license dollars. In the early 1980's, the facility was turned over to the COE to be redeveloped for trout production under the LSRCF and is now operated as a satellite of Lyons Ferry Trout Hatchery. Nearly all production is resident trout with only a small amount of spring chinook produced. Spring chinook production is reported on in the WDF report, Lyons Ferry Hatchery section. The hatchery is staffed with 2.3 FTE's.

The rearing units are in good condition and consist of 40 troughs, 1 adult holding/rearing pond, 2 collection raceways, 6 circular ponds of 40 foot diameter, and a 1.25 acre rearing pond. The adult holding/rearing pond is the only facility used for anadromous fish (spring chinook) production. The hatchery is designed to produce 41,000 pounds of resident trout and 8,800 pounds of spring chinook.

Adult spring chinook are trapped and spawned here. Eggs are transferred to Lyons Ferry Salmon Hatchery where they are fertilized and incubated. Fry are **ponded** at Lyons Ferry Salmon Hatchery and usually in late November of the year following spawning are transferred back to Tucannon Hatchery for final rearing, acclimation, and release. Spring chinook releases are credited to and reported by the Lyons Ferry Salmon Hatchery, operated by WDF.

Trout eggs are shipped in from other WDW hatcheries, incubated, and reared. This report does not summarize in detail the resident trout production.

Disease problems in chinook have included bacterial kidney disease (BKD) and erythrocytic inclusion body syndrome (EIBS). Trout have had problems with Ich and IHN.

The water right totals 9,203 gpm from 3 sources; the Tucannon River (7,181 gpm), springs (1,122 gpm), and wells (900 gpm). The adult holding/rearing pond used for rearing spring chinook utilizes 2,244 gpm and the remaining water is used for trout production. The spring chinook pond uses single pass water while the trout ponds can re-use water.

### Current Production Constraints

Circular rearing ponds used for trout are constrained by available water. The rearing pond shape is not ideal and constrains use at maximum density.

Production is fixed by mitigation program.

It is suspected that IHN is entering the hatchery in the river water.

### Theoretical Production

Theoretical production for the resident trout rearing ponds based on the flow method is 48,134 pounds and based on density is 134,225 pounds and does not include the spring chinook pond. Average trout production was about 51,000 pounds and the agency goal was 45,700 pounds. Theoretical production, average production, and agency goal for spring chinook is reported on under the Lyons Ferry Salmon Hatchery section of the WDF report. Theoretical calculations were computed for trout as follows:

#### Flow Method

Rearing Pond:	1.67 X 2,200 gpm X 9.35" =	34,352 lbs
Circular Ponds:	1.34 X 1,100 gpm X 9.35" X =	<u>13,782 lbs</u>
(6 ponds)		48,134 lbs

#### Density Method

Rearing Pond:	.03 X 318,920 cu ft X 9.35" =	89,457 lbs
Circular Ponds:	.3 X 2,660 cu ft X 9.35 X 6 ponds =	<u>44,768 lbs</u>
		134,225 lbs

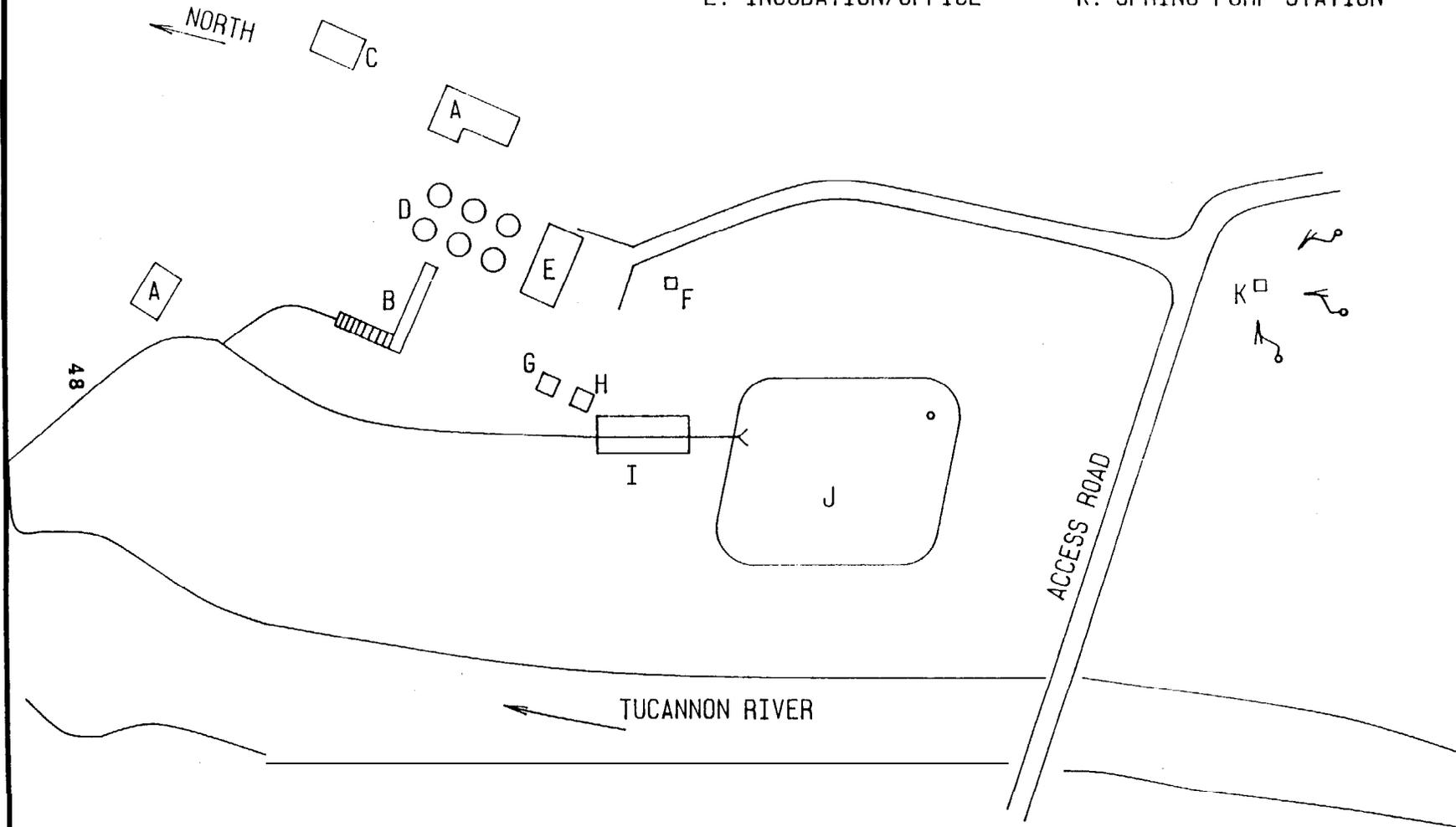
Comparison of the 2 theoretical calculations indicates that flow is the limiting factor in production. The trout program is well balanced with current water supply. Trout production is at capacity based on available flow to ponds.

### Hatchery Expansion Capability

This hatchery is situated on 31.3 acres owned by the COE. Approximately 80% is currently being used for fish culture. The remaining area is suitable for hatchery expansion. Additional water would be needed for expansion to occur. There should be additional water available from the Tucannon River. The availability of a water right is unknown. The potential for developing water from wells is unknown.

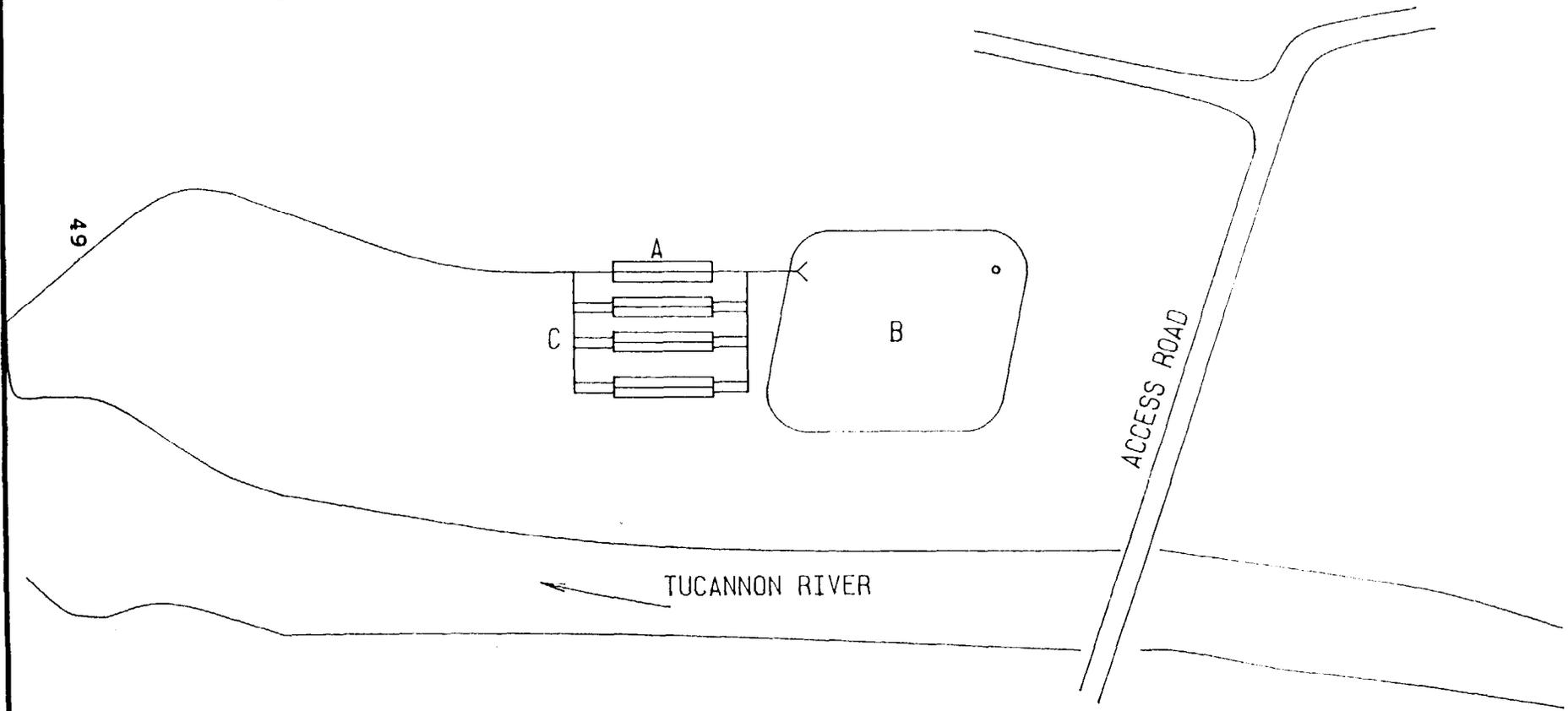
If adequate water supplies are available there is room to construct six 10' x 90' raceways. Approximately 170,000 steelhead smolts weighing 28,500 pounds could be produced.

- |  |                        |
|--|------------------------|
| A. RESIDENCES                                  | F. AERATER             |
| B. ADULT HOLDING/LADDER/<br>SMOLT IMPRINT R.W. | G. FEED STORAGE        |
| C. GARAGE/SHOP                                 | H. GENERATOR           |
| D. CIRCULAR PONDS                              | I. COLLECTION RACEWAYS |
| E. INCUBATION/OFFICE                           | J. REARING POND        |
|  | K. SPRING PUMP STATION |



**TUCANNON HATCHERY  
EXISTING FACILITIES**

- A. EXISTING COLLECTION RACEWAY
- B. EXISTING REARING POND
- C. PROPOSED RACEWAYS



TUCANNON HATCHERY  
PROPOSED FACILITIES

Curl Lake  
Lyons Ferry Trout Hatchery  
P.O. Box 278  
Starbuck, Wa. 99359

Funding Agency: USFWS  
Species Reared: Summer **Steelhead**

Manager: Harold Harty  
Phone #: (509) 646-3454

### Introduction

Curl Lake is located on the Tucannon River near the town of Pomeroy. Elevation of the facility is 2,560 feet above sea level. The acclimation facility is technically a satellite of the Lyons Ferry Trout Hatchery, but is operated by personnel from Tucannon Hatchery. Curl Lake was redeveloped under the LSRCP in 1984 as a **steelhead** acclimation pond from a pond originally developed for recreational trout fishing. It is still used for that purpose after the steelhead **smolts** migrate from the pond.

The 2.8 surface acre lake is in excellent condition. There are no adult collection or spawning facilities.

Fish are transferred into Curl Lake in late February or March from Lyons Ferry Trout Hatchery. Fish are reared and acclimated until **volitionally** released in April or May. During summer months the lake is stocked with catchable trout and used for recreational fishing.

The water right totals 2,693 gpm from the Tucannon River. Water is delivered by gravity flow and there is a constant 4,488 gpm available during months steelhead are in the lake. Flow and temperature data in Summary Tables only include the February to May period when steelhead are reared.

### Current Production Constraints

The present mitigation program for the Tucannon River is setting the production level. Additional pounds could be produced with existing pond space and flow.

If the production goal was to maximize pounds then available flow would be the limiting factor.

Pond can not be used in winter because it freezes over.

### Theoretical Production

Theoretical production based on the flow method is 62,640 pounds and with density is 168,000 pounds. Average production was 27,078 pounds and the 1987 agency goal was 26,667 pounds. Theoretical

calculations were computed for steelhead as follows:

Flow Method  
 $2.90 \times 2,700 \text{ gpm} \times 8" = 62,640 \text{ lbs}$

Density Method  
 $.03 \times 700,000 \text{ cu ft} \times 8" = 168,000 \text{ lbs}$

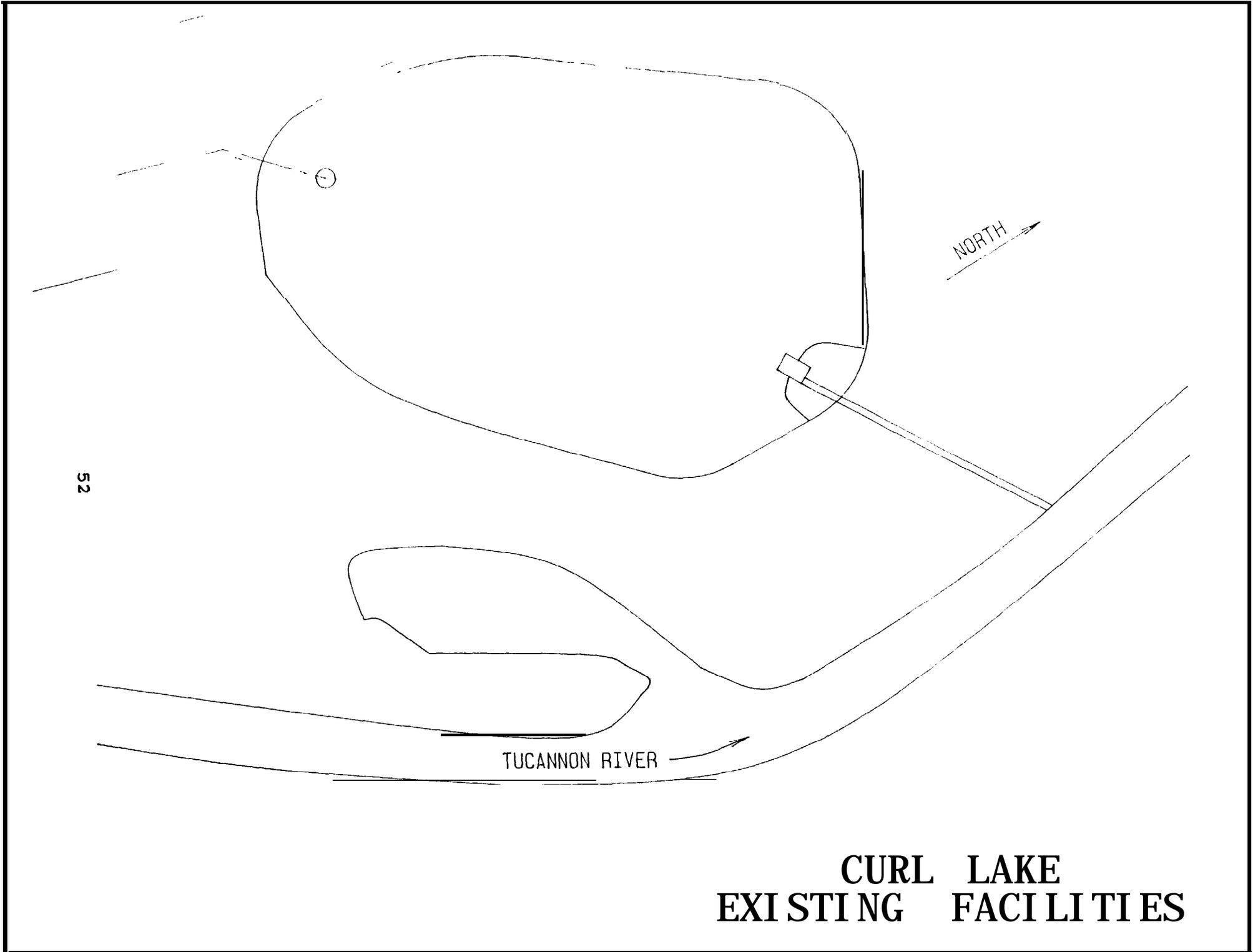
Comparison of the 2 theoretical calculations indicates that flow is the limiting factor in production. As indicated above, the present mitigation program is setting production levels. This facility could produce additional smolts within the existing pond and flow. However, the river system is small and the smolt production goal is about right for it. If production was increased then a trapping facility would be needed to **outplant** fish.

Production is not possible based on the calculated density method even if sufficient water were available to balance with pond space. Large ponds are not as efficient as raceways or small ponds in utilizing the entire rearing area.

#### Hatchery Expansion Capability

Curl Lake is situated on 6.03 acres owned by the COE. The area is 100% in use. There is no room to expand production facilities. Additional water is not available from the Tucannon River. The potential for providing water from a well field is unknown.

No expansion capability was identified by WDW.



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NORTH

TUCANNON RIVER

**CURL LAKE  
EXISTING FACILITIES**

Dayton Pond  
Lyons Ferry Trout Hatchery  
P.O. Box 278  
Starbuck, Wa. 99359

Funding Agency: USFWS  
Species Reared: Summer Steelhead

### Introduction

Dayton Pond is located on the **Touchet** River in the town of Dayton. Elevation of the pond is 1,616 feet above sea level. The pond began operation in 1987 under the LSRCP as an imprint and acclimation facility. It is operated as a satellite of the Lyons Ferry Trout Hatchery and is staffed with **.25 FTE's**.

The acclimation facility is in excellent condition and consists of a **.8-acre** pond. No adult collection or egg taking facilities are **present**.

Summer steelhead pre-smolts are transferred in from Lyons Ferry Trout Hatchery in late February or March. Fish are reared and acclimated until **volitionally** release in April and May.

The water right totals 2,693 gpm from the **Touchet** River. The water right is only good for the period January 1 through May 15. Water is delivered by gravity flow and actual pond use **equals** the water right.

### Current Production Constraints

The water right currently held does not allow year round rearing.

### Theoretical Production

Theoretical production based on the flow method is 57,240 pounds and with density is 50,160 pounds. The 1987 production was 26,294 pounds and the 1987 agency goal was 22,778 pounds. The first year of releases from this pond was 1987. The agency goal has recently increased to 150,000 to 170,000 smolts (30,000 to 34,000 pounds). The theoretical calculations were computed for steelhead as follows:

Flow Method  
 $2.65 \times 2,700 \text{ gpm} \times 8" = 57,240 \text{ lbs}$

Density Method  
 $.03 \times 209,000 \text{ cu ft} \times 8" = 50,160 \text{ lbs}$

Comparison of the 2 theoretical calculations indicates that pond

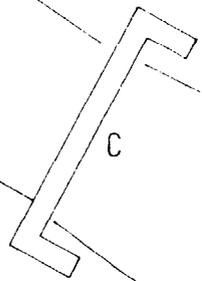
space may be the limiting factor in production. Production in 1987 was not at capacity. The current agency goal of 34,000 pounds is considered by WDW to be in balance with pond space to produce high quality smolts.

#### Hatchery Expansion Capability

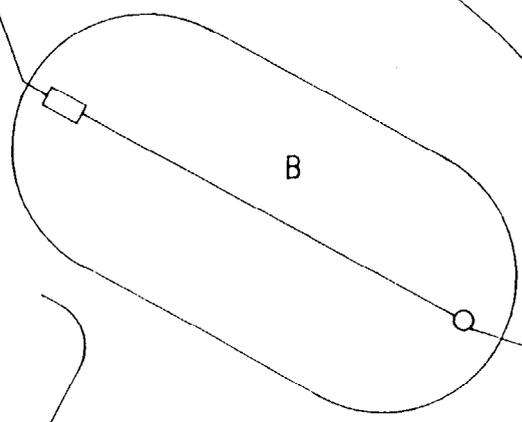
The acclimation pond is situated on 7.13 acres. There is no room for expansion. There is additional water from the **Touchet** River, the availability of a water right is not known. The potential for water from **wells** is not known.

No expansion capability is identified.

SS  
NORTH



- A. STORAGE BUILDING
- B. ASPHALT POND
- C. FOOT BRIDGE TO PARK



TOUCHET RIVER



# DAYTON POND EXISTING FACILITIES

Naches Hatchery  
3410 South Naches Road  
Naches, Wa 98937

Funding Agency: WDW

Species Reared: Resident Fish  
Summer Steelhead

Manager: Tim Huwe  
Phone #: (509) 575-2738

### Introduction

Naches Hatchery is located in the Yakima River Basin near the town of Yakima. Elevation of the hatchery is 1,500 feet above sea level. It is an aging facility in a varying state of disrepair. This state owned and operated facility first began operation in 1922 and is staffed with 2.2 **FTE's**.

Most of the facility is in poor condition and in need of major rehabilitation or replacement. Only the recently installed pumped water supply system and hatchery building are in good condition. The rearing units consist of 3 upper and 5 lower serial raceways of varying sizes, 6 intermediate raceways, 3 raceways, and separate serial raceways which are currently not usable. Steelhead production has been confined to the 3 raceways and 6 intermediate raceways. Resident fish have been reared in the remaining rearing facilities.

Steelhead make up a small percentage of production and are not normally reared to smolt size at this facility. They are reared to about 20 fish per pound and then transferred to Nelson Springs Raceway for final rearing by the Yakima Chapter of Trout Unlimited (YCTU). Summer steelhead have also been started for **Ringold** Trout Pond but are not reared to as large a size. Resident trout are the primary species reared.

There are no adult anadromous collection or spawning at this hatchery. Fingerlings or eggs are usually transferred in from other hatcheries. No smolt releases occurred during this evaluation. Parasitic, bacterial, and environmental diseases have caused problems, but to date no viral diseases have occurred.

Water rights dating back to 1949 total 4,223 gpm. The spring supply (2,423 gpm of water right), originally an excellent water source has dwindled essentially to nothing due to changes in the irrigation system above the hatchery. Water supplied from the infiltration trench and sump must be pumped and ranges from 1,000 gpm to 1,800 gpm with the highest flow being available when Bumping and **Rimrock** Reservoirs are releasing water. This is all the water currently available for fish culture.

Water is re-used extensively on this station. Water is re-used in the tandem hatchery troughs and then through all serial raceways. Raceways also receive re-used water and the concrete raceway drain to the 5th serial raceway. In all, water can be used up to 6 times

on this station.

### Current Production Constraints

Available water is limiting production at this station. Springs account for over 50% of the water right and are not supplying any water. The present delivery system will not allow use of infiltration trench water in the hatchery building.

Production potential in serial raceways is reduced by use of re-use water.

There are no suitable adult holding facilities.

Kokanee do not do well in this water supply.

Emergency use of irrigation water from nearby ditch has brought in pathogens in the past.

### Theoretical Production

Theoretical production for the entire hatchery based on the flow method is 31,979 pounds and with density is 67,695 pounds. Average production for the entire hatchery was 34,104 pounds and the agency goal was 44,250 pounds.

Theoretical production for raceways rearing steelhead (included in above numbers) based on flow was 5,485 pounds and with density is 3,005 pounds. Average steelhead production was 7,349 pounds and the 1987 agency goal was 5,250 pounds. Theoretical calculations were computed as follows:

#### Flow Method

##### Steelhead:

3 raceways: 1.52 X 390 gpm X 5.23" = 3,100 lbs

6 intermediates: 1.52 X 300 gpm X 5.23" = 2,385 lbs

##### Rainbow:

3 upper serials: 1.52 X 500 gpm X 8.3" = 6,308 lbs \*

5 lower serials: 1.52 X 1,600 gpm X 8.3" = 20,186 lbs \*

31,979 lbs

#### Density Method

##### Steelhead:

3 raceways: .25 X 1,518 cu ft X 5.23" = 1,985 lbs

6 intermediates: .25 X 780 cu ft X 5.23" = 1,020 lbs

##### Rainbow

3 upper serials: .3 X 3,480 cu ft X 8.3" = 8,665 lbs \*

6 lower serials: .3 X 22,500 cu ft X 8.3" = 56,025 lbs \*

67,695 lbs

\* Note: Utilizes re-use water. Normal practice is to reduce

## fish loading's.

Comparison of the 2 theoretical calculations indicates that flow is **probably** the limiting factor in production. Flow calculations were computed with water being re-used up to 3 times, so water restraints are even greater than the numbers above would **indicate**. Production is at capacity based on available flow. The agency goal appears to expect more production than is capable of occurring from serial re-use raceways. Average production is well balanced with available flow.

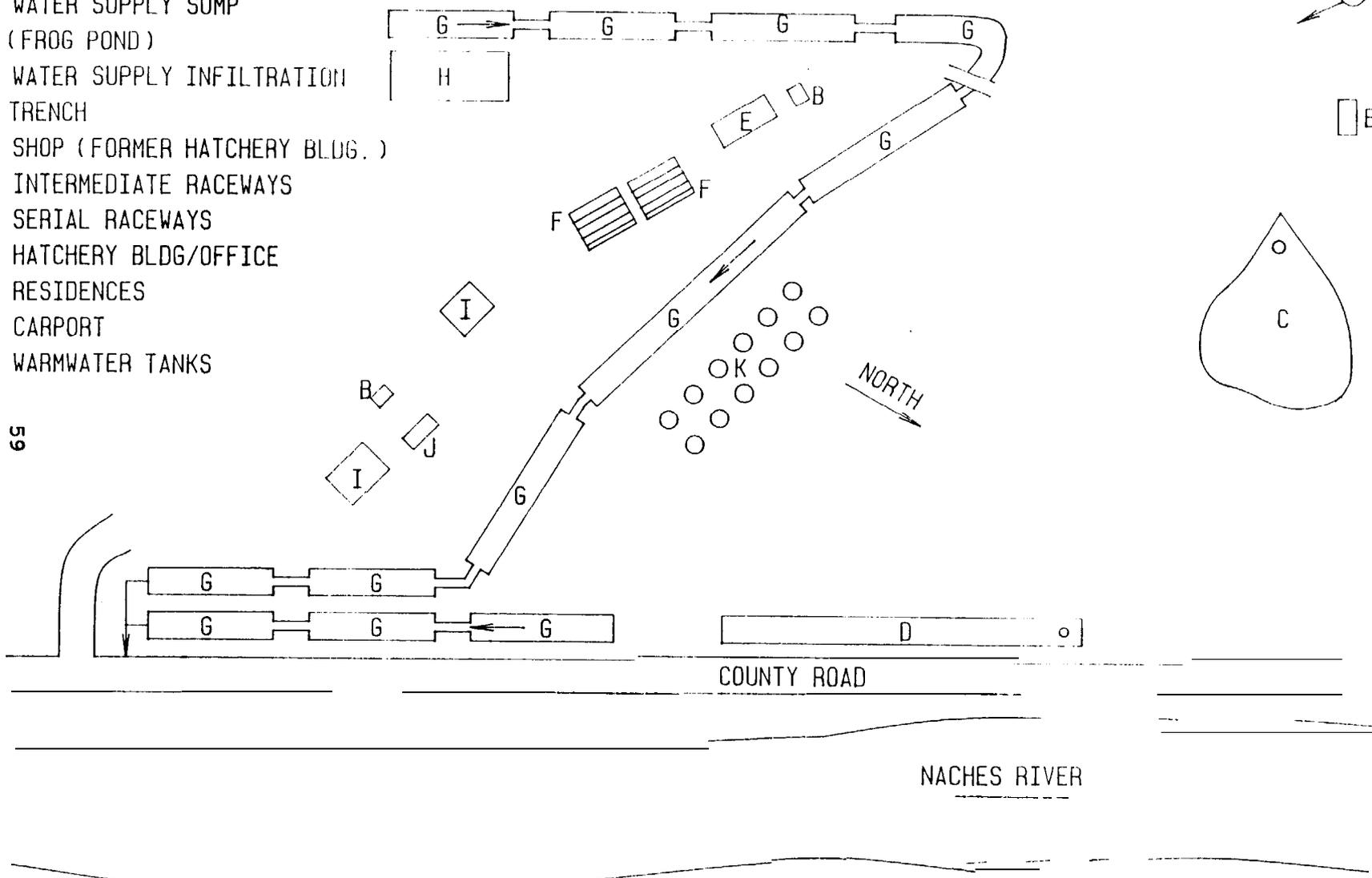
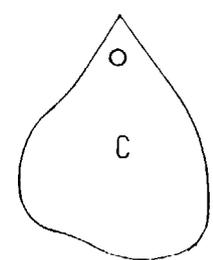
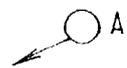
### Hatchery Expansion Capability

The hatchery is situated on 46 acres owned by WDW. Approximately 60% of the land is in use. The remaining property has several acres of flat land suitable for hatchery expansion. Approximately 800 gpm of additional water should be available from another infiltration trench. The potential for water from wells is not known.

Construction of a 2 pass system of 10 raceways to replace all existing rearing units is planned for 1990 by the state. Also planned is construction of an infiltration **gallery** to **supply** additional water **and a 40,000** cubic foot rearing pond. **This** replacement will allow production to be maintained at current levels.

No expansion capability is identified.

- A. SPRINGS
- B. STORAGE BLDGS.
- C. WATER SUPPLY SUMP (FROG POND)
- D. WATER SUPPLY INFILTRATION TRENCH
- E. SHOP (FORMER HATCHERY BLDG.)
- F. INTERMEDIATE RACEWAYS
- G. SERIAL RACEWAYS
- H. HATCHERY BLDG/OFFICE
- I. RESIDENCES
- J. CARPORT
- K. WARMWATER TANKS



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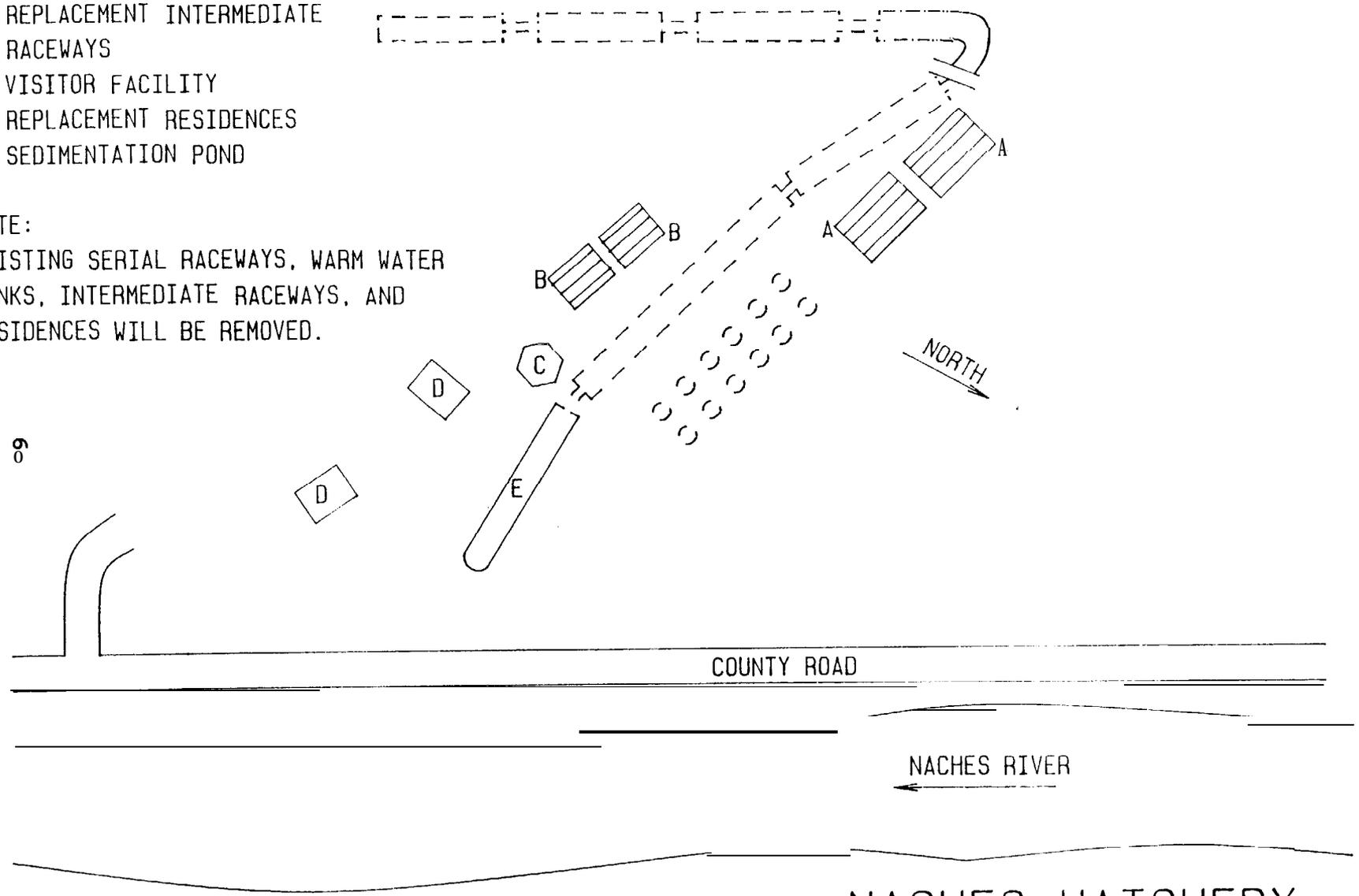
COUNTY ROAD

NACHES RIVER

**NACHES HATCHERY  
EXISTING FACILITIES**

- A. STANDARD RACEWAYS  
4 UPPER, 4 LOWER
- B. REPLACEMENT INTERMEDIATE  
RACEWAYS
- C. VISITOR FACILITY
- D. REPLACEMENT RESIDENCES
- E. SEDIMENTATION POND

NOTE:  
EXISTING SERIAL RACEWAYS, WARM WATER  
TANKS, INTERMEDIATE RACEWAYS, AND  
RESIDENCES WILL BE REMOVED.



# NACHES HATCHERY PROPOSED FACILITIES

Nelson Springs Raceway  
P.O. Box-10342  
Yakima, Wa. 98902

Funding Agency: YCTU, WDW  
Species Reared: Summer **Steelhead**

Manager: Glenn R. Miller (YCTU)  
Tim Huwe (WDW)  
Phone #: (509) 697-3468

### Introduction

Nelson Springs is located adjacent to the **Naches** River approximately 2 miles upstream from the confluence with the Yakima River. The site is leased by the YCTU from the adjacent golf course. Elevation of the site is approximately 1,200 feet above sea level. The raceway began operation in 1958 and is staffed with volunteers. Technical assistance is provided by **Naches** Hatchery personnel.

The single long raceway consists of wood sides and a dirt bottom and can be divided into separate rearing sections. Summer steelhead are usually transferred in from **Naches** Hatchery in December at about 20 fish per pound. The fish are reared until release in April at about 6 fish per pound. Various stocks have been used at this site including Yakima, **Ringold**, and **Skamania**. No adults are collected or spawned although a crude trap exists.

The water right totals 3,591 gpm from an unnamed stream and is held by Yakima County. Actual flow measurement into the raceway is not available but is estimated to average 2,244 gpm. Additional spring water is available on-site and is being considered for use under the **Yakima/Klickitat** Restoration Plan.

### Current Production Constraints

Rearing space is the limiting factor at this site. Sufficient water is available to rear additional pounds but there is not the pond space. Water temperature in the spring supply is borderline (to warm) for good smoltification.

Land the raceway is located on is controlled by YCTU by lease from land owner. The water right is held by Yakima County.

### Theoretical Production

Theoretical production based on the flow method is 27,720 pounds and based on density is 11,634 pounds. Production averaged 14,748 pounds and the 1987 goal was 16,667 pounds. Theoretical calculations were computed for steelhead as follows:

Flow Method

$$1.54 \times 2,250 \text{ gpm} \times 8" = 27,720 \text{ lbs}$$

Density Method

$$.25 \times 5,817 \text{ cu ft} \times 8" = 11,634 \text{ lbs}$$

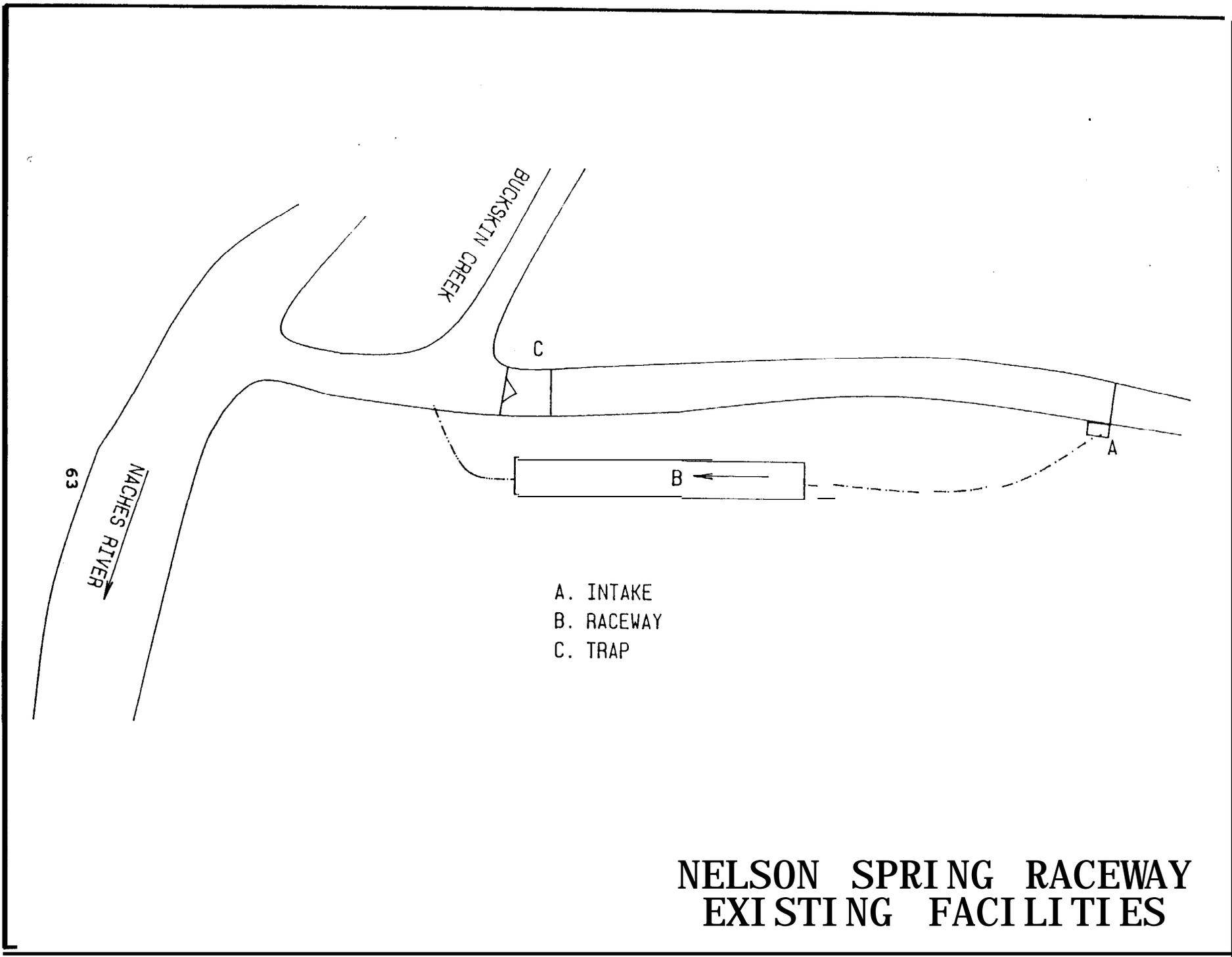
Comparison of the 2 theoretical calculations indicates that pond space is probably the limiting factor in production. The present production goal over crowds fish and should not exceed the theoretical density calculation (70,000 **smolts**) unless additional space is provided.

### Hatchery Expansion Capability

The raceway is situated on 1 acre leased by YCTU. Approximately 40% of the area is in use. The remaining area is suitable for expansion. Additional water is available on site. The water supplies currently being used could support additional fish production.

This site is currently being studied under the Yakima Restoration Project. Potential production will be thoroughly evaluated by that study and planning process.

No expansion capability is currently identified.



**NELSON SPRING RACEWAY  
EXISTING FACILITIES**

Ringold Springs Rearing Pond  
Star Route, Box 188  
Mesa, Wa. 99343

Funding Agency: **NMFS**  
Species Reared: Summer **Steelhead**

Manager: Bruce Walters  
Phone #: (509) 269-4327

### Introduction

Ringold Springs Rearing Pond is located on the east bank of the Columbia River approximately 20 miles north of Richland. Elevation of the site is 275 feet above sea level. The rearing pond was constructed under the CRFDP and began operation in 1962. The facility is staffed with 1.3 **FTE's**.

The rearing facility is in fair condition and consists of a 4.8 acre earthen pond. There are no spawning or egg incubation facilities.

Adult steelhead are collected at the adjacent WDF facility and transferred to either Yakima or Chelan Hatcheries for holding and spawning. Resultant fry are transferred to Columbia Basin Hatchery for the summer and then stocked in **Ringold** Pond for final rearing in September. **Smolts** are released the following April. The **Ringold** stock originated from Skamania Hatchery. Diseases of concern include eye fluke and Ich which preclude use of the pond during summer months.

Local bass clubs have contributed funds to match **DJ-WB** funds to construct 4 small ponds to produce warm water species. They are not connected to the steelhead pond and are not included in this report. The warm water program has not been successful.

Water rights are jointly held with WDF and total 26,929 gpm from springs. This includes undeveloped water which is not currently being utilized. Water is delivered by gravity flow with an average 1,400 gpm available for use at the WDW facility. The springs are supplied from irrigation return water with high flow occurring in late summer and low flow in late winter or spring when demand is highest. Extra water is bypassed in the fall but total amount available is used February through April from developed source.

### Current Production Constraints

Production is limited by amount of water being delivered to the rearing pond. Additional undeveloped water is available from existing springs but would require pumping to supply the pond. The water right for undeveloped water is jointly held by WDW and WDF.

Peak flow from the springs does not coincide with peak pond loading. The water supply is irrigation return water and can

contain chemicals used in farming.

Ich and eye fluke have been serious problems with losses occurring when fish have been reared during summer months.

Rearing pond is larger than needed for amount of production occurring. Predator control is difficult.

Land is owned by the Bureau of Reclamation (BR) and is leased to WDW. Lease expires in 2001, but renewal is not expected to be a problem.

### Theoretical Production

Theoretical production based on the flow method is 29,184 pounds and with density is 401,520 pounds. Average production was 29,553 pounds and the 1987 agency goal was 30,000 pounds. The average production was lowered due to an egg shortage in 1984/85. Theoretical calculations were computed for steelhead as follows:

Flow Method

$$2.28 \times 1,600 \text{ gpm} \times 8" = 29,184 \text{ lbs}$$

Density Method

$$.03 \times 1,673,000 \text{ cu ft} \times 8" = 401,520 \text{ lbs}$$

Comparison of the 2 theoretical calculations indicates that flow is the limiting factor in production. The theoretical production based on density is not achievable even if sufficient water was supplied (It would require 36,000 to 40,000 gpm - 80 to 90 cfs). Large dirt ponds with their non-uniform flow pattern dead water areas, and plant growth all contribute to reduce production.

Average production and the agency goal are nearly equal to the theoretical calculation based on flow. If the pond was subdivided into 3 smaller ponds and additional water was provided, production could be increased.

Production is currently at capacity based on available flow to pond.

### Hatchery Expansion Capability

The facility is situated on 30 acres owned by BR and leased to WDW. Approximately 12% of the area is in use. Some of the remaining land is managed for wildlife. At least 3,591 gpm of spring water not being used is available and maybe more. It may require pumping from collection sites to rearing pond. Large quantities of water are available from the Columbia River, but is considered a poor source due to temperature and potential disease problems. A water

supply study is needed to determine how much spring water is available. The potential for well water is not known.

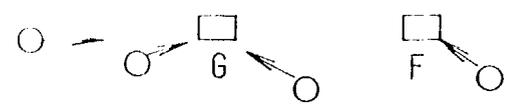
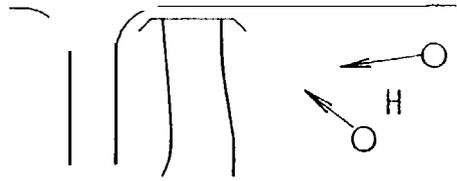
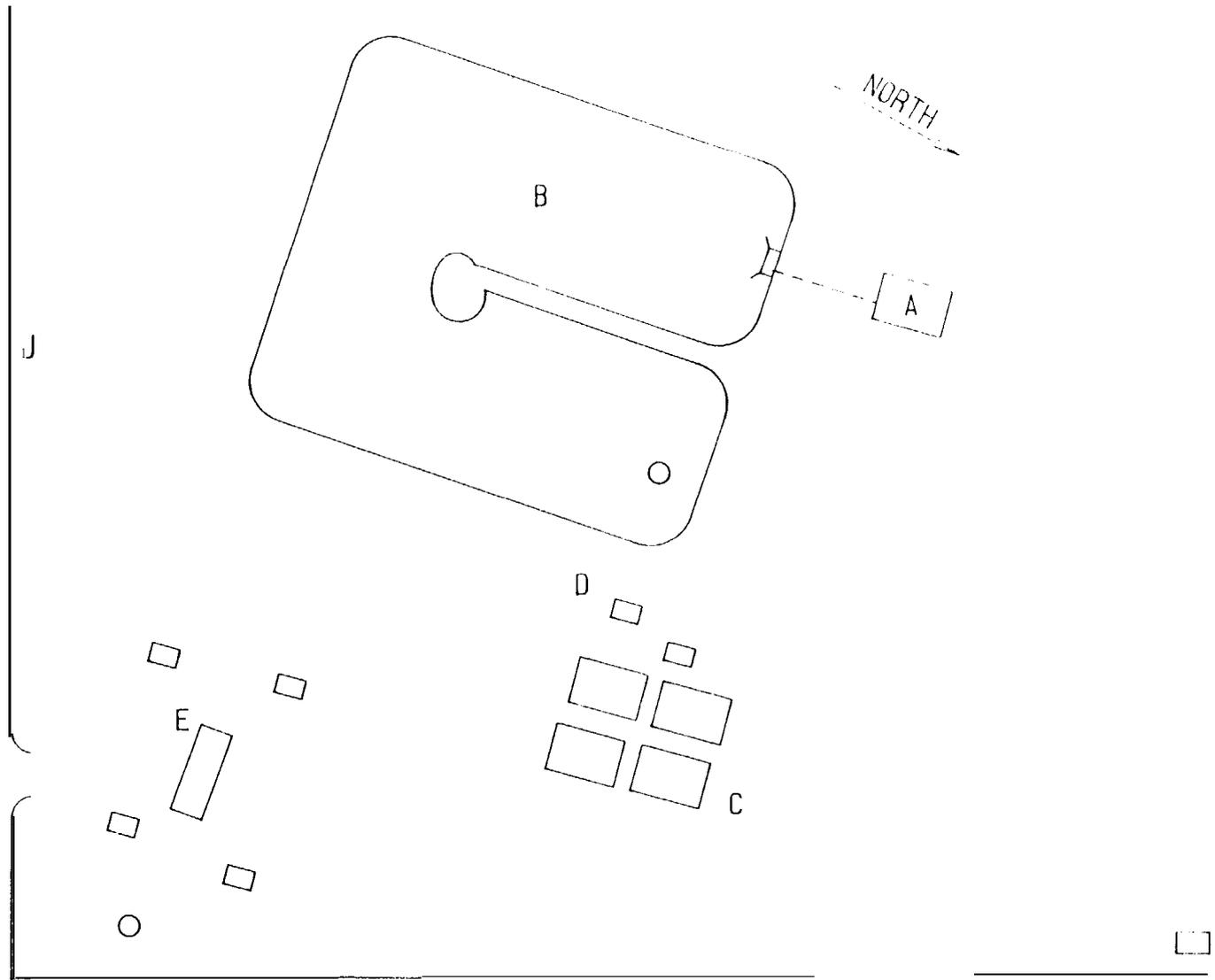
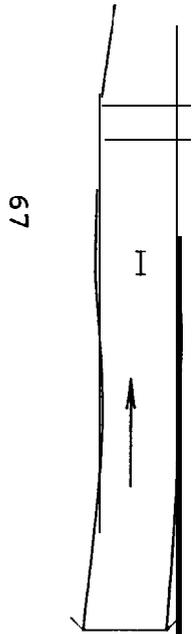
Expansion possibilities include:

1. Sub-divide existing pond into 3 ponds.
2. Add second pass ponds for catchable trout
3. Add raceways and incubation facilities
4. Ozone treatment
5. Water supply development
6. Residences, shop, garage, storage, and visitor facility
7. Standby generator

Only the expansion capability for summer steelhead has been identified in Table 13, but the total production increase (including resident trout) is estimated to be:

1. Summer steelhead - 184,000 **smolts**, 30,666 pounds
2. **Catchable** trout - 529,000 fish
3. Fingerling trout - 563,000 fish

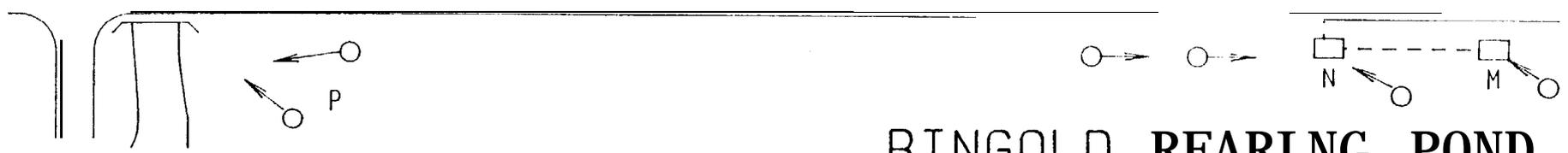
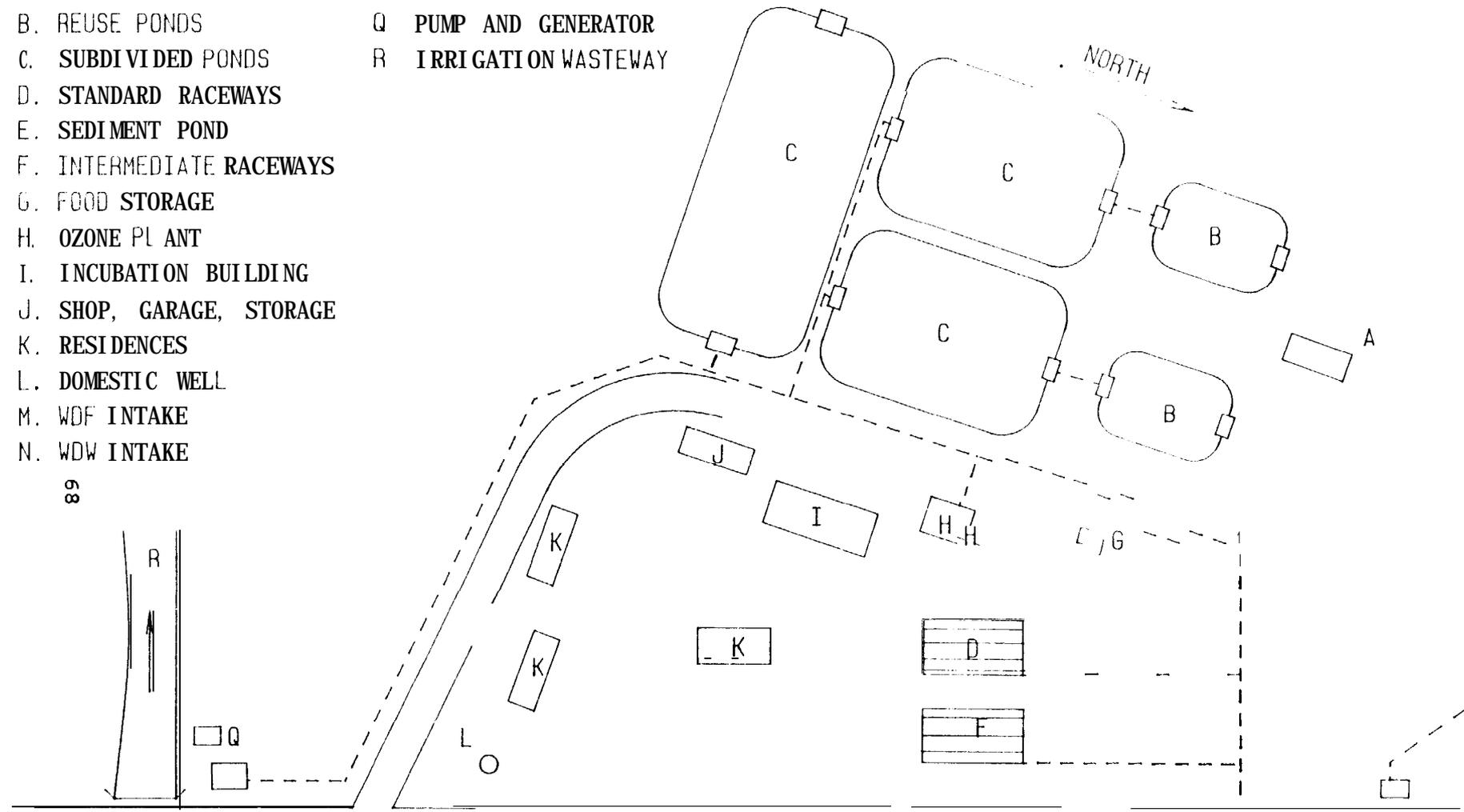
- A. SMOLT TRAP
- B. REARING POND
- C. WARM WATER PONDS
- D. FEED STORAGE
- E. RESIDENCE, SHOP, ETC.
- F. WDF INTAKE
- G. WDW INTAKE
- H. UNDEVELOPED SPRINGS
- I. IRRIGATION WASTEWAY
- J. FISHING ACCESS ROAD.



RINGOLD REARING POND  
EXISTING FACILITIES

- A. SMOLT TRAP
- B. REUSE PONDS
- C. SUBDIVIDED PONDS
- D. STANDARD RACEWAYS
- E. SEDIMENT POND
- F. INTERMEDIATE RACEWAYS
- G. FOOD STORAGE
- H. OZONE PL ANT
- I. INCUBATION BUILDING
- J. SHOP, GARAGE, STORAGE
- K. RESIDENCES
- L. DOMESTIC WELL
- M. WDF INTAKE
- N. WDW INTAKE
- P. UNDEVELOPED WATER
- Q. PUMP AND GENERATOR
- R. IRRIGATION WASTEWAY

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## RINGOLD REARING POND PROPOSED FACILITIES

Skamania Hatchery  
M.P.O. 39L Steelhead Rd.  
Washougal, Wa. 98671

Funding Agency: NMFS

Species Reared: Summer Steelhead  
Winter Steelhead  
Searun Cutthroat

Manager: Mitch Combs (Acting)  
Phone #: (206) 837-3131

### Introduction

Skamania Hatchery is located along the North Fork Washougal River approximately .5 mile upstream from its confluence with the Washougal River and twelve miles east of the town of Washougal. Elevation of the hatchery is 110 feet above sea level. The hatchery was constructed under the CRFDP (Mitchell Act) and began operation in 1956. It is staffed with 5 FTE's.

The hatchery consists of a full range of facilities for a self contained operation. The rearing units are in fair condition and consist of 10 intermediate raceways, 32 standard raceways, 3 adult holding raceways (used for rearing in the spring), and 80 troughs. The hatchery is programmed to rear 600,000 to 700,000 smolts and pre-smolts annually. Waters are stocked from the Klickitat to Kalama Rivers. Pre-smolts are supplied to Gobar Pond, Alder Creek Pond and Merwin Net Pens.

Adult summer and winter steelhead are collected and spawned. Searun cutthroat adults returning to the facility are also spawned, if insufficient eggs are taken to meet the production goal, additional eyed eggs are transferred in from Beaver Creek Hatchery. Because of the potential fish loss from IHN, the bulk of the egg take is incubated, hatched, and reared in virus free water until June at Vancouver Hatchery. Also, the remaining eggs and fish held at Skamania Hatchery are kept on virus free Vogel Creek water as long as possible. In mid June, fingerling fish are transferred back to Skamania Hatchery to complete the rearing cycle.

The IHN virus is a constant threat at this station. The virus is usually found in samples taken from adults at spawning and has caused major loss in juvenile fish in the past.

The water right totals 11,670 gpm from 2 sources, North Fork Washougal River and Vogel Creek. The Washougal River provides the majority of water used. Actual flow available for hatchery use averages 9,800 gpm and ranges from 6,650 gpm to 11,460 gpm. The Vogel Creek supply is normally used in the troughs and for part of the intermediate raceways. The standard raceways are all supplied by the North Fork Washougal River. Silt in the Vogel Creek supply is a problem during incubation.

The re-use system includes water from troughs passing through adult holding raceways. Raceway water is also normally re-used through the adult holding raceways.

Current Production Constraints

Low summer flow and high water temperatures limit production. Maximum production which can be held on station at this time is 30,720 pounds based on theoretical flow calculations.

Winter ice, which potentially can block the water supply is a serious problem. Low ionic levels and high copper content in water supply may increase stress related problems.

Vogel Creek water, used for incubation and fry rearing has high level of silt'. A system to remove silt would be helpful.

Virus free water (Vogel Creek) can not be used in all intermediate raceways used to start fry. This causes some fingerlings to be exposed to river water earlier than desired. Viral infections (IHN) have caused major fish loss in recent years.

Adult steelhead are allowed above the river intake and are thought to be the source of IHN problems. A fish barrier and sorting facility would help to control IHN transmission and hatchery/wild spawning interaction.

Adult holding raceways only receive second pass water from troughs or standard raceways. This exposes adults to fish pathogens which may be in juvenile fish. First pass water would be better for adult holding. Adult raceways are only available for juvenile rearing in the spring.

Theoretical Production

Theoretical production based on the flow method is 316,615 pounds and based on density is 157,688 pounds. Average production was 95,978 pounds and the 1987 agency goal was 105,611 pounds. Average production is reduced because of a less than normal release in 1985. The flow calculation is based on high flow in the spring and does not take into account that adult ponds are supplied with re-use water. Theoretical calculations were computed for steelhead as follows:

Flow Method				
Intermediates:	1.79	X	40 gpm X 3" X 10 ponds	= 2,148 lbs
Raceways:	1.79	X	330 gpm X 8" X 32 ponds	= 151,219 lbs
Adult Ponds:	1.79	X	3,800 gpm X 8" X 3 ponds	= 163,248 lbs *
				316,615 lbs

Density Method				
Intermediates:	.25	X	216 cu ft X 3" X 10 ponds	= 1,620 lbs
Raceways:	.25	X	1,913 cu ft X 8" X 32 ponds	= 122,432 lbs
Adult Ponds:	.25	X	5,606 cu ft X 8" X 3 ponds	= 33,636 lbs *
				157,688 lbs

\* Note: Supplied with re-use water. Normal hatchery practice would be to reduce fish **loading's**.

Comparison of the 2 theoretical calculations seems to indicate that pond space is limiting factor in production. This is misleading because in the summer/fall when low flow and high temperature occurs, production is limited by flow to only 30,720 pounds (960 pounds per raceway). It is this summer limitation that is controlling the production level. Only 200 gpm can be supplied to each standard raceway during this period and adult holding raceways are not available for juvenile rearing.

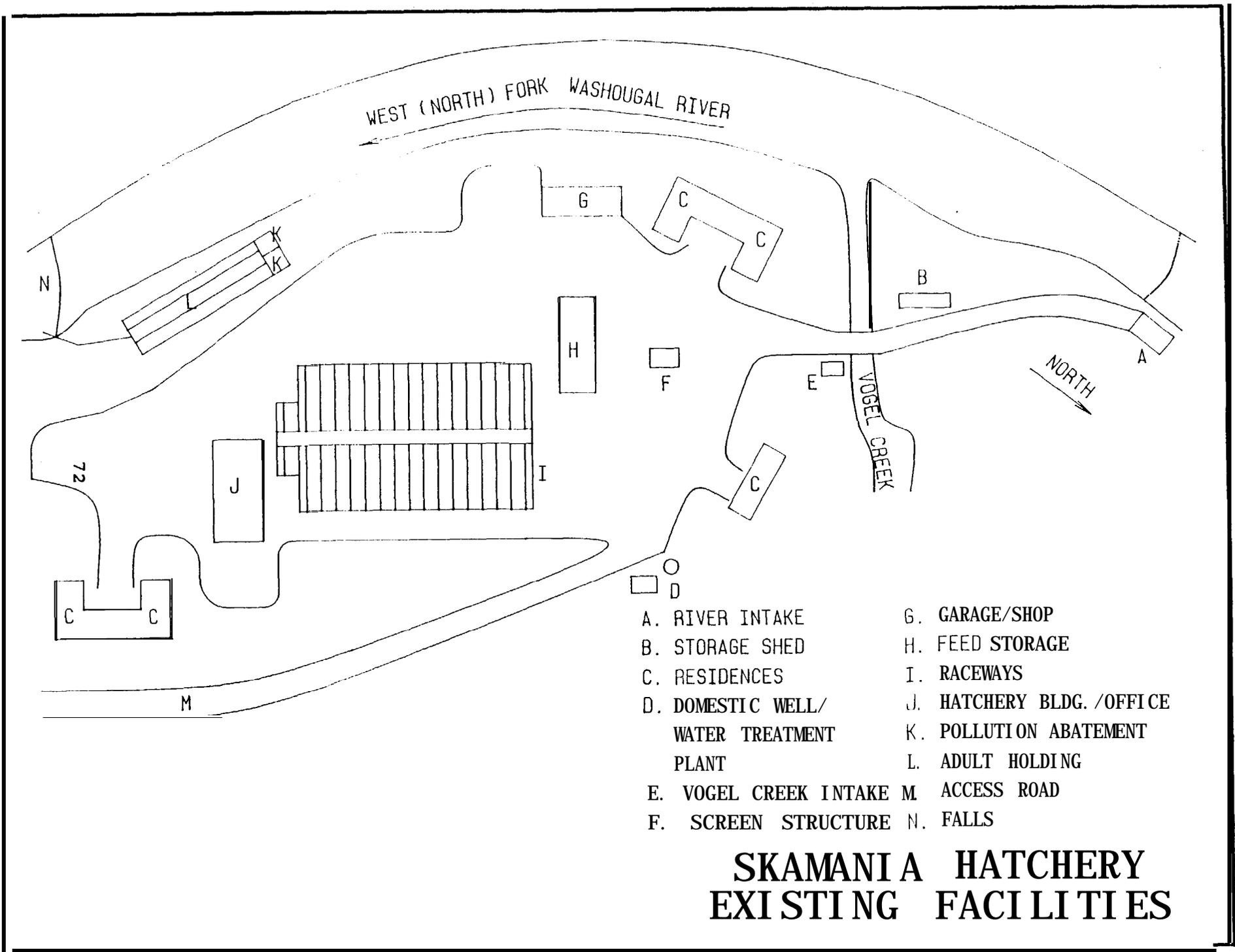
Production based on theoretical flow is not achievable for reason indicated above. Also, the flow calculation unrealistically shows a greater production from the 3 adult raceways (with 16,818 cubic feet of rearing space) than from the 32 standard raceways (with 61,216 cubic feet of rearing space).

Production based on density is also not achievable. As indicated above, pounds of fish which can be held in summer and fall months is limiting. Adult raceways are unavailable for juvenile rearing at this time. The density calculation gives 122,432 pounds for the standard raceways and should be achievable in an average or better water year.

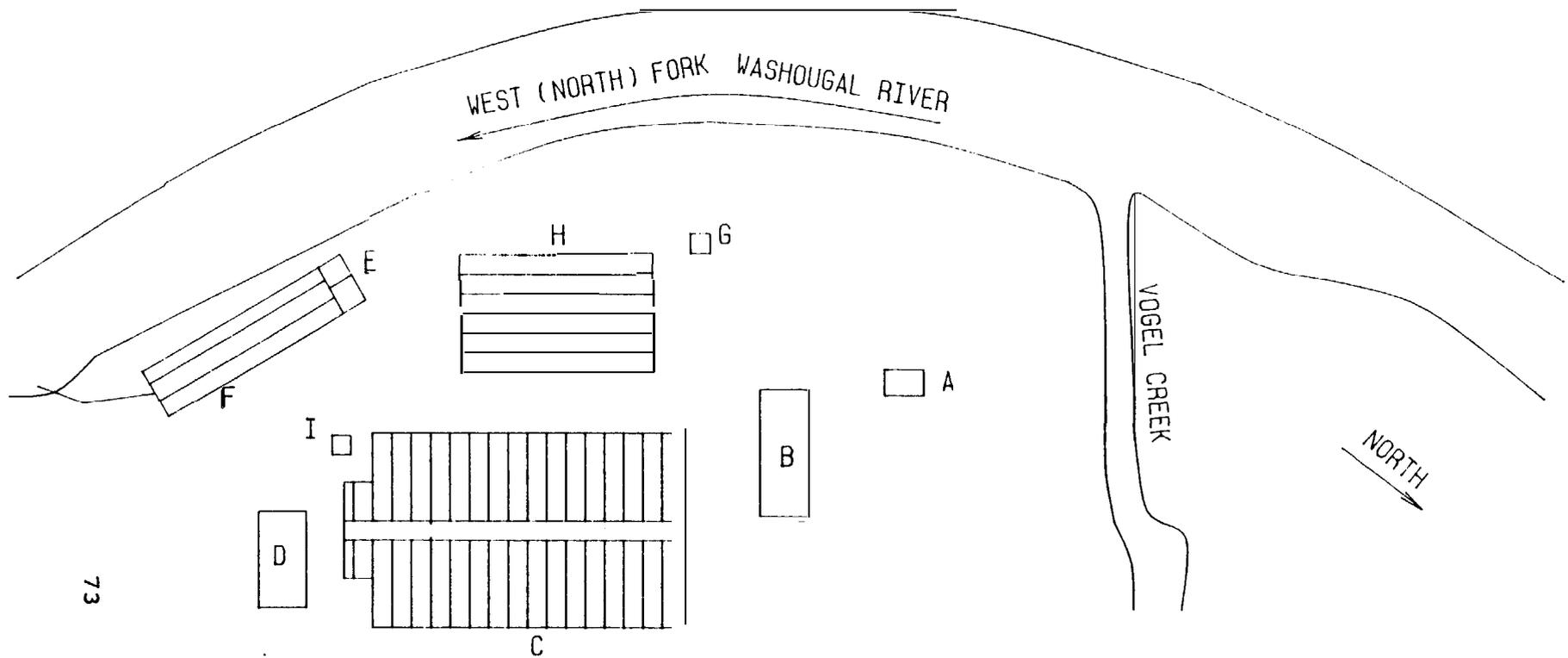
### Hatchery Expansion Capability

The hatchery is situated on about 40 acres owned by WDW. Approximately 15% of the land is being utilized. Topography of most of the remaining land is unsuitable for fish culture. No additional surface water is available for expansion. Only limited well water is thought to be present.

Production could be expanded by constructing 5 new **10' x 100'** raceways. These raceways would be supplied by pumping second pass water from the north bank of standard raceways. The water should be aerated between uses. An additional 90,000 steelhead **smolts** weighing 15,000 pounds could be produced.



# SKAMANIA HATCHERY EXISTING FACILITIES



- A. EXISTING GARAGE/SHOP
- B. EXISTING FEED STORAGE
- C. EXISTING RACEWAYS
- D. EXISTING HATCHERY BLDG.
- E. EXISTING POLLUTION ABATEMENT
- F. EXISTING ADULT HOLDING
- G. PROPOSED AREATOR
- H. PROPOSED RACEWAYS
- I. PROPOSED PUMP STATION

## SKAMANIA HATCHERY PROPOSED FACILITIES

Turtle Rock  
C/O Chelan Hatchery  
HCR Box 52  
Chelan, Wa. 98816

Funding Agency: Chelan County PUD#1  
Species Reared: Summer Steelhead

Manager: John Penny  
Phone #: (509) 682-5514

### Introduction

The Turtle Rock facility has recently been closed and steelhead production from here has been transferred to the new East Bank Hatchery beginning with the 1990 smolt release. Production of approximately 200,000 steelhead smolts weighing 33,333 pounds could be maintained at Turtle Rock if a source of operational funding became available.

Turtle Rock is located on an Island in the Columbia River near the town of Wenatchee. Elevation of the facility is 700 feet above sea level. The WDW operated 1 of 4 rearing ponds that were redeveloped from a spawning channel in the early 1970's. The WDF operate the other 3 ponds. Only the WDW pond is summarized in this report. A semi-natural rearing pond producing smallmouth bass is also located at this facility but is not included in this report. This facility was staffed with 1 FTE.

The rearing pond is in good condition. The pond operated by WDW is the first in the series of 4 ponds. With the Eastbank Hatchery on line, this potentially frees up this facility for other uses.

Adults are not collected or spawned at this facility. Fingerlings were usually transferred in during November and reared until release the following April or May. Releases were normally made into the Wenatchee and Entiat Rivers. Skamania, Ringold, and Wells stocks have been reared. Wells is currently the preferred stock. IHN and Ich have caused problems in the past.

The water right totals 3,591 gpm from the Columbia River. A constant 3,366 gpm of pumped water can be supplied to the pond.

### Current Production Constraints

High summer temperatures and a multitude of disease organisms in the Columbia River water prevent year round rearing.

Stickleback and other small fish enter with water supply. Slotted plate screens plug easily. IHN, Ich, and columnaris have caused fish loss.

Adults can not be held because of high summer/fall water temperatures. Egg shortages have occurred in the past.

The facility is owned by Chelan County PUD #1 and is operated by both WDW and WDF. Change of use at this site would need to be negotiated with Chelan County PUD #1.

The island location makes access inconvenient.

### Theoretical Production

Theoretical production based on the flow method is 59,242 pounds and based on density is 6,960 pounds. Average production was 23,189 pounds and the 1987 agency goal was 33,333 pounds. Theoretical calculations were computed for steelhead as follows:

Flow Method

$$2.2 \times 3,366 \text{ gpm} \times 8" = 59,242 \text{ lbs}$$

Density Method

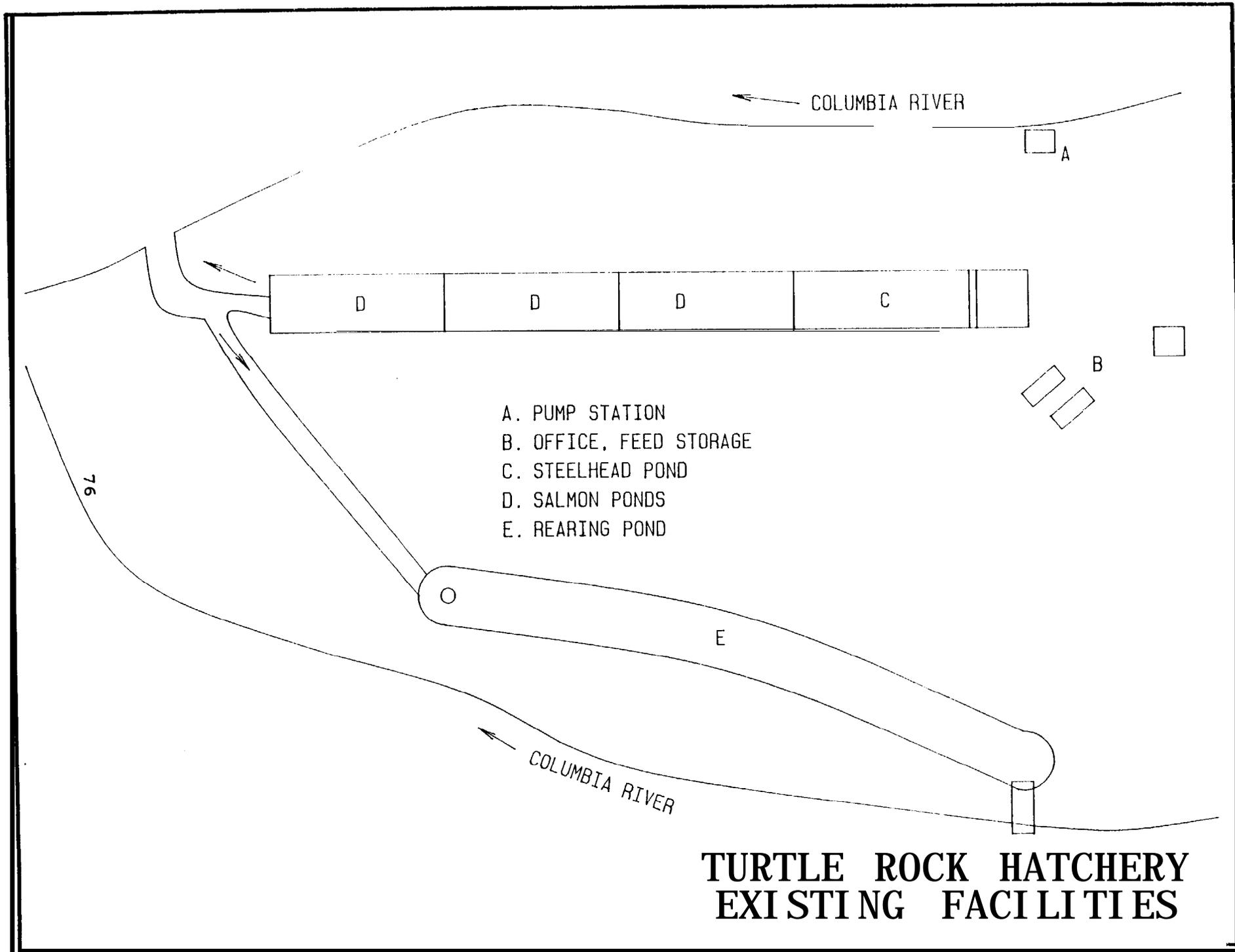
$$.03 \times 29,000 \text{ cu ft} \times 8" = 6,960 \text{ lbs}$$

Comparison between the 2 theoretical calculations would seem to indicate that pond space is the limiting factor in production. This is misleading since this pond is a cross between a rearing pond and raceway. The density index used in the above calculation is for a large rearing pond (.03 index). If the raceway index (.25) is used, production based on density increases to 58,000 pounds and would be in balance with flow. A density index of .14 is required to meet the agency goal of 33,333 pounds. Since this facility is a cross between a raceway and large pond, production potential probably lies between the two density indices listed above. The WDW considers the production goal listed above to be appropriate for this pond.

### Hatchery Expansion Capability

The rearing pond is situated on an island owned by Chelan County PUD #1. Approximately 10% of the land is in use. The lower 1/3 of Turtle Rock Island is suitable for expansion. Pumped water from the Columbia River is available in large quantities. The potential for water from wells is unknown.

Since the production from this facility has been moved to the new Eastbank Hatchery it has freed up this facility for other uses. The facility is currently not being utilized. Production of approximately 200,000 smolts weighing 33,333 pounds could be maintained if a source of operation and maintenance funds becomes available.



Vancouver Hatchery  
12208 SE. Evergreen Highway  
Vancouver, Wa. 98684

Funding Agency: WDW, NMFS  
Species Reared: Summer **Steelhead**  
Winter **Steelhead**  
Resident Trout

Manager: Rick **Stilwater**  
Phone #: (206) 892-2581

### Introduction

Vancouver Hatchery is located long the Columbia River near the town of Vancouver. Elevation of the facility is 100 feet above sea level. The hatchery was constructed in the late 1930's on what at that time was an excellent spring water source. A combination of development and drought has left the station short of water. The hatchery is staffed with 3 FTE's.

The facility is in fair condition and consists of 4 raceways, 12 circular ponds, an upper earth pond, east earth pond, west earth pond, rearing lake, old raceway, and 96 troughs. The rearing lake is used to rear steelhead. The remaining rearing units are mainly used for resident trout. There is ample rearing space at this facility, but at present production is limited by water supply.

Adult steelhead are not collected or spawned here. Eggs are transferred in and incubated mainly from Skamania Hatchery. Steelhead fry are transferred back to Skamania, hopefully after the threat from importing IHN in the river water is past. Some fry are retained, reared to smolt size, and planted into several streams. Steelhead production accounts for about 40% of total pounds produced. Production numbers and pounds in Summary Tables include only steelhead production.

Water rights total 3,927 gpm from 1 well and springs. Water available for hatchery use averages 1,580 gpm and ranges from 1,300 gpm to 1,830 gpm. As indicated above, urban development in the area has reduced the amount of spring water in recent years. A new deep well is currently under development and if sufficient good quality water is found a second well is planned.

Water is re-used extensively at this station. Hatchery troughs are in tandem, then water is delivered to earth ponds, and then to raceways. Water from upper earthen pond flows to lower earthen pond and finally to raceways. Water from rearing lake can be used in raceways also. Water can also be recirculated by pumping up to 300 gpm from hatchery outfall back to earthen ponds.

### Current Production Constraints

Water supply is limiting production. Springs which formerly supplied 4,488 gpm or more have dwindled to less than 1,346 gpm. The water delivery system does not provide for second-pass use of

water from circular ponds.

Circular ponds do not allow full use of water supplies. A 2-pass raceway system would allow more efficient use of scarce water.

Theoretical Production

Theoretical production, average production, and agency goal in pounds is shown below for the steelhead pond only and the entire hatchery.

	Steelhead only	Hatchery Total
Flow Method	20,720 lbs	48,976 lbs
Density Method	67,680 lbs	122,965 lbs
Average Production	29,899 lbs	72,399 lbs
Agency Goal	25,700 lbs	64,033 lbs

The theoretical calculations were computed as follows:

Flow Method

Rainbow Trout

12 circular ponds: 1.67 X 680 gpm X 4" = 4,542 lbs  
 4 raceways: 1.67 X 1,000 gpm X 4" = 6,680 lbs \*  
 old raceway: 1.67 X 300 gpm X 4" = 2,004 lbs \*\*

Brown Trout

upper pond: 1.67 X 600 gpm X 10" = 10,020 lbs \*  
 East pond: 1.67 X 300 gpm X 10" = 5,010 lbs \*\*

Steelhead:

Rearing lake: 2.59 X 1,000 gpm X 8" = 20,720 lbs  
 48,976 lbs

Density Method

Rainbow Trout

12 circular ponds: .3 X 31,356 cu ft X 4" = 37,627 lbs  
 4 raceways: .3 X 5,464 cu ft X 4" = 6,557 lbs  
 old raceway: .3 X 2,216 cu ft X 4" = 2,659 lbs

Brown Trout

upper pond: .03 x 11,340 cu ft x 10" = 3,402 lbs  
 east pond: .03 X 7,800 cu ft X 10" = 2,700 lbs  
 West pond:\*\*\* .03 x 9,000 cu ft x 10" = 2,340 lbs

Steelhead

rearing lake: .03 X 282,000 cu ft X 8" = 67,680 lbs  
 122,965 lbs

- \* Second pass water supplied to these ponds.
- \*\* Third pass water supplied to these ponds.
- \*\*\* Note that West Pond was not used in theoretical flow calculation.

Comparison of the 2 theoretical calculations indicate that production is limited by available water supplies. Average production exceeds theoretical production based on flow.

Although production could be increased with additional water, it is not possible to equal the theoretical density calculation. The large rearing lake has a natural shape and broad width in relation to its length creating uneven flow patterns which reduces production potential. The hatchery should be considered at capacity based on available flow.

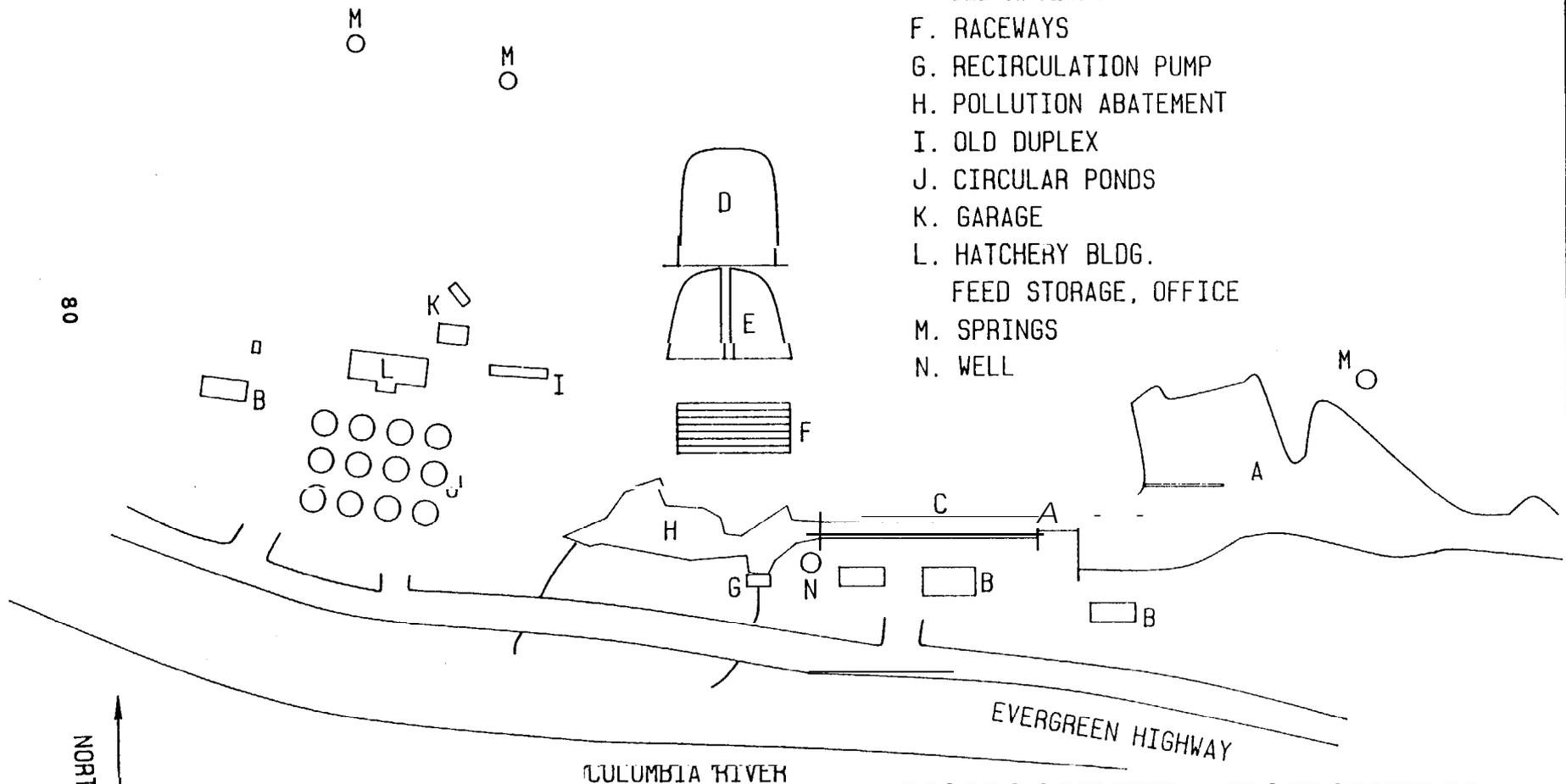
#### Hatchery Expansion Capability

The hatchery is situated on 42 acres owned by WDW. Approximately 40% of the land is being used. The remaining property is not suitable for expansion. There is no additional suitable surface water available. Water from deep wells (800' to 900' deep) may be available. One well is currently being developed.

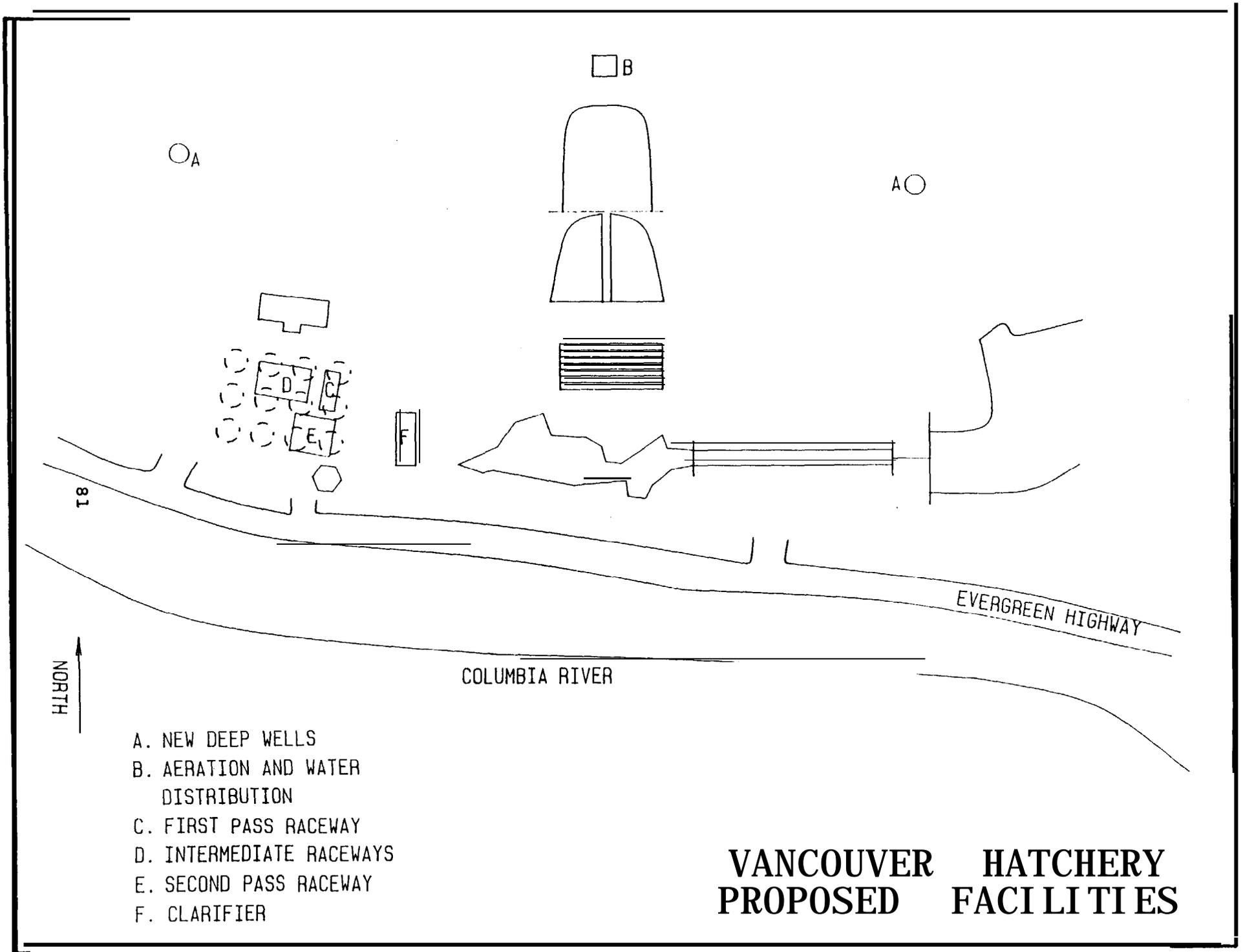
Hatchery expansion of 100,000 steelhead smolts weighing 16,666 pounds and 500,000 fingerlings for transfer is possible. It would require replacing the circular ponds with 9 standard raceways, 10 intermediate raceways, 2 deep wells, standby generator, alarm system, piping, aeration, etc. It is expected that the 2 deep wells may be able to supply up to 2,000 gpm of water. In addition to the steelhead production listed above, the resident trout program currently produced in the circular ponds would also be maintained.

Pacific Power and Light provided funding to construct four concrete raceways to produce trout for Swift Reservoir 3 years ago. Production in these raceways is to move to the new Lewis River Hatchery in 1991. These ponds should also be available for other uses after that date.

- A. REARING LAKE
- B. RESIDENCES
- C. SMOLT TRAP
- D. UPPER EARTH POND
- E. EAST POND, WEST POND,  
OLD RACEWAY
- F. RACEWAYS
- G. RECIRCULATION PUMP
- H. POLLUTION ABATEMENT
- I. OLD DUPLEX
- J. CIRCULAR PONDS
- K. GARAGE
- L. HATCHERY BLDG.  
FEED STORAGE, OFFICE
- M. SPRINGS
- N. WELL



**VANCOUVER HATCHERY  
EXISTING FACILITIES**



- A. NEW DEEP WELLS
- B. AERATION AND WATER DISTRIBUTION
- C. FIRST PASS RACEWAY
- D. INTERMEDIATE RACEWAYS
- E. SECOND PASS RACEWAY
- F. CLARIFIER

**VANCOUVER HATCHERY  
PROPOSED FACILITIES**

Wells Trout Hatchery  
Box 2, Azwell Route  
Pateros, Wa. 98846

Funding Agency: Douglas County PUD  
BR (5 year program)

Manager: Steve Miller  
Phone #: (509) 923-2471

Species Reared: Summer Steelhead  
Resident Trout

## Introduction

Wells Trout Hatchery is located along the Columbia River near Wells Dam. Elevation of the facility is 750 feet above sea level. This facility was constructed in 1967, is shared with WDF, and rears chinook and steelhead. This section of the report only presents information on facilities utilized by WDW for steelhead production. The salmon rearing facilities are summarized in the WDF report. The WDW facility is staffed with 4 FTE's.

The rearing program is primarily funded by Douglas County PUD who owns the facility. The BR has funded improvements and is currently responsible for 25% of operations under a 5 year program to enhance the Okanogan River steelhead fishery. Resident trout are also produced.

The original facility consisted of a 6,000 foot long spawning channel and a 5 acre rearing pond with appropriate support structures. The spawning channel concept has now been abandoned as has the 5 acre pond. The 5 acre pond was sub-divided and now consists of 4 rearing ponds of various sizes. There are also 6 old raceways and 4 new ones used for rearing. The other facilities, adult raceway, portable raceways and intermediate raceway are not normally used for juvenile rearing.

Adult steelhead are collected from the Wells Dam ladder to provide a mix of hatchery and wild broodstock. This facility routinely supplies eggs to other hatcheries. Fingerlings are held in raceways and supplied with well water throughout the summer and fall. Fish are then transferred to rearing ponds supplied with river water in November for final rearing. Smolts are produced at low density in the rearing ponds and are collected and transported to release sites on the Methow and Okanogan Rivers.

No water rights have been identified.

Water for the facility is supplied from 13 wells (13,000 gpm, pumped) and Columbia River (10,772 gpm, gravity flow). It is shared with WDF and not all is available for use by WDW. The rearing ponds are usually supplied with 1,500 gpm river water and raceways with 450 gpm well water each. The well water is used to start fish and for rearing through the summer. Wells 1, 2, and 3 are used to supply the hatchery building. Final rearing is done on river water (November through May). River water is only supplied to the large rearing ponds.

Water can be re-used at this station. Raceway water is re-used through the adult raceway. Second-pass well water is available to rearing ponds. Water from upper raceways can be re-used through lower raceways, but is not normally done.

Current Production Constraints

Water being supplied (1,500 gpm per pond) to the rearing ponds is limiting production.

River water can not be used during summer/fall months. Warm water temperatures and various diseases would be serious problems if river water were used then.

The WDW and WDF programs occasionally are in competition for well water.

Production is set by mitigation agreement with Douglas County PUD. Any changes in production programs would need to be negotiated.

Theoretical Production

Theoretical production is shown below for the 4 steelhead ponds and for the entire hatchery (includes resident trout). Average hatchery production and agency goal is shown also.

	Steelhead Only	Hatchery Total
Flow Method	141,087 lbs	157,562 lbs
Density Method		
Average Production	287,932 lbs*	303,783 lbs
1987 Agency Goal	87,777	91,850 lb
	112,000 lbs*	115,000 lbs

\* Note that steelhead residuals used to stock the Methow River are included (10,830 pounds) and also the agency goal (12,000 pounds). Residuals are utilized similarly to a resident trout program.

Theoretical calculations were computed as follows:

Flow Method  
 Steelhead \*  
 old raceways: 1.62 X 450 gpm X 3.85" X 3 ponds = 8,420 lbs  
 rearing ponds: 1.62 X 1500 gpm X 8" X 44 ponds = 11,227 lbs  
 ponds = 121,440 lbs \*  
 Residual Steelhead  
 old raceways: 1.62 X 450 gpm X 8" X 2 ponds = 11,664 lbs

Trout  
 new raceways: 1.62 X 450 gpm X 6.6" X 1 pond =  $\frac{4,811 \text{ lbs}}{157,562 \text{ lbs}}$

Density Method

Steelhead \*  
 old raceways: .25 X 2,338 cu ft X 3.85" X 3 ponds= 6,750 lbs  
 new raceways: .25 X 2,281 cu ft X 3.85" X 4 ponds= 8,782 lbs  
 4 rearing ponds: .03 X 1,135,000 cu ft X 8" = 272,400 lbs \*

Residual Steelhead

old raceways: .3 X 2,338 cu ft X 8" X 2 ponds = 11,222 lbs  
 Trout  
 new raceway: .3 X 2,338 cu ft X 6.6" X 1 pond =  $\frac{4,629 \text{ lbs}}{303,783 \text{ lbs}}$

\* Only the 4 rearing ponds are used to produce **smolts**.

Comparison of the 2 theoretical calculations indicates that flow is probably the limiting factor in production. This flow limitation is entirely located in the four steelhead rearing ponds. Production in the raceways appears to be limited by space. All of the production potential based on density is in the 4 large rearing ponds. They could probably produce additional smolts if supplied with greater flow, however this would require additional starting containers, raceways, and possibly more well water to produce the fingerlings for stocking rearing ponds at higher densities. Although production can be increased by providing additional flow, it would be unrealistic to expect it to approach the theoretical density calculation. As indicated in prior sections of this report large ponds do not utilize space as efficiently as raceways.

The agency goal of 100,000 pounds of steelhead and 12,000 pounds of residual steelhead (used as catchable trout) is well balanced to the raceway space and flow according to WDW.

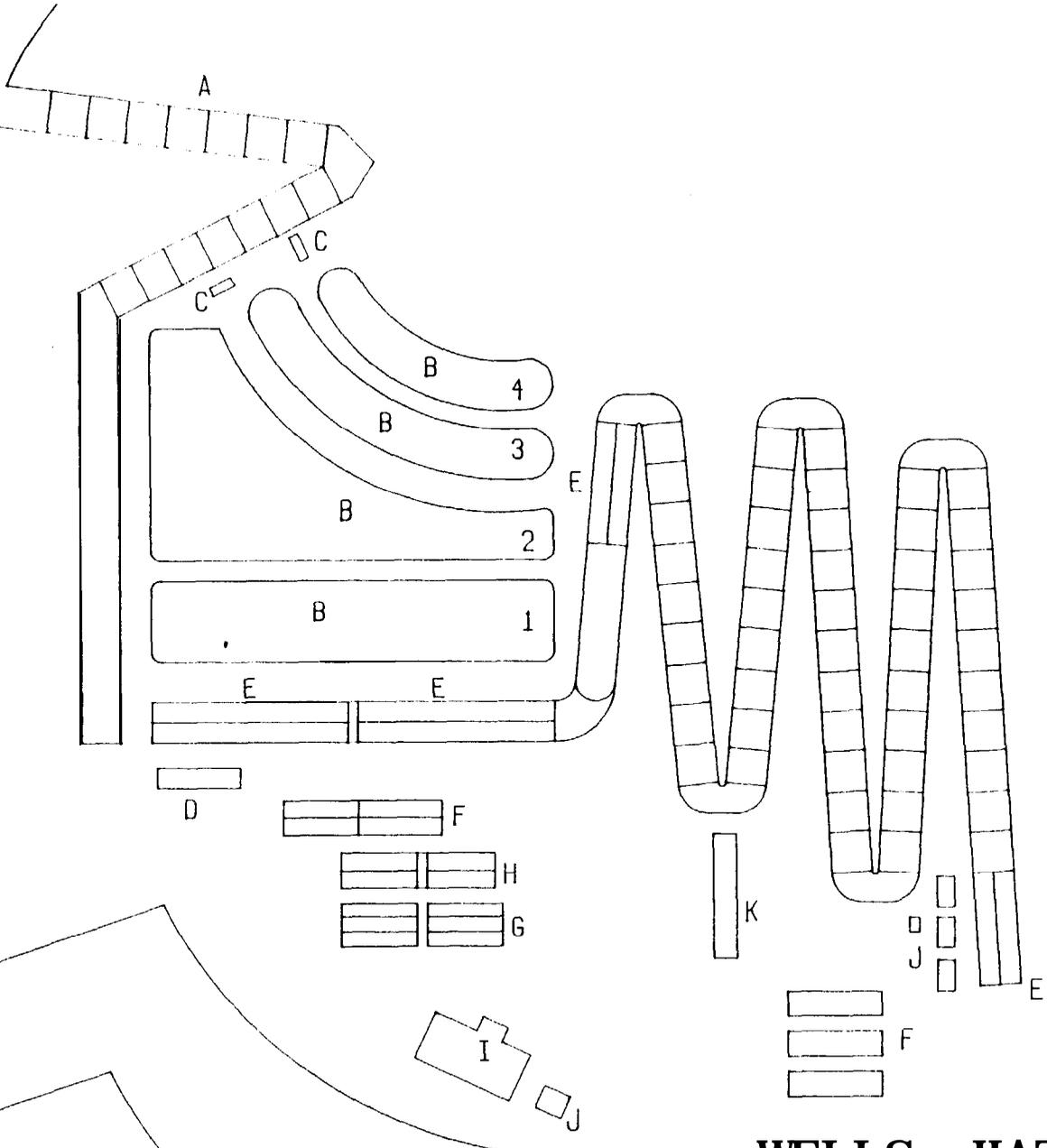
Hatchery Expansion Capability

The hatchery is situated on land owned by Douglas County PUD. There is no room for expansion on the existing site. Land is available on Carpenter Island for expansion. Additional well water may be available in the forebay area and river water is present in large quantity although it can not be used during summer and early fall months.

No expansion capability is identified.

COLUMBIA RIVER

WELLS DAM



- A. LADDER
- B. REARING PONDS
- C. SMOLT TRAPS
- D. ADULT HOLDING
- E. SPAWNING CHANNEL SECTION ADAPTED FOR REARING AND /OR ADULT HOLDING
- F. VINYL RECEWAYS
- G. OLD CONCRETE RACEWAYS
- H. NEW CONCRETE RACEWAYS
- I. HATCHERY BLDG. FEED STORAGE OFFICE.
- J. AERATION/WATER DIST.
- K. GARAGE, STORAGE

**WELLS HATCHERY  
EXISTING FACILITIES**

Yakima Trout Hatchery  
2306 S. 16th Avenue  
Yakima, Wa. 98903

Funding Agency: WDW, Yakima Indian  
Nation

Manager: Jim Lee  
Phone #: (509) 575-2737

Species Reared: Resident Trout  
Steelhead

### Introduction

The Yakima Hatchery is located near the town of Yakima, adjacent to the Airport. Elevation of the facility is 1,060 feet above sea level. This hatchery is currently operated cooperatively with the Yakima Indian Nation (YIN). The trout program is state funded while steelhead and some trout are reared under funding from YIN. Fingerling trout were also produced under agreement (which ended in 1989) with Douglas County PUD. Resident trout make up the majority of production. This facility is staffed with 2 FTE's.

This facility is in poor to fair condition. The 10 circular ponds are in poor condition with 4 unusable. There are also 10 lower and 10 upper raceways in fair condition. The water supply has dwindled over the years and is of poor quality during summer months. The hatchery borders on the Yakima Airport and may eventually have to be closed due to airport expansion.

Adult steelhead are collected off-site and transported to this facility for spawning. Resident trout are imported as eggs or fingerlings from other hatcheries. Steelhead are reared for release in the Yakima Basin. Bacterial and parasitic diseases along with environmental problems make this hatchery difficult to manage.

Water rights total 9,876 gpm from 3 sources. Wide Hollow Creek (water right of 1,346 gpm) provides no water to hatchery because pipeline is not usable. Spring Creek (water right of 7,630 gpm) provides majority of the hatchery supply. The third source is a well (water right of 900 gpm). Water is re-used in troughs and raceways. A recirculation system is present but currently is not in use.

### Current Production Constraints

Available water is limiting production. Wide Hollow Creek water is too warm in summer and contains pathogens. Spring water supplies have dwindled and are not plumbed to raceways. Water quality is affected by agricultural practices. Well and spring water are both too warm for optimum smoltification.

Most circular ponds are in very poor condition with 4 unusable. Intake screen does not remove larval stages of outside fish species.

There are no suitable facilities for adult collection, holding, or spawning.

Vibration from air traffic has caused green egg losses in past. Airport expansion could affect site's future.

Theoretical Production

Theoretical production, average production, and 1987 agency goal is listed below.

	Steelhead Only	Hatchery Total
Theoretical Flow Method	25,128 lb	43,728 lbs
Average Production	74,176 lbs	125,676 lbs
1987 Agency Goal	3,619	52,225 lbs
	17,417 lbs	74,865 lbs

Theoretical calculations were computed as follows:

Flow Method

10 upper ponds:	11536 X 600 gpm X 8" =	6,528 lb *
10 lower raceways:	1.55 X 1,500 gpm X 8" =	18,600 lbs *
	raceways: X 1,500 gpm X 8"	<u>18,600 lbs</u>
		43,728 lbs

Density Method

10 upper ponds:	.25 X 2,098 cu ft X 8" X 6 ponds=	25,176 lbs *
10 lower raceways:	.25 X 24,500 cu ft X 8"	49,000 lbs *
	raceways: X 25,750 cu ft X 8" =	<u>51,500 lbs</u>
		125,676 lbs

\* WDW indicate that these ponds can be utilized for either steelhead or resident trout. Poundages calculated for these ponds have been used in Summary Table 12.

Comparison of the 2 theoretical calculations indicates that flow is probably the limiting factor in production. Production has exceeded theoretical flow calculation because of program succession.

The theoretical flow production listed above is for the April/May period. July/August production is constrained to 8,000 pounds of 4 inch fish based on flow and temperature.

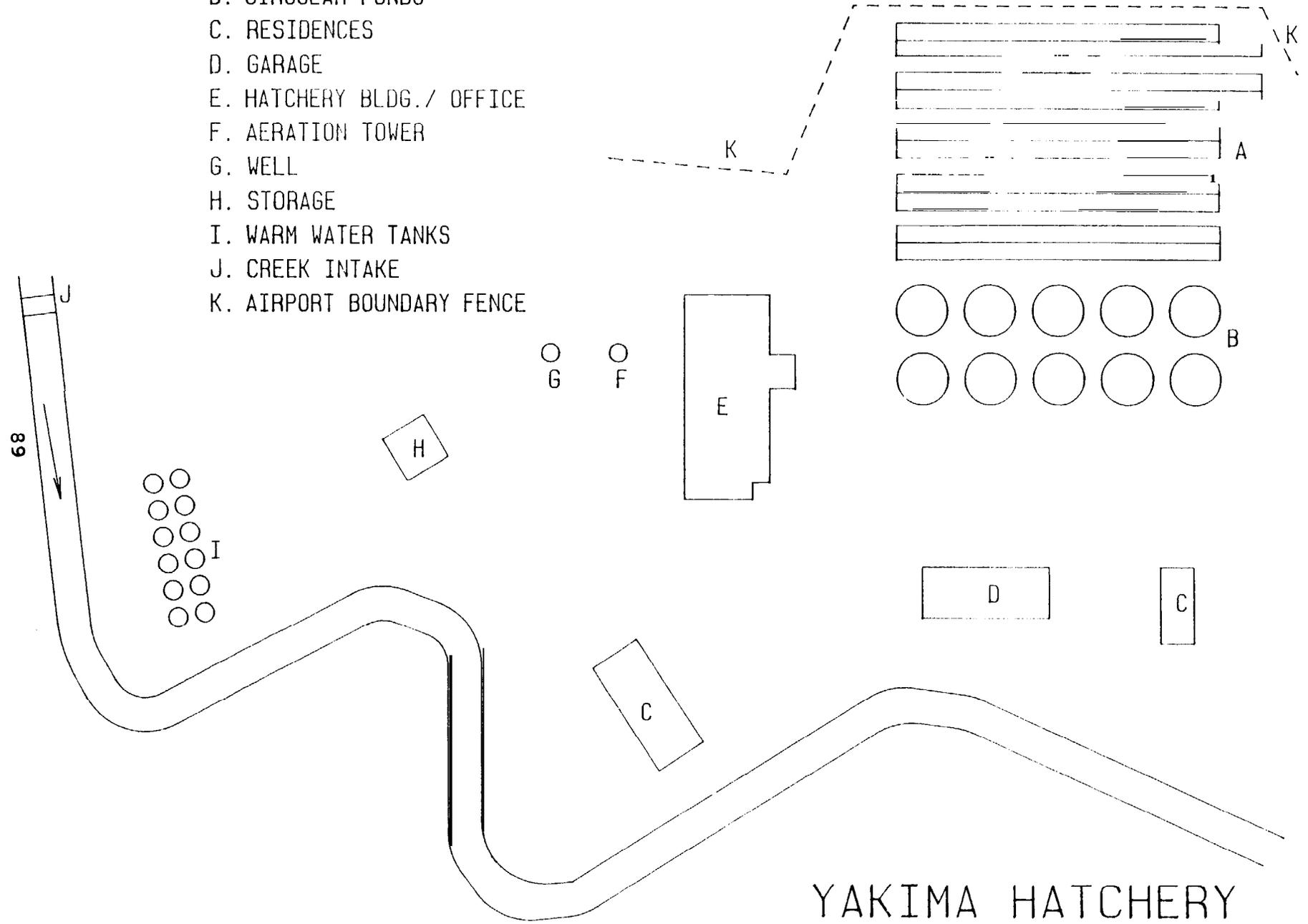
### Hatchery Expansion Capability

This facility is situated on 7 acres owned by WDW. The site is 100% in use with no room to expand. No additional water is available.

If the existing raceways and circular ponds were replaced with 2 rearing ponds, production could be increased by 30,000 pounds, but due to water quality constraints anadromous fish production is not recommended.

No expansion capability is identified.

- A. RACEWAYS
- B. CIRCULAR PONDS
- C. RESIDENCES
- D. GARAGE
- E. HATCHERY BLDG. / OFFICE
- F. AERATION TOWER
- G. WELL
- H. STORAGE
- I. WARM WATER TANKS
- J. CREEK INTAKE
- K. AIRPORT BOUNDARY FENCE



**YAKIMA HATCHERY  
EXISTING FACILITIES**

## LITERATURE CITED

- Piper, Robert G., Ivan B. McElwain, Leo E. Orme, Joseph P. McCararen, Laurie G. Fowler, and John R. Leonard. 1982. Fish Hatchery Management. United States Department of the Interior, Fish and Wildlife Service, Washington, D.C. 517 p.
- 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  
Washington Department Of Wildlife

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

Hatchery	Staffing in FTE's	Operation and Maintenance Costs		
		1985	1986	1987
Beaver Creek	7.3	239,302	211,620	219,634
Chelan PUD	3.2	146,758	137,761	144,370
Cottonwood Pond	0.25			
Cowlitz Trout	6.0	359,601	380,396	377,942
Curl Lake				
Dayton Pond	0.25			
Gobar Pond	0.25	8,000	8,000	8,000
Lyons Ferry	6.5	630,598	629,701	711,372
Naches	2.2	84,700	89,174	96,648
Nelson Springs		4,000	4,000	4,000
Ringold Trout	1.3	51,803	52,007	63,739
Skamania	5.0	200,868	186,985	229,947
Tucannon	2.3	84,641	132,347	124,672
Turtle Rock	1.0	27,231	26,056	33,970
Vancouver	3.0	110,256	115,023	143,061
Wells Trout	4.0	133,432	132,305	139,065
Yakima Trout	2.0	97,000	102,000	107,000

Summary Table 2. Initial Year Hatchery Operated, Land Available, Percent In Use, And Ownership For Facilities Operated By The Washington Department Of Wildlife Which Produce Anadromous Fish In The Columbia River Basin.

Hatchery	Initial Year of Operation	Land Available Acres	% in Use	Land Ownership
Beaver Creek	1957	44	20%	WDW
Chelan PUD	1965	4 Plus Well Field	80%	Chelan County PUD #1
Cottonwood Pond	1984	8.71	100%	COE
Cowlitz Trout	1967	600	20%	City of Tacoma
Curl Lake	1984	6.03	100%	COE
Dayton Pond	1987	7.13		COE
Gobar Pond	1975	8	100%	Weyerhauser Corp.
Lyons Ferry	1982	101.19	35%	COE
Naches	1922	46	60%	WDW
Nelson Springs	1958	1	40%	Suntide Corp.
Ringold Trout	1962	30	12%	US Bureau of Rec.
Skamania	1956	40	15%	WDW
Tucannon	1949	31.3	80%	COE
Turtle Rock	1970's	Small Island	10%	Chelan County PUD #1
Vancouver	1930's	42	40%	WDW
Wells Trout	1967			Douglas County PUD
Yakima Trout	1935	7	100%	WDW

**Summary Table 3. List Of The Existing Rearing Facilities For Each Hatchery Operated By The Washington Department Of Wildlife 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 Length	Dimension Width	Dimension Depth	Unit volume	No. of Units	Total Volume	Construction Mterial	Rearing Units Age	Units Condition	Comments
<b>Beaver Creek</b>											
	Buckets					320		Plastic	8	Fair	Used in troughs
	Circular Tanks	16		5	1,000	2	2,000	Fiberglass		Good	Not set up
	Earth Rearing Pond				217,800		217,800	Earth	10	Good	One surface acre
	Heath Type Incubators					4		Fiberglass	24	Fair	Add on system
	Holding Raceways	96.5	11.8	3.7	4,327	2	8,654	Concrete	32	Fair	Holding & rearing
	Intermediate Raceways	27.5	3.8	2.	209	10	2,090	Concrete	32	Fair	
	Lower Adult Trap				126		126	Concrete/Wbod	32	Fair	Adult trap only
	Production Raceways	79.5	9.8	2.2	1,636	20	16,360	Concrete	32	Fair	
	Smolt Trap	43.8	4.58	2.7	532	2	1,064	Concrete	10	Good	Smolt trap
	Troughs	16.4	1	0.5	8	40	8	Concrete	32	Fair	6 baskets/ trough
	Troughs	4.5	1.2	1	5	20	104	Fiberglass	20	Fair	Portable set up
	Upper Adult Trap				138		138	Concrete/Wbod	32	Fair	Adult trap only
<b>Chelan PUD</b>											
	Adult Raceway	72	10	5	3,600		3,600	Concrete	24	Good	Re-use water only
	Intermediate Raceways	28	3.8	2	214	8	1,712	Concrete	24	Good	Located indoors
	Shallow Troughs	14.3	1	0.5	7	80	576	Concrete	24	Good	In tandem
	Standard Raceways	89	9.7	2.7	2,308	16	36,928	Concrete	24	Good	2 batteries of 8
	Vinyl Lined Portables	80	8	2.6	1,651	2	3,302	Vinyl/steel	4	Good	Located indoors
<b>Cottonwood Pond</b>											
	1.25 Acre Earth Pond				380,000	1	380,000	Earth/concrete	5	Excellent	
<b>Cowlitz Trout</b>											
	"A" Series Raceways	87.8	20	3	5,270	8	42,160	Concrete	22	Fair	
	"B" Series Raceways	87.8	20	3	5,270	8	42,160	Concrete	22	Fair	
	"C" Series Raceways	87.8	20	3	5,270	8	42,160	Concrete	22	Fair	Riv. water/1st pass
	"F" Series Raceways	88.3	9.8	2.7	2,388	6	14,328	Concrete	22	Fair	1st pass well water
	5 Acre Ponds	1,450	160	7	1,624,000	4	6,496,000	Earth	22	Fair	
	Adult Raceways	158.8	10	5	7,940	3	23,820	Concrete	22	Fair	Not for rearing
	Buckets							Plastic	8	Fair	Used for culling
	Smolt Trap	49.7	10	2.7	1,343	2	2,686	Concrete	22	Fair	Not used to rear
	Troughs	14.4	1	0.5	7	104	750	Concrete	22	Fair	
<b>Curl Lake</b>											
	2.8 Acre Pond				700,000	1	700,000	Earth	5	Good	Inprint pond only
<b>Dayton Pond</b>											
	.8 Acre Pond				209,000	1	209,000	Asphalt	3	Very good	

Summary Table 3. Continued

Hatchery	Rearing Unit	Unit Length	Dimension Width	Dimension Depth	Unit Volume	No. of Units	Total Volume	Construction Material	Rearing Age	Units Condition	Comments
<b>Gobar Pond</b>											
	Rearing Pond	450	90	6	243,000	1	243,000	Earth		Fair	
	Smolt Trap	40	9	3	1,080	1	1,080	Concrete	15	Fair	
<b>Lyons Ferry</b>											
	2 Acre Earth Ponds	1,100	78	7.2	618,000	3	1,854,000	Earth/concrete	7	Good	Bottom paved/side liner
	Adult Raceways	84.4	10	5	4,221	3	12,663	Concrete	7	Good	
	Buckets					192		Plastic	7	Good	Used for incubation
	Intermediate Raceways	27.6	3.8	2	211	4	844	Concrete	7	Good	Used for incubation
	Production Raceways	88.5	9.7	3.3	2,873	19	54,587	Concrete	7	Good	
	Troughs	14.4	1	0.5	7	88	634	Concrete	7	Good	
<b>Naches</b>											
	Intermediate raceways	28	3.5	1.3	130	6	780	Concrete	50	Fair	
	Lower Serial Raceways	150	15	2	4,500	5	22,500	Rock wall/dirt	68	Poor	Considered one unit
	Raceways	37	8	1.7	506	3	1,518	Concrete	50	Fair	
	Raceways	150	15	2	4,500	3	13,500	Rock wall/dirt	68	Poor	Not usable
	Troughs	14.4	1	0.5	7	48	346	Concrete	41	Fair	
	Upper Serial Raceways	58	10	2	1,160	3	3,480	Rock wall/dirt	68	Poor	Considered one unit
<b>Nelson Springs Raceway</b>											
	Raceway	198	9.2	3.2	5,817	1	5,817	Wood and dirt		Fair	
<b>Ringold Trout</b>											
	4.8 Acre Rearing Pond				1,673,000	1	1,673,000	Earth	27	Fair	Inefficient pond
<b>Skamania</b>											
	Adult Holding Raceways	130.5	12	3.6	5,606	3	16,818	Concrete	33	Fair	Used also for rearing
	Buckets, 2.5 Gallon					200		Plastic	6	Fair	Not always used
	Intermediates	27	4	2	216	10	2,160	Concrete	33	Fair	
	Smolt Trap	12	8.8	2.2	230	1	230	Concrete	33	Fair	Short term holding
	Standard Raceways	76.5	10	2.5	1,913	32	61,216	Concrete	33	Fair	
	Troughs	14.4	1	0.5	8	80	624	Concrete	33	Good	
<b>Tucannon</b>											
	1.25 Acre Pond				318,920	1	318,920	Earth	21	Fair	
	40 Foot Circular Pond	40		2.2	2,660	6	15,960	Concrete	40	Good	Resurfaced in 1984-85
	Adult Holding/Rear Pd	115	15	4.4	7,611	1	7,611	Concrete	4	Good	Used by WDF-5 cfs riv
	Collection Raceway	88	9.7	2.8	2,428	2	4,856	Concrete	6	Good	Also used for rearing
	Troughs	14.4	1	0.5	8	40	320	Concrete	40	Good	Troughs are in tandem

Summary Table 3. Continued

Hatchery	Rearing Unit	Unit Length	Unit Dimension Width	Unit Dimension Depth	Unit Volume	No. of Units	Total Volume	Construction Material	Rearing Units Age	Rearing Units Condition	Comments
<b>Turtle Rock</b>											
	Spawning Chan. Section	200	36.2	4	29,000	4	116,000	Concr./gravel	14	Good	VDW uses 1 section
<b>Vancouver</b>											
	40 Foot Circular Ponds	40		2.1	2,613	12	31,356	Concrete	50	Fair	Restricted by water
	East Earth Pond	65	40	3	7,800	1	7,800	Earth	50	Fair	Re-use water/upper pd
	Old Raceway	83	10	2.67	2,216	1	2,216	Concrete	50	Fair	Re-use water
	Raceways	69.5	9.8	2	1,366	4	5,464	Concrete	16	Fair	Re-use water from pds
	Rearing Lake	210	150	8	282,000	1	282,000	Earth/Concrete	41	Fair	
	plus	150	50	4							
	Smolt Trap	112	9.6	2.5	2,682	1	2,682	Wood side	14	Fair	Not used for rearing
	Troughs	14.4	1	0.5	7	96	691	Concrete	36	Fair	Operate 56 at 1 time
	Upper Earth Pond	84	54	2.5	11,340	1	11,340	Earth	50	Fair	
	West Earth Pond	75	40	3	9,000	1	9,000	Earth	50	Poor	Not in use
<b>Wells Trout</b>											
	Adult Raceway	46.3	10	5.7	2,664	1	2,664	Concrete	22	Good	Not used for rearing
	Incubators					160		Fiberglass	22	Fair	20 stacks/8 trays each
	Intermediate Raceway	30.4	4	1.7	203	1	203	Aluminum	5	Good	Inside building
	New Raceways	89.2	9.6	2.7	2,281	4	9,124	Concrete	3	Good	
	Old Raceways	89.2	9.8	2.7	2,338	6	14,028	Concrete	22	Good	
	Portable Raceways	79.2	8	2.7	1,686	8	13,488	Vinyl lined	4	Fair	Used only for marking
	Rearing Pond #1	440	100	5	220,000	1	220,000	Earth/liner	22	Fair	Ponds 1-4 once 1 pond
	Rearing Pond #2	667	120	5	400,000	1	400,000	Earth/liner	22	Good	Ponds 1-4 once 1 pond
	Rearing Pond #3	520	100	5	260,000	1	260,000	Earth/liner	22	Good	Ponds 1-4 once 1 pond
	Rearing Pond #4	464	110	5	255,000	1	255,000	Earth/liner	22	Good	Ponds 1-4 once 1 pond
	Rearing Pd 1-3 Trap	43.3	6	4	1,040	1	1,040	Concrete	22	Fair	Not used for rearing
	Rearing Pond #4 Trap	40	6	4	960	1	960	Concrete	3	Fair	Not used for rearing
	Shallow Troughs	14.4		0.5	7	42	302	Concrete	22	Fair	Some spauling
<b>Yakima</b>											
	40 Foot Circulars	40		1.7	2,098	10	20,980		51	Poor	4 are unusable
	Lower Raceways	103.	10	2.5	2,575	10	25,750		51	Fair	
	Troughs	14.4	1	0.5	7	84	605	Concrete	51	Fair	
	Troughs	14.4	1	0.5	7	10	72	Aluminum	51	Fair	
	Upper Raceways	98	10	2.5	2,450	10	24,500		51	Fair	

\* Note: Rearing unit volumes above do not always add up correctly due to rounding errors when converting inches to tenths of feet in Length, width, and depth columns. Volumes provided by agencies 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 Washington Department Of Wildlife Which Rearing Anadromous Fish In The Columbia River Basin. All Flows Are Given In Gallons Per Minute (GPM).

Hatchery Permit #	Water Source	Date	Water Right	Water Available in GPM During Year			Comments
				GPM	Low flow	High Flow	
<b>Beaver Creek</b>							
3349	2 Wells	12/10/57	1,650	380	450	448	Fish rearing & domestic
7419	Beaver Creek	12/16/55	8,977	45	8,977	5,835	Mid November to mid May
9453	Elochoman River	12/03/64	898				Fish Propagation
7419	Elochoman River	12/16/55	4,488	5,386	5,386	5,386	Mid May to mid November
		<b>Total</b>	<b>16,013</b>	<b>5,811</b>	<b>14,813</b>	<b>11,669</b>	
<b>Chelan PUD</b>							
S4 26814A	Columbia River	06/11/80	7,181				Fish Propagation
	Spring			400	600	500	Fish Propagation
G3 21143	Well	05/11/73	7,181	2,500	2,500	2,500	Fish Propagation
G6419	Wells	09/11/63	450				Fish Prop. & Domestic
		<b>Total</b>	<b>14,812</b>	<b>2,900</b>	<b>3,100</b>	<b>3,000</b>	
<b>Cottonwood Pond</b>							
S3-27704C	Cottonwood Creek	12/01/83	2,693	1,795	2,693	2,244	Fish Propagation
G3-27662C	Well	08/23/83	20				Domestic supply
		<b>Total</b>	<b>2,713</b>	<b>1,795</b>	<b>2,693</b>	<b>2,244</b>	
<b>Cowlitz Trout</b>							
G6334	2 North Wells	03/28/69	860	270	480	370	Fish Propagation
G633 1	9 South Wells	02/07/69	4,861	990	1,960	1,500	Fish Propagation
S10453C	Cowlitz River	09116168	25,134	24,000	24,000	24,000	Fish Propagation
		<b>Total</b>	<b>30,855</b>	<b>25,260</b>	<b>26,440</b>	<b>25,870</b>	
<b>Curl Lake</b>							
S3-27767C	Tucannon River	01/20/84	2,693	4,488	4,488	4,488	Fish Propagation
		<b>Total</b>	<b>2,693</b>	<b>4,488</b>	<b>4,488</b>	<b>4,488</b>	
<b>Dayton Pond</b>							
S3-28263	Touchet Rive	01/01/87	2,693	2,400	2,900	2,693	Fish Propagation
		<b>Total</b>	<b>2,693</b>	<b>2,400</b>	<b>2,900</b>	<b>2,693</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>Gobar Pond</b>							
S2-23782C	Gobar Creek	04/21/75	3,142			3,142	Fish Propagation
			.....				
		<b>Total</b>	<b>3,142</b>	<b>0</b>	<b>0</b>	<b>3,142</b>	
<b>Lyons Ferry</b>							
G3-26489C	3 Wells	12/06/79	26,200	22,100	22,100	22,100	Fish Propagation
G3-26147C	6 Wells	01/27/79	27,000	27,000	27,000	27,000	Domestic/Fish/Fire
			.....	.....	.....	.....	
		<b>Total</b>	<b>53,200</b>	<b>49,100</b>	<b>49,100</b>	<b>49,100</b>	
<b>Naches</b>							
G427311P	Infiltration Trench	02/13/81	900	500	900	800	Fish Propagation
S414297C	Spring	04/22/57	538	0	0	0	Fish Propagation
S414295C	Spring	04/22/57	449	0	0	0	Fish Propagation
S409225C	Spring	11/25/49	898	0	0	0	Fish Prop./Domestic
S414296C	Spring	04/22/57	538	0	0	0	Fish Propagation
G428156P	Sump	03/02/84	900	500	900	800	Fish Propagation
			.....	.....	.....	.....	
		<b>Total</b>	<b>4,223</b>	<b>1,000</b>	<b>1,800</b>	<b>1,600</b>	
<b>Nelson Springs Raceway</b>							
S4-01206C	Unnamed Stream	02/06/58	3,591			2,244	Fish Propagation
			.....	.....	.....	.....	
		<b>Total</b>	<b>3,591</b>	<b>0</b>	<b>0</b>	<b>2,244</b>	
<b>Ringold Trout</b>							
S3-00408C	Ringold Spring	04/17/61	13,465				Fish Propagation
S3-27815P	Ringold Spring	04/20/84	6,732	1,150	1,600	1,400	Fish Propagation
S3-27816P	Ringold Spring	04/26/84	6,732				Fish Propagation
			.....	.....	.....	.....	
		<b>Total</b>	<b>26,929</b>	<b>1,150</b>	<b>1,600</b>	<b>1,400</b>	
<b>Skamania</b>							
9511	N.F. Washougal River	11/19/53	8,977	6,400	10,500	9,000	Fish Propagation
9512	Vogel Creek	11/19/53	2,693	250	960	800	Fish Propagation
			.....	.....	.....	.....	
		<b>Total</b>	<b>11,670</b>	<b>6,650</b>	<b>11,460</b>	<b>9,800</b>	

Summary Table 4. Continued

Hatchery Permit #	Water Source	Date	Water Right	Water Available in GPM During Year			Comments
				GPM	Low Flow	High Flow	
<b>Tucannon</b>							
5050	Springs	04/29/83	1,122	898	1,571	1,257	Fish Propagation
6560	Tucannon River	12/16/55	1,795				Fish Propagation
11437	Tucannon River	02/03/70	5,386	7,181	7,181	7,181	Fish Propagation
G3-28233	Well No. 2	10/17/86	600	898	898	898	Fish Propagation
G3-27674C	Well No. 3	10/04/83	300	400	400	400	Fish Propagation
			-----	-----	-----	-----	
		Total	9,203	9,377	10,050	9,736	
<b>Turtle Rock</b>							
S321142C	Columbia River	05/11/73	3,591	3,366	3,366	3,366	Fish Propagation
			-----	-----	-----	-----	
		Total	3,591	3,366	3,366	3,366	
<b>Vancouver</b>							
S2-09596C	Spring	05/12/50	898	200	380	300	Fish Prop./Domestic
02499C	Spring	09/27/50	2,693	850	1,150	1,000	Fish Propagation
S2-04460C	Spring	09/08/37	36				Fish Prop./Domestic
G2-22597C	Well	05/29/74	300	250	300	280	Fish Propagation
			-----	-----	-----	-----	
		Total	3,927	1,300	1,830	1,580	
<b>Wells Trout</b>							
	13 Wells			13,000	13,000	13,000	Fish Propagation
	Columbia River			10,772	10,772	10,772	Fish Propagation
			-----	-----	-----	-----	
		Total		23,772	23,772	23,772	
<b>Yakima Trout</b>							
S4-04222C	Spring Creek	05/01/36	3,142	380	500	400	Fish Propagation
S4-09492C	Spring Creek	03/29/50	4,488	800	1,800	1,500	Fish Propagation
G4-10415C	Well	09/18/69	900	600	600	600	Fish Propagation
S4-21397A	Wide Hollow Creek	01/13/69	1,346	0	0	0	Fish Propagation
			-----	-----	-----	-----	
		Total	9,876	1,780	2,900	2,500	

Summary Table 5. Summary Of Water Used By Hatcheries Operated By The Washington Department Of Uildlife 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	Delivery	Average		High Flow		Low Flow		Highest Water		Lowest Water	
Water Source	Method	Flow	Temp.	Volume	Mnth	Volume	Mnth	Temp.	Mnth	Temp.	Mnth
<b>Beaver Creek</b>											
2 Wells	Pumped	448	51	450	January	380	May	51	Constant	51	Constant
Beaver Creek	Gravity	5,835	52	8,977	January	45	September	72	August	36	January
Elochoman River	Pumped		52					72	August	36	January
Elochoman River	Pumped	5,386	52	5,386	January	5,386	September	72	August	36	January
<b>Chelan PUD</b>											
Columbia River	Pumped		45					65	August	37	February
Spring	Pumped	500	54	600	February	400	August	57	August	52	January
Well	Pumped	2,500	53	2,500	Constant	2,500	Constant	56	November	50	May
Wells	Pumped		53		Constant		Constant	56	November	50	May
<b>Cottonwood Pond</b>											
Cottonwood Creek	Gravity	2,244	48	2,693	March	1,795	May	53	May	43	February
Well	Pumped										
<b>Cowlitz Trout</b>											
2 North Wells	Pumped	370	50	480	December	270	July	53	Sept/Oct	48	April/May
9 South Wells	Pumped	1,500	49	1,960	June	990	September	50	October	48	April/May
Cowlitz River	Pumped	24,000	49	24,000	Constant	24,000	Constant	58	August	39	February
<b>Curl Lake</b>											
Tucannon River	Gravity	4,488	46	4,488		4,488		50	May	43	February
<b>Dayton Pond</b>											
Touchet River	Gravity	2,693	50	2,900	March	2,400	May	56	May	38	February
<b>Gobar Pond</b>											
Gobar Creek	Gravity	3,142	48					56	May	42	February
<b>Lyons Ferry</b>											
3 Wells	Pumped	22,100	52	22,100	Constant	22,100	Constant	53	May	51	November
6 Wells	Pumped	27,000	52	27,000	Constant	27,000	Constant	53	May	51	November

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>Naches</b>												
Infiltrat.	Trench	Pumped	800	53	900	September	500	July	57		46	
Spring		Gravity	0	53	0	July	0	January	60		47	
Spring		Gravity	0	53	0	July	0	January	60		47	
Spring		Gravity	0	53	0	July	0	January	60		47	
Spring		Gravity	0	53	0	July	0	January	60		47	
Sump		Pumped	800	53	900	September	500	July	57		49	
<b>Nelson Springs Raceway</b>												
Unnamed	Stream	Gravity	2,244	53		July		February	59	August	48	January
<b>Ringold Trout</b>												
Ringold	Spring	Gravity		60		September			60	September	38	January
Ringold	Spring	Gravity	1,400	60	1,600	September	1,150		60	September	38	January
Ringold	Spring	Gravity		60		September			60	September	38	January
<b>Skamania</b>												
N. F.	Washougal R.	Gravitv	9,000	50	10,500	December	6,400	Aug/Sept.	68	Aug/Sept	29	Jan/Feb
Vogel	Creek	Gravity	800	50	960	December	250	Aug/Sept.	64	Aug/Sept	33	Jan/Feb
<b>Tucannon</b>												
Springs		Pumped	1,257	52	1,571	Nov-March	898	September	52	Constant	52	Constant
Tucannon	River	Gravity		50		March		August	68	August	32	January
Tucannon	River	Gravity	7,181	50	7,181	March	7,181	August	68	August	32	January
Well No. 2		Pumped	898	61	898	Constant	898	Constant	61	Constant	61	Constant
Well No. 3		Pumped	400	59	400	Constant	400	Constant	59	Constant	59	Constant
<b>Turtle Rock</b>												
Columbia	River	Pumped	3,366	45	3,366	Constant	3,366	Constant	65	August	37	February
<b>Vancouver</b>												
Spring		Gravity	300	52	380	January	200	August	55	July	50	January
Spring		Gravity	1,000	52	1,150	January	850	August	55	July	50	January
Spring		Gravity		52		January		August	57	July	49	January
Uell		Pumped	280	52	300	Varies	250	Varies	52	Constant	52	Constant
<b>Wells Trout</b>												
13 Wells		Pumped	13,000	52	13,000	Constant	13,000	Constant	58	October	47	April
Columbia	River	Gravity	10,772	52	10,772	Constant	10,772	Constant	73	August	33	January

Summary Table 5. Continued

Hatchery		Delivery	Average		High Flow		Low Flow		Highest Water		Lowest Water	
Water	Source	Method	Flow	Temp.	Volume	Month	Volume	Month	Temp.	Month	Temp.	Month
<b>Yakima Trout</b>												
	Spring Creek	Gravity	400	54	500	November	380	July	60	July	54	January
	Spring Creek	Gravity	1,500	53	1,800	March	800	July	74	July	47	January
	Well	Pumped	600	60	600	Constant	600	Constant	60	Constant	60	Constant
	Wide Hollow Cr.	Gravity	0		0		0					

Summary Table 6. Adult Return Information For Hatcheries Operated By The Washington Department Of Wildlife Which Rear Anadromous Fish In The Columbia River Basin. Adult Holding Inflow Is Given In Gallons per Minute (GPM).

Hatchery	Brood	Adult	Holding		Adult	Returns		No. Femles	Adult	Adult	
Species	Stock	Year	Inflow	Period	Males	Females	Jacks	Total	Spawned	Mrts.	Releases
<b>Beaver Creek</b>											
<b>Searun Cutthroat</b>											
Elochoman		1984	1,500	Nov. - Feb.				1,245	203		
Elochoman		1985	1,500	Nov. - Feb.				1,031	228		
Elochoman		1986	1,500	Nov. - Feb.				751	268		
<b>Winter Steelhead</b>											
Elochoman		1984	1,500	Dec. - Feb.				2,165	477		
Elochoman		1985	1,500	Dec. - Feb.				2,044	250		
Elochoman		1986	1,500	Dec. - Feb.				1,214	367		
<b>Cowlitz Trout</b>											
<b>Searun Cutthroat</b>											
Cowlitz		1983	1,000	Sept. - Jan.				3,359	404	165	2,681
Cowlitz		1984	1,000	Sept. - Jan.	719	577		1,296	348		4,344
Cowlitz		1985	1,000	Aug. - Jan.	740	645		1,385	499	32	1,084
<b>Summer Steelhead</b>											
Cowlitz		1984	1,000	July- Feb.	255	383		638	161	128	396
Cowlitz		1985	1,000	July- Feb.	327	322		649	130	18	813
Cowlitz		1986	1,000	July- Jan.	200	301		501	121	3	516
<b>Winter Steelhead</b>											
Cowlitz	Earlies	1984	1,000	Nov. - Feb.	1,052	711		1,763	365	36	1,266
Cowlitz	Earlies	1985	1,000	Nov. - Feb.	396	703		1,099	363		1,194
Cowlitz	Earlies	1986	1,000	Dec. - Jan.	622	570		1,192	321	51	932
Cowlitz	Lates	1984	1,000	April- May	124	191		315	32	8	
Cowlitz	Lates	1985	1,000	April- May	24	36		60	22		
Cowlitz	Lates	1986	1,000	April- May				401	30		
<b>Lyons Ferry</b>											
<b>Summer Steelhead</b>											
Lyons Ferry		1986	1,800	August- March			3		361	78	1,478
<b>Ringold Trout</b>											
<b>Summer Steelhead</b>											
Ringold		1984						138			
Ringold		1985	4,500	July- Sept.				604			
Ringold		1986	4,500	July- Sept.				547			
<b>Skamania</b>											
<b>Summer Steelhead</b>											
Skamania		1984	3,800	May- Feb.	556	769		1,325	440		
Skamania		1985	3,800	May- Feb.				2,987	560		
Skamania		1986	3,800	May- Feb.	824	1,446		2,270	490		
<b>Winter Steelhead</b>											
Wahougal		1984	3,800	Dec. - Feb.	667	344	26	1,037	120		
Wahougal		1985	3,800	Dec. - Feb.				153	40		46
Wahougal		1986	3,800	Dec. - Feb.				493	78		

Summary Table 6. Continued

Hatchery	Stock	Brood Year	Adult Inflow	Holding Period	Males	Adult Females	Returns Jacks	Total	No. Spawned	Females Mrts.	Adult Releases
<b>Wells Trout</b>											
<b>Summer Steelhead</b>											
	Wells	1984	2,700	Aug. - April				673	371		4
	Wells	1985	2,700	Aug. - Feb.				690	362		18
	Wells	1986	2,700	Aug. - Feb.	333	417		750	375		3
<b>Yakima</b>											
<b>Summer Steelhead</b>											
	Ringold	1984		June - Feb.	41	80	17	138	68		24 40
	Ringold	1985		July - Feb.				604	380		12 52
	Yakima	1986		Sept - April				130	61		12 47

Summary Table 7. Total Egg Take And Fish Poned For Hatcheries Operated By The Washington Department Of Wildlife Which Rear Anadromous Fish In The Columbia River Basin.

Hatchery	# Female	Spawning	Dates	Release	Egg	Egg Transfers	Fingerlings	Poned	Transfer			
Species	Stock	Spawned	Begin	End	Year	Take	In	out	No.	Date	Fish	In
<b>Beaver Creek</b>												
Searun Cutthroat												
Elochomn	203	12/20/83	02/01/84	1985	163,848				104,984	March	1984	
Elochomn	228	12/19/84	01/30/85	1986	215,000				182,773	Feb.	1985	
Elochomn	268	01/23/86	02/12/86	1987	274,000				124,357	March	1986	
Summer Steelhead												
Skannia				1985		128,444			119,156	March	1984	
Skannia				1986		149,940			149,240	March	1985	
Skannia				1987		137,664			117,664	March	1986	
Winter Steelhead												
Elochomn	477	12/20/83	02/08/84	1985	1,187,000				833,550	March	1984	51,000
Elochomn	250	12/19/84	02/14/85	1986	980,000				851,000	March	1985	
Elochomn	367	01/22/86	02/12/86	1987	1,300,000				1,195,220	March	1986	
Elochomn X Kalama				1987	120,000				117,000	March	1986	
<b>Chelan PUD</b>												
Summer Steelhead												
Wells				1985		249,920			243,827	March	1984	
Wells				1986		246,843			238,137	Feb.	1985	
Wells				1987		266,400			255,600	Feb.	1986	
<b>Cottonwood Pond</b>												
Summer Steelhead												
Wallowa				1985						March	1985	127,919
Wallowa				1986						March	1986	124,200
Wallowa				1987						March	1987	201,081
<b>Cowlitz Trout</b>												
Searun Cutthroat												
Cowlitz	404	11/29/83	12/13/83	1985	400,000		61,056		297,741	Dec.	1983	
Cowlitz	348	11/28/84	12/17/84	1986	352,368		63,360		235,065	Dec.	1984	
Cowlitz	499	11/25/85	01/06/86	1987	468,000		55,400		327,286	Dec.	1985	
Summer Steelhead												
Cowlitz	161	12/20/83	02/07/84	1985	684,502				595,826	June	1984	
Cowlitz	130	12/18/84	02/06/85	1986	612,400				512,546	Jan.	1985	
Cowlitz	121	01/13/86	01/28/86	1987	537,400				494,721	Feb.	1986	
Winter Steelhead												
Cowlitz	365	12/20/83	02/01/84	1985	1,697,302				1,606,357	Jan.	1984	
Cowlitz	363	12/18/84	02/19/85	1986	1,957,017		146,048		1,605,159	June	1985	
Cowlitz	321	12/23/85	01/29/86	1987	1,802,800				1,689,671	Jan.	1986	
Cowlitz	32	05/07/84	05/07/84	1985	109,944				96,048	June	1984	
Cowlitz	22	05/07/85	05/07/85	1986	132,000				93,285	June	1985	
Cowlitz	30	05/13/86	05/13/86	1987	150,000				179,308	June	1986	

Summary Table 7. Continued

Hatchery Species	Stock	# Female Spawned	Spawning Begin	Dates End	Release Year	Egg Take	Egg Transfers In out	Fingerlings No.	Ponded Date	Transfer Of Fish In
<b>Curl Lake</b>										
<b>Summer Steelhead</b>										
	Lyons Ferry				1987				March 1987	162,135
	Uallowa				1985				March 1985	156,062
	Uallowa				1986				March 1986	40,465
	Uells				1986				March 1986	100,826
<b>Dayton Pond</b>										
<b>Summer Steelhead</b>										
	Lyons Ferry				1987				April 1987	34,677
	Uells				1987				March 1987	102,050
<b>Lyons Ferry</b>										
<b>Summer Steelhead</b>										
	Lyons Ferry	361	02/11/86	03/17/86	1987	705,000		702,256	March 1986	
	Uallowa				1985		830,453	795,653	May 1984	100,310
	Uallowa				1986		377,770	348,360	May 1985	
	Uallowa				1987		449,952	391,303	May 1986	
	Wells				1985		373,648	340,339	March 1984	
	Wells				1986		471,200	451,670	March 1985	114,326
	Wells				1987		464,800	433,800	March 1986	
<b>Nelson Springs Raceway</b>										
<b>Summer Steelhead</b>										
	Ringold				1986				December 1985	70,675
	Skannia				1986				December 1985	42,615
	Uells				1985				December 1984	111,700
	Yakim River				1987				December 1986	86,260
<b>Ringold Trout</b>										
<b>Summer Steelhead</b>										
	Ringold				1985				October 1984	130,234
	Ringold				1986				Sept. 1985	224,942
	Ringold				1987				Sept. 1986	210,641
<b>Skannia</b>										
<b>Searun Cutthroat</b>										
	Cowlitz				1985		61,056	54,892	Jan. 1984	
	Cowlitz				1986		63,360	62,018	Feb. 1985	
	Cowlitz				1987		55,400	54,408	Feb. 1986	

Summary Table 7. Continued

Hatchery Species	Stock	# Female Spawmed	Spawning Dates Begin End	Release Year	Egg Take	Egg Transfers In out	Fingerlings Poned No. Date	Transfer Of Fish In
<b>Skamania - Continued</b>								
<b>Summer Steelhead</b>								
Skamania		440	12/14/83 02/08/84	1985	1,747,500	1,208,766	329,868 March 1984	
Skamania		560	12/27/84 03/06/85	1986	2,206,400	1,207,747	99,841 March 1985	
Skamania		490	12/15/85 01/31/86	1987	1,942,400	1,276,391	260,413 March 1986	443,776
<b>Winter Steelhead</b>								
Cowlitz				1986		45,824	44,872 April 1985	90,288
Uashougal		120	01/04/84 02/02/84	1985	451,000	217,038	178,811 June 1984	
Uashougal		40	01/09/85 02/27/85	1986	136,000	120,258	142,434 June 1985	
Uashougal		78	01/01/86 02/28/86	1987	300,000	201,132	42,132 March 1986	162,945
<b>Vancouver</b>								
<b>Summer Steelhead</b>								
Skamania				1985		1,075,822	1,031,822 March 1984	
Skamania				1986		904,808	984,780 March 1985	
Skamania				1987		1,064,999	1,003,399 March 1986	
<b>Winter Steelhead</b>								
Cowlitz				1985		100,224	88,224 April 1984	
Uashougal				1985		120,258	106,388 March 1984	
Uashougal				1986		201,132	186,582 April 1984	
Uashougal				1987		220,608	205,000 March 1987	
<b>Wells Trout</b>								
<b>Summer Steelhead</b>								
Wells		371	01/11/84 04/13/84	1985	1,966,233	919,296	864,266 Feb. 1984	
Wells		362	01/02/85 02/27/85	1986	2,234,560	718,843	1,150,000 March 1985	
Wells		375	12/30/85 03/03/86	1987	2,209,000	731,200	1,240,000 March 1986	
<b>Yakima</b>								
<b>Summer Steelhead</b>								
Ringold		68	12/28/83 03/15/84	1985	276,602		208,502 March 1984	
Ringold		380	12/26/84 02/15/85	1986	1,468,930	710,499	522,711 January 1985	
Yakima		61	01/07/86 04/01/86	1987	335,329		281,296 Feb-April 86	

Summary Table 8. Releases And Hatchery Production Goals For Each Hatchery Operated By The Washington Department Of Fisheries Which Reared Anadromous Fish In The Columbia River Basin In 1985.

Hatchery	Smolt	Releases	Fingerling	Releases	Transfers	Smolt	Production Goal	Nonsmolt	Goal	
Species	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
<b>Beaver Creek</b>										
Searun Cutthroat										
Elochomn	65,915	13,431			7,200	800	95,000	23,750		
Summer Steelhead										
Skamnia	32,995	4,750			18,080	1,910	60,000	10,000	30,000	3,750
Winter Steelhead										
Chanbers Creek	19,976	2,350			21,000	2,000				
Elochomn	344,914	67,110			109,732	14,065	387,000	64,500	80,000	10,000
<b>TOTAL</b>	<b>463,800</b>	<b>87,641</b>	<b>0</b>	<b>0</b>	<b>156,012</b>	<b>18,775</b>	<b>542,000</b>	<b>98,250</b>	<b>110,000</b>	<b>13,750</b>
<b>Chelan PUD</b>										
Summer Steelhead										
Skamnia					84,325	7,953				
Wells	216,825	40,910					195,000	32,500		
<b>TOTAL</b>	<b>216,825</b>	<b>40,910</b>	<b>0</b>	<b>0</b>	<b>84,325</b>	<b>7,953</b>	<b>195,000</b>	<b>32,500</b>	<b>0</b>	<b>0</b>
<b>Cottonwood Pond</b>										
Summer Steelhead										
Wallowa	127,946	23,263					127,900	21,316		
<b>TOTAL</b>	<b>127,946</b>	<b>23,263</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>127,900</b>	<b>21,316</b>	<b>0</b>	<b>0</b>
<b>Cowlitz Trout</b>										
Searun Cutthroat										
Cowlitz	130,371	23,449	12,240	102	41,410	2,020	80,000	20,000		
Summer Steelhead										
Cowlitz	230,349	40,307	149,464	3,363	59,580	5,728	220,000	36,667		
Winter Steelhead										
Cowlitz Earlies	838,384	142,948	62,975	793	27,180	1,510	700,000	116,667		
Cowlitz Lates	59,679	9,730	38,769	285			50,000	8,333		
<b>TOTAL</b>	<b>1,258,783</b>	<b>216,434</b>	<b>263,448</b>	<b>4,543</b>	<b>128,170</b>	<b>9,258</b>	<b>1,050,000</b>	<b>181,667</b>	<b>0</b>	<b>0</b>
<b>Curl Lake</b>										
Summer Steelhead										
Wallowa	154,606	27,123					150,000	25,000		
<b>TOTAL</b>	<b>154,606</b>	<b>27,123</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>150,000</b>	<b>25,000</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>Gobar Pond</b>											
<b>Summer Steelhead</b>											
	Skamania	59,245	10,261					60,000	10,000		
<b>Winter Steelhead</b>											
	Elochonn	60,440	10,468					60,000	10,000		
<b>TOTAL</b>		<b>119,685</b>	<b>20,729</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>120,000</b>	<b>20,000</b>	<b>0</b>	<b>0</b>
<b>Lyons Ferry</b>											
<b>Summer Steelhead</b>											
	Lyons Ferry							17,333			
	Willowa	164,935	22,928			663,334	84,276	160,000	20,000	660,000	66,000
	Wells	341,542	70,369					300,000	50,000		
<b>TOTAL</b>		<b>506,477</b>	<b>93,297</b>	<b>0</b>	<b>0</b>	<b>663,334</b>	<b>84,276</b>	<b>477,333</b>	<b>70,000</b>	<b>660,000</b>	<b>66,000</b>
<b>Naches</b>											
<b>Summer Steelhead</b>											
	Wells			8,316	154	111,700	9,308			105,000	5,250
<b>TOTAL</b>		<b>0</b>	<b>0</b>	<b>8,316</b>	<b>154</b>	<b>111,700</b>	<b>9,308</b>	<b>0</b>	<b>0</b>	<b>105,000</b>	<b>5,250</b>
<b>Nelson Springs Raceway</b>											
<b>Summer Steelhead</b>											
	Wells	89,970	15,000					100,000	16,666		
<b>TOTAL</b>		<b>89,970</b>	<b>15,000</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>100,000</b>	<b>16,666</b>	<b>0</b>	<b>0</b>
<b>Ringold Trout</b>											
<b>Summer Steelhead</b>											
	Ringold	112,001	17,500					180,000	30,000		
<b>TOTAL</b>		<b>112,001</b>	<b>17,500</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>180,000</b>	<b>30,000</b>	<b>0</b>	<b>0</b>
<b>Skamania</b>											
<b>Searun Cutthroat</b>											
	Cowlitz	38,765	3,198					35,000	7,778		
<b>Summer Steelhead</b>											
	Skamania	349,588	47,264	285,400	a20	100,303	8,144	350,000	58,333	100,000	10,000
<b>Winter Steelhead</b>											
	Uashougal	74,846	9,799					135,000	22,500		
<b>TOTAL</b>		<b>463,199</b>	<b>60,261</b>	<b>285,400</b>	<b>a20</b>	<b>100,303</b>	<b>a, 144</b>	<b>520,000</b>	<b>88,611</b>	<b>100,000</b>	<b>10,000</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>Turtle Rock</b>											
Summer Steelhead											
	Skamania	88,875	13,150					200,000	33,333		
	<b>TOTAL</b>	88,875	13,150	0	0	0	0	200,000	33,333	0	0
<b>Vancouver</b>											
Summer Steelhead											
	Skamania	116,094	24,864			681,547	4,340	125,000	20,833	550,000	3,667
Winter Steelhead											
	Cowlitz					90,288	304			80,000	533
	Wahouga l					142,434	523			100,000	667
	<b>TOTAL</b>	116,094	24,864	0	0	914,269	5,167	125,000	20,833	730,000	4,867
<b>Wells Trout</b>											
Summer Steelhead											
	Wells	449,051	66,878	109,008	11,495			450,000	75,000	50,000	10,000
	<b>TOTAL</b>	449,051	66,878	109,008	11,495	0	0	450,000	75,000	50,000	10,000
<b>Yakim Trout Hatchery</b>											
Summer Steelhead											
	Ringold					158,160	300			150,000	500
	<b>TOTAL</b>	0	0	0	0	158,160	300	0	0	150,000	500

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

Hatchery		Smolt Releases		Fingerling Releases		Transfers		Smolt Production Goal		Nonsmolt Goal	
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
<b>Beaver Creek</b>											
Searun Cutthroat											
	Elochoman	108,121	23,705	15,478	710	6,750	900	95,000	23,750		
Summer Steelhead											
	Skamania	82,998	15,320			37,429	3,162	60,000	10,000	25,000	3,125
Winter Steelhead											
	Elochoman	500,274	99,013			125,916	13,325	385,000	64,167	125,000	15,625
	<b>TOTAL</b>	<b>691,393</b>	<b>138,038</b>	<b>15,478</b>	<b>710</b>	<b>170,095</b>	<b>17,387</b>	<b>540,000</b>	<b>97,917</b>	<b>150,000</b>	<b>18,750</b>
<b>Chelan PUD</b>											
Summer Steelhead											
	Ringold					192,206	9,610				
	Wells	201,105	36,550					195,000	32,500		
	<b>TOTAL</b>	<b>201,105</b>	<b>36,550</b>	<b>0</b>	<b>0</b>	<b>192,206</b>	<b>9,610</b>	<b>195,000</b>	<b>32,500</b>	<b>0</b>	<b>0</b>
<b>Cottonwood Pond</b>											
Summer Steelhead											
	Wallowa	124,077	26,908					124,000	20,667		
	<b>TOTAL</b>	<b>124,077</b>	<b>26,908</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>124,000</b>	<b>20,667</b>	<b>0</b>	<b>0</b>
<b>Cowlitz Trout</b>											
Searun Cutthroat											
	Cowlitz	60,763	8,587	29,133	2,190			80,000	20,000		
Summer Steelhead											
	Cowlitz	126,657	19,353	3,647	2,200			220,000	36,667		
Winter Steelhead											
	Cowlitz Earlies	479,603	75,657	65,986	2,421			700,000	116,667		
	Cowlitz Lates	51,415	10,600	24,960	520			50,000	8,333		
	<b>TOTAL</b>	<b>718,438</b>	<b>114,197</b>	<b>123,726</b>	<b>7,331</b>	<b>0</b>	<b>0</b>	<b>1,050,000</b>	<b>181,667</b>	<b>0</b>	<b>0</b>
<b>Curl Lake</b>											
Summer Steelhead											
	Wallowa	40,494	7,362					40,000	6,666		
	Wells	100,574	18,287					100,000	16,667		
	<b>TOTAL</b>	<b>141,068</b>	<b>25,649</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>140,000</b>	<b>23,333</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>Gobar Pond</b>					
S - r Steelhead Skamania	59,969 11,528			60,000 10,000	
Winter Steelhead Elochoman	66,815 12,845			60,000 10,000	
<b>TOTAL</b>	<b>126,784 24,373</b>	<b>0 0</b>	<b>0 0</b>	<b>120,000 20,000</b>	<b>0 0</b>
<b>Lyons Ferry</b>					
S - r Steelhead Wallowa	71,050 12,020		241,264 22,006	71,000 11,833	241,000 21,900
Wells	491,229 84,422		100,826 14,039	490,000 81,666	100,000 14,084
<b>TOTAL</b>	<b>562,279 96,442</b>	<b>0 0</b>	<b>342,090 36,045</b>	<b>561,000 93,499</b>	<b>341,000 35,984</b>
<b>Naches</b>					
S - r Steelhead Ringold			75,175 5,423		105,000 5,250
Skamania			42,615 3,043		
<b>TOTAL</b>	<b>0 0</b>	<b>0 0</b>	<b>117,790 8,466</b>	<b>0 0</b>	<b>105,000 5,250</b>
<b>Nelson Springs Raceway</b>					
Summer Steelhead Ringold	66,100 11,396			100,000 16,667	
Skamania	42,530 7,332				
<b>TOTAL</b>	<b>108,630 18,728</b>	<b>0 0</b>	<b>0 0</b>	<b>100,000 16,667</b>	<b>0 0</b>
<b>Ringold Trout</b>					
S - r Steelhead Ringold	192,081 37,180			180,000 30,000	
<b>TOTAL</b>	<b>192,081 37,180</b>	<b>0 0</b>	<b>0 0</b>	<b>180,000 30,000</b>	<b>0 0</b>
<b>Skamania</b>					
Searun Cutthroat Cowlitz	43,715 8,246			35,000 7,778	
Summer Steelhead Skamania	414,954 60,434	21,508 172	132,797 10,174	350,000 58,333	140,000 14,000
Winter Steelhead Cowlitz	68,325 10,188	78,400 1,103	20,950 1,331		
Washougal	77,747 15,767			135,000 22,500	30,000 1,500
<b>TOTAL</b>	<b>604,741 94,635</b>	<b>99,908 1,275</b>	<b>153,747 11,505</b>	<b>520,000 88,611</b>	<b>170,000 15,500</b>

Summary Table 9. Continued

Hatchery Species	Stock	Smolt Releases		Fingerling Releases		Transfers		Smolt Production Goal		Nonsmolt Goal	
		No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
<b>Turtle Rock</b>											
<b>Summer Steelhead</b>											
	Ringold	183,045	21,040					200,000	33,333		
	<b>TOTAL</b>	<b>183,045</b>	<b>21,040</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>200,000</b>	<b>33,333</b>	<b>0</b>	<b>0</b>
<b>Vancouver</b>											
<b>Summer Steelhead</b>											
	Skamania	157,053	24,665	16,008	1,551	534,976	2,831	125,000	20,833	550,000	3,667
<b>Winter Steelhead</b>											
	Washougal					162,945	455			180,000	1,200
	<b>TOTAL</b>	<b>157,053</b>	<b>24,665</b>	<b>16,008</b>	<b>1,551</b>	<b>697,921</b>	<b>3,286</b>	<b>125,000</b>	<b>20,833</b>	<b>730,000</b>	<b>4,867</b>
<b>Wells Trout</b>											
<b>Summer Steelhead</b>											
	Wells	475,891	65,119	44,020	8,210	167,790	1,695	450,000	75,000	75,000	15,000
	<b>TOTAL</b>	<b>475,891</b>	<b>65,119</b>	<b>44,020</b>	<b>8,210</b>	<b>167,790</b>	<b>1,695</b>	<b>450,000</b>	<b>75,000</b>	<b>75,000</b>	<b>15,000</b>
<b>Yakima Trout Hatchery</b>											
<b>Summer Steelhead</b>											
	Ringold					411,610	905				
	<b>TOTAL</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>411,610</b>	<b>905</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

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

Hatchery		Smolt Releases		Fingerling Releases		Transfers		Smolt Production Goal		Nonsmolt Goat	
Species	Stock	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
<b>Beaver Creek</b>											
Searun Cutthroat	Elochoman	76,705	23,200			22,780	3,400	95,000	23,750		
Summer Steelhead	Skamnia	44,940	7,950			5,963	1,125	60,000	10,000	25,000	3,125
Winter Steelhead	Elochoman	598,700	123,529			8,800	1,100	355,000	59,167	65,000	8,125
	Elochoman X Kalama	32,745	6,700			59,880	8,471	30,000	5,000	60,000	7,500
<b>TOTAL</b>		<b>753,090</b>	<b>161,379</b>	<b>0</b>	<b>0</b>	<b>97,423</b>	<b>14,096</b>	<b>540,000</b>	<b>97,917</b>	<b>150,000</b>	<b>18,750</b>
<b>Chelan PUD</b>											
Summer Steelhead	Ringold					219,675	15,150				
	Wells	208,390	40,410					195,000	32,500		
<b>TOTAL</b>		<b>208,390</b>	<b>40,410</b>	<b>0</b>	<b>0</b>	<b>219,675</b>	<b>15,150</b>	<b>195,000</b>	<b>32,500</b>	<b>0</b>	<b>0</b>
<b>Cottonwood Pond</b>											
Summer Steelhead	Wallowa	200,844	37,193					200,000	33,333		
<b>TOTAL</b>		<b>200,844</b>	<b>37,193</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>200,000</b>	<b>33,333</b>	<b>0</b>	<b>0</b>
<b>Cowlitz Trout</b>											
Searun Cutthroat	Beaver Creek			33,088	118						
	Cowlitz	29,150	5,588					80,000	20,000		
Summer Steelhead	Cowlitz	63,826	11,575	3,912	351			220,000	36,667		
Winter Steelhead	Cowlitz Earlies	777,297	175,460	152,415	11,993			700,000	116,667		
	Cowlitz Lates	62,806	11,050	68,156	1,549			50,000	8,333		
<b>TOTAL</b>		<b>933,079</b>	<b>203,673</b>	<b>257,571</b>	<b>14,011</b>	<b>0</b>	<b>0</b>	<b>1,050,000</b>	<b>181,667</b>	<b>0</b>	<b>0</b>
<b>Curl Lake</b>											
Summer Steelhead	Lyons Ferry	162,231	28,461					160,000	26,667		
<b>TOTAL</b>		<b>162,231</b>	<b>28,461</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>160,000</b>	<b>26,667</b>	<b>0</b>	<b>0</b>

Summary Table 10. Continued

Hatchery	Species	Stock	Smolt Releases No.	Releases Lbs.	Fingerling Releases No.	Releases Lbs.	Transfers No.	Lbs.	Smolt Production Goal No.	Lbs.	Non-smolt Goal No.	Lbs.
<b>Dayton Pond</b>												
Summer Steelhead												
	Lyons Ferry		34,677	6,669					34,677	5,778		
	Wells		102,050	19,625					102,000	17,000		
	<b>TOTAL</b>		<b>136,727</b>	<b>26,294</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>136,677</b>	<b>22,778</b>	<b>0</b>	<b>0</b>
<b>Gobar Pond</b>												
Summer Steelhead												
	Skamania		58,201	11,641					60,000	10,000		
Winter Steelhead												
	Elochoman X Kalama		52,672	11,704					60,000	10,000		
	<b>TOTAL</b>		<b>110,873</b>	<b>23,345</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>120,000</b>	<b>20,000</b>	<b>0</b>	<b>0</b>
<b>Lyons Ferry</b>												
Summer Steelhead												
	Lyons Ferry		104,343	20,892	317,229	1,311	196,812	28,907	104,000	17,333	196,000	28,405
	Wallowa		103,517	18,107	47,799	113	201,080	23,690	103,000	17,667	200,000	22,988
	Wells		190,008	32,870	88,665	638	127,090	19,202	190,000	31,667	127,000	18,955
	<b>TOTAL</b>		<b>397,868</b>	<b>71,869</b>	<b>453,693</b>	<b>2,062</b>	<b>524,982</b>	<b>71,799</b>	<b>397,000</b>	<b>66,667</b>	<b>523,000</b>	<b>70,348</b>
<b>Naches</b>												
Summer Steelhead												
	Ringold						131,396	370				
	Yakima River						86,260	3,750			105,000	5,250
	<b>TOTAL</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>217,656</b>	<b>4,120</b>	<b>0</b>	<b>0</b>	<b>105,000</b>	<b>5,250</b>
<b>Nelson Springs Raceway</b>												
Summer Steelhead												
	Yakima River		85,387	10,515					100,000	16,667		
	<b>TOTAL</b>		<b>85,387</b>	<b>10,515</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>100,000</b>	<b>16,667</b>	<b>0</b>	<b>0</b>
<b>Ringold Trout</b>												
Summer Steelhead												
	Ringold		179,858	33,980					180,000	30,000		
	<b>TOTAL</b>		<b>179,858</b>	<b>33,980</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>180,000</b>	<b>30,000</b>	<b>0</b>	<b>0</b>

Summary Table 10. Continued

Hatchery	Species	Stock	Smolt No.	Releases Lbs.	Fingerling No.	Releases Lbs.	Transfers No.	Lbs.	Smolt No.	Production Lbs.	Goal Lbs.	Nonsmolt No.	Goal Lbs.
<b>Skamania</b>													
	Searun	Cutthroat											
		Cowlitz	41,118	9,936	2,665	130			35,000	7,778			
	Summer Steelhead	Skamania	316,663	56,597	100,072	2,124	172,065	16,797	350,000	58,333		170,000	17,000
	Winter Steelhead	Washougal	140,824	25,068	53,286	642			135,000	22,500			
	<b>TOTAL</b>		<b>498,605</b>	<b>91,601</b>	<b>156,023</b>	<b>2,896</b>	<b>172,065</b>	<b>16,797</b>	<b>520,000</b>	<b>88,611</b>		<b>170,000</b>	<b>17,000</b>
<b>Turtle Rock</b>													
	Summer Steelhead	Ringold	219,209	35,376					200,000	33,333			
	<b>TOTAL</b>		<b>219,209</b>	<b>35,376</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>200,000</b>	<b>33,333</b>		<b>0</b>	<b>0</b>
<b>Vancouver</b>													
	Summer Steelhead	Skamania	131,500	26,300			639,906	3,239	125,000	20,833		550,000	3,667
	Winter Steelhead	Washougal			43,500	145	132,756	481				180,000	1,200
	<b>TOTAL</b>		<b>131,500</b>	<b>26,300</b>	<b>43,500</b>	<b>145</b>	<b>772,662</b>	<b>3,720</b>	<b>125,000</b>	<b>20,833</b>		<b>730,000</b>	<b>4,067</b>
<b>Wells Trout</b>													
	Summer Steelhead	Wells	615,203	98,410	202,260	6,500	35,460	5,025	600,000	100,000		60,000	12,000
	<b>TOTAL</b>		<b>615,203</b>	<b>98,410</b>	<b>202,260</b>	<b>6,500</b>	<b>35,460</b>	<b>5,025</b>	<b>600,000</b>	<b>100,000</b>		<b>60,000</b>	<b>12,000</b>
<b>Yakima Trout Hatchery</b>													
	Summer Steelhead	Yakima River	56,385	8,347	45,706	780	95,025	525	100,000	16,667		45,000	750
	<b>TOTAL</b>		<b>56,385</b>	<b>8,347</b>	<b>45,706</b>	<b>780</b>	<b>95,025</b>	<b>525</b>	<b>100,000</b>	<b>16,667</b>		<b>45,000</b>	<b>750</b>

Summary Table 11. Production In Pounds During The Three Year Period 1985 -1987 For Hatcheries Operated By The Washington Department Of Wildlife Which Rear Anadromous Fish In The Columbia River Basin. Smolts Include Pounds Of Smolts Released, Fingerling Includes Pounds Of Non-Smolting Fish Released, And Trans. Includes 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>Beaver Creek</b>												
Searun Cutthroat												
	Elochoman		13,431		800	23,705	710	900	23,200		3,400	
Summer Steelhead												
	Skamnia		4,750		1,910	15,320		3,162	7,950		1,125	
Winter Steelhead												
	Chambers Creek		2,350		2,000							
	Elochoman		67,110		14,065	99,013		13,325	123,529		1,100	
	Elochoman X Kalama								6,700		8,471	
			87,641	0	18,775	138,038	710	17,387	161,379	0	14,096	146,009
<b>Chelan PUD</b>												
Summer Steelhead												
	Ringold							9,610			15,150	
	Skamnia				7,953							
	Wells		40,910			36,550			40,410			
			40,910	0	7,953	36,550	0	9,610	40,410	0	15,150	50,194
<b>Cottonwood Pond</b>												
Summer Steelhead												
	Wallowa		23,263			26,908			37,193			
			23,263	0	0	26,908	0	0	37,193	0	0	29,121
<b>Cowlitz Trout</b>												
Searun Cutthroat												
	Beaver Creek										118	
	Cowlitz		23,449	102	2,020	8,587	2,190		5,588			
Summer Steelhead												
	Cowlitz		40,307	3,363	5,728	19,353	2,200		11,575	351		
Winter Steelhead												
	Cowlitz Earlies		142,948	793	1,510	75,657	2,421		175,460	11,993		
	Cowlitz Lates		9,730	285		10,600	520		11,050	1,549		
			216,434	4,543	9,258	114,197	7,331	0	203,673	14,011	0	189,816

Summary Table 11. Continued

Hatchery Species	stock	1985			1986			1987			3 Year Average
		Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	
<b>Curl Lake</b>											
Summer Steelhead											
Lyons Ferry								28,461			
Wallowa		27,123			7,362						
Wells					18,287						
		27,123	0	0	25,649	0	0	28,461	0	0	27,078
<b>Dayton Pond</b>											
Summer Steelhead											
Lyons Ferry								6,669			
Wells								19,625			
		0	0	0	0	0	0	26,294	0	0	8,765
<b>Gobar Pond</b>											
Summer Steelhead											
Skamania		10,261			11,528			11,641			
Winter Steelhead											
Elochoman		10,468			12,845						
Elochoman X Kalama								11,704			
		20,729	0	0	24,373	0	0	23,345	0	0	22,816
<b>Lyons Ferry</b>											
Summer Steelhead											
Lyons Ferry								20,892	1,311	28,907	
Willowa		22,928	84,276		12,020	22,006		18,107	113	23,690	
Wells		70,369			84,422	14,039		32,870	638	19,202	
		93,297	0	84,276	96,442	0	36,045	71,869	2,062	71,799	151,930
<b>Naches</b>											
Summer Steelhead											
Ringold							5,423			370	
Skamania							3,043				
Wells			154	9,308							
Yakima River										3,750	
		0	154	9,308	0	0	8,466	0	0	4,120	7,349

Summary Table 11. Continued

Hatchery	Species	Stock	1985			1986			1987			3 Year Average
			Smolt	Fingerling	Trans.	Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	
<b>Nelson Springs Raceway</b>												
<b>Summer Steelhead</b>												
	Ringold					11,396						
	Skamania					7,332						
	Wells	15,000										
	Yakima River								10,515			
-----												
		15,000	0	0		18,728	0	0	10,515	0	0	14,748
<b>Ringold Trout</b>												
<b>Summer Steelhead</b>												
	Ringold	17,500				37,180			33,980			
-----												
		17,500	0	0		37,180	0	0	33,980	0	0	29,553
<b>Skamania</b>												
<b>Searun Cutthroat</b>												
	Cowlitz	3,198				8,246			9,936	130		
<b>Summer Steelhead</b>												
	Skamania	47,264	820	8,144		60,434	172	10,174	56,597	2,124	16,797	
<b>Winter Steelhead</b>												
	Cowlitz					10,188	1,103	1,331				
	Wahougal	9,799				15,767			25,068	642		
-----												
		60,261	820	8,144		94,635	1,275	11,505	91,601	2,896	16,797	95,978
<b>Turtle Rock</b>												
<b>Summer Steelhead</b>												
	Ringold					21,040			35,376			
	Skamania	13,150										
-----												
		13,150	0	0		21,040	0	0	35,376	0	0	23,189
<b>Vancouver</b>												
<b>Summer Steelhead</b>												
	Skamania	24,864		4,340		24,665	1,551	2,831	26,300		3,239	
<b>Winter Steelhead</b>												
	Cowlitz			304								
	Wahougal			523				455		145	481	
-----												
		24,864	0	5,167		24,665	1,551	3,286	26,300	145	3,720	29,899

Summary Table 11. Continued

Hatchery Species	Stock	1985			1986			1987			3 Year Average
		Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	Smolts	Fingerling	Trans.	
<b>Wells Trout</b>											
Summer Steelhead											
Wells		66,878	11,495		65,119	8,210	1,695	98,410	6,500	5,025	
		.....			.....			.....			.....
		66,878	11,495	0	65,119	8,210	1,695	98,410	6,500	5,025	87,777
<b>Yakima Trout Hatchery</b>											
Summer Steelhead											
Ringold				300			905				
Yakima River								8,347	780	525	
		.....			.....			.....			.....
		0	0	300	0	0	905	8,347	780	525	3,619

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

Hatchery	Total Hatchery Production in Pounds				Theoretical Productions in Pounds		1987 Agency Goal in Lbs
	1985	1986	1987	Average	Flow Method	Density Method	
Beaver Creek	106,416	156,135	175,475	146,009	158,376	135,020	116,667
Chelan PUD	48,863	46,160	55,560	50,194	50,710	84,011	32,500
Cottonwood Pond	23,263	26,908	37,193	29,121	50,580	91,200	33,333
Cowlitz Trout	230,235	121,528	217,684	189,816	489,510	1,820,955	181,667
Curl Lake	27,123	25,649	28,461	27,078	62,640	168,000	26,667
Dayton Pond	0	0	26,294	8,765	57,240	50,160	22,778
Gobar Pond	20,729	24,373	23,345	22,816	48,132	58,320	20,000
Lyons Ferry *	177,573	132,487	145,730	151,930	279,534	444,960	137,015
Naches *	9,462	8,466	4,120	7,349	5,485	3,005	5,250
Nelson Springs	15,000	18,728	10,515	14,748	27,720	11,634	16,667
Ringold Trout	17,500	37,180	33,980	29,553	29,184	401,520	30,000
Skamania	69,225	107,415	111,294	95,978	316,615	157,688	105,611
Tucannon *	0	0	0	0	48,134	134,225	0
Turtle Rock	13,150	21,040	35,376	23,189	59,242	6,960	33,333
Vancouver	30,031	29,502	30,165	29,899	20,720	67,680	25,700
Wells Trout	78,373	75,024	109,935	87,777	141,087	287,932	112,000
Yakima Trout *	300	905	9,652	3,619	25,128	74,176	17,417
<b>TOTAL</b>	<b>867,243</b>	<b>831,500</b>	<b>1,054,779</b>	<b>917,841</b>	<b>1,821,903</b>	<b>3,863,221</b>	<b>916,605</b>

\* Total hatchery production, theoretical production, and agency goal include only anadromous fish production. Each of these facilities also have a resident trout program not included in the table. Note that Tucannon Hatchery produced no anadromous fish for WDW but is included here because it has expansion capability.

Summary Table 13. Anadromous Species Which Can Be Reared At Hatcheries Operated By The Washington Department Of Wildlife In The Columbia River Basin. An "O" Indicates Species Currently Being Reared And A "X" Designates Species Which Potentially Could Be Reared.

Hatchery	Fall	Spring	Summer	Coho	Steelhead	Searun		Chum
	Chinook	Chinook	Chinook			Cutthroat	Sockeye	
Beaver Creek	X			X	O	O		X
Chelan PUD	X	X	X	X	O			
Cottonwood Pond		X	X		O			
Cowlitz Trout	X	X		X	O	O		X
Dayton Pond					O			
Gobar Pond	X	X		X	O	X		
Lyons Ferry	X	X	X	X	O			
Naches	X			X	O			
Nelson Springs Raceway	X	X	X	X	O		X	
Ringold Trout	X	X	X	X	O			
Skamania	X			X	O	O		X
Tucannon	X	O	X	X	X			
Turtle Rock	X		X	X	O			
Vancouver	X	X		X	O	X		X
Wells Trout	X	X	X	X	O			
Yakima Trout	X			X	O			

APPENDIX A  
ADDRESSES AND PHONE NUMBERS  
OF AGENCIES OPERATING 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 Rishts:

	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:** \_\_\_\_\_

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

**I/Correct for irregular shapes.**

**LAYOUT:** 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 desian information):

Description	cost
-------------	------

Land Acquisition:

Construction:

Water Related:

O&M:

Potential Smolt Production: